

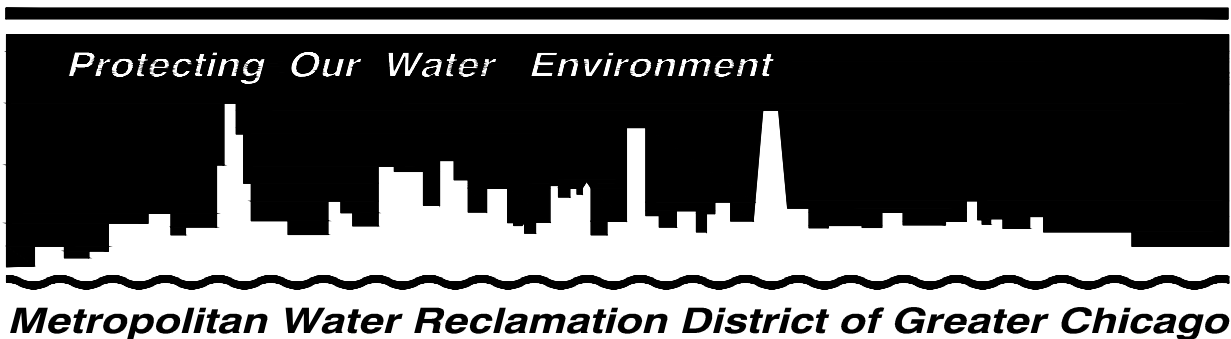
Contract Documents

for

Flood Control Project on Midlothian Creek in Robbins, Illinois, CSA

Little Calumet River Watershed
Robbins, Illinois

Contract 14-253-5F



Room 508, 100 East Erie Street

Chicago, Illinois 60611

Volume 2 of 4 SPECIFICATIONS February 2024

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**METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO
FLOOD CONTROL PROJECT ON MIDLOTHIAN CREEK IN ROBBINS, ILLINOIS, CSA
CONTRACT 14-253-5F**

VOLUME 2 OF 4 - SPECIFICATIONS

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

GENERAL CONDITIONS

Water Reclamation District Law

Article 1. The Contractor hereby agrees to carry on all the work provided for in this Contract in strict conformity with the requirements of the law under which the Metropolitan Water Reclamation District of Greater Chicago is organized, entitled "An Act to create Sanitary Districts and to remove obstructions from the Des Plaines and Illinois Rivers," approved May 29, 1889, in force July 1, 1889, and all acts amendatory thereof and supplementary thereto (70 ILCS 2605). The Contractor shall comply with the Illinois Human Rights Act, Art.2, 775 ILCS 5/2-101-5/2-105.

Laws, Ordinances, Permits and Taxes.

Article 2. The Contractor shall obtain all permits and certificates required by the municipalities within which the work is being performed, or which may be required by any governmental agency having proper jurisdiction, without additional expense to the Water Reclamation District, and shall strictly comply with all ordinances, statutes and regulations of the Water Reclamation District, the municipalities within which the work is being carried on, the State of Illinois, and the United States Government, and any governmental agency having proper jurisdiction, in any manner affecting the work hereunder or controlling or limiting in any way the actions of those engaged on work pertaining to this Contract.

The Contractor shall save and keep the Water Reclamation District harmless from any liability or expense incurred because of said permits, ordinances, statutes or regulations or violations thereto.

At the pre-construction meeting the Contractor will provide the Engineer with copies of all regulatory and environmental permits, approvals, certificates, and inspection fee receipts relative to the Illinois Environmental Protection Act. (415 ILCS 5/). Thereafter, new copies of these documents will be given to the Engineer within 24 hours of receipt.

As part of each monthly pay request an affidavit must be submitted to the Engineer attesting that all regulatory

and environmental permits and licenses necessary to the Work are in place and being complied with. This submittal is a condition precedent to payment. Any citation or notice of an environmental violation will be forwarded to the Engineer by the most expeditious method possible.

The Water Reclamation District is not liable for the Illinois Retailer's Occupational Tax, the Service Occupation Tax, the Service Use Tax, or Transportation Tax. The Illinois Exemption Identification Number is indicated on the Proposal form of the Contract Document. No payment will be made for taxes from which the Water Reclamation District is exempt.

The parties agree that any lawsuit concerning this contract, its breach, or work done hereunder, shall be brought in the Circuit Court of Cook County, Illinois. The Contract (also referred to as "Agreement") will be construed under Illinois law, which will prevail in the event of any conflict of law.

Wage Rates/Employment

Article 3a. The Contractor shall comply with the Prevailing Wage Act, 820 ILCS 130/0.01 et. seq. Current prevailing wage rates for Cook County and/or Fulton County are determined by the Illinois Department of Labor. It is the responsibility of the Contractor to obtain and comply with any revisions to the rates should they change during the duration of the Contract.

Article 3b. The Contractor shall comply with Employment of Illinois Workers on Public Works Act, 30 ILCS 570/0.01 et. seq. The Act indicates that the level of unemployment in the State of Illinois is measured by the United States Bureau of Labor Statistics in its monthly publication of employment and unemployment figures. It is the responsibility of the Contractor to determine the level of unemployment in the State of Illinois, and to employ only Illinois laborers when required by the Act.

No additional compensation will be allowed the Contractor because of any delays or additional costs to the Contractor, or any subcontractor of the Contractor, in any way arising from or caused by appealing any decision of the Water Reclamation District or any

hearing in Court, or for any other delays or costs, any of which may have been occasioned by compliance on the part of the Water Reclamation District, the Contractor or any subcontractor of the Contractor, with the provisions of Acts, laws. Or statutes.

Approximate Quantities.

Article 4. It is expressly understood and agreed by the parties hereto that where quantities of various classes of work to be done and material to be furnished under this Contract have been established and stated in the approximate statement of quantities in the "Form of Proposal" attached hereto, said quantities are only approximate and are to be used solely for the purpose of comparing, on a uniform basis, the proposals offered for the work under this Contract. And the Contractor further agrees that the Water Reclamation District will not be held responsible if any of said quantities shall be found incorrect; and the Contractor will not make any claim for damages or for loss of profits or for an extension of time because of a difference between the quantities of the various classes of work as estimated and the work actually done. If any error, omission, or misstatement shall be discovered in the said estimated quantities, the same shall not invalidate this Contract or release the Contractor from the execution and completion of the whole or any part of the work herein specified, to the satisfaction of the Engineer and in accordance with the specifications and plans and for the price or prices herein agreed upon and fixed therefore, or excuse him from any of the obligations or liabilities hereunder, or entitle him to any damages or compensation other than as specified in this Contract, except for such extra work as may be required, for the performance of which written orders must be given and received as herein specified.

Changes in Plans and Specifications.

Article 5. The Water Reclamation District reserves the right to make any changes in the specifications and plans which may be deemed necessary either before or after beginning any work under this Contract, without invalidating this Contract; provided that if alterations are made, the general character of the work as a whole is not changed thereby.

If such alterations increase the quantity of work to be done, where unit prices are specified, such increase shall be paid for according to the quantity of work actually done at the unit price specified under this Contract for each class of work performed. If such alterations diminish the quantity of work to be done, where unit prices are specified, they shall not constitute

a claim for damages or for loss of profit on the work that may be dispensed with, and the Water Reclamation District shall not be required to pay for work or material omitted.

If such alterations increase the amount of work to be done, where lump sum prices are specified, such increase shall be paid for as an extra as provided in Articles 7 and 8. If such alterations or omissions diminish the amount of work to be done, where lump sum prices are specified, such alterations or omissions shall not constitute a claim for damages or for loss of profits on the work dispensed with, and the Water Reclamation District shall not be required to pay for work or material, omitted nor for any loss of anticipated profits on such omitted work. The value of any such work or material omitted will be determined by the Engineer from the balance statement submitted under Article 33, "Progress Payments and Reserves," or from an independent estimate prepared by the Engineer in accordance with Article 8, "Estimating Change Orders."

Where, however, such alterations involve the addition or omission of work to items where lump sum prices are specified, which can be properly classified and measured under appropriate unit price items of this Contract, the extra cost or the credit to be allowed will be based on said appropriate unit price items.

Construction conditions may require that minor changes be made in the location and installation of the work and equipment to be furnished and other work to be performed hereunder, and the Contractor, when ordered by the Engineer, shall make such adjustments and changes in said locations and work as may be necessary without additional charge, provided such adjustments and changes do not substantially alter the character, quantity or cost of the work as a whole, and provided further that plans and specifications showing such adjustments and changes are furnished the Contractor by the Water Reclamation District within a reasonable time before any work involving such adjustments and changes is begun. The Engineer shall be the sole judge of what constitutes a minor change for which no additional compensation shall be allowed.

In the event that any material is omitted, by order of the Engineer, which has been called for and furnished in accordance with the accompanying plans and specifications for use in the work under any item hereof, and has been delivered to or has been partially worked upon by the Contractor and for any reason will not be available at its full value for any purpose other than for use under this Contract, then, in that event, the Contractor shall be paid for only the actual cost of such omitted material, as so delivered, furnished or worked

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upon, with fifteen (15) per cent of such cost added thereto, less the fair market value of such material as so delivered, furnished or worked upon, all as shall be determined by the Engineer.

Federal Regulations.

Article 6. For grant funded projects, all Federal regulations including labor standards, Copeland "Anti-Kickback" Act (18U.S.C.874), equal employment opportunity and access to work shall be in effect. These regulations appear in Appendix B in the contract documents and form a part thereof. In the event of a conflict between these Federal regulations and any other requirements in the Contract Documents, the Federal regulation shall apply, and the Contractor shall abide by their provisions.

In the event that a grant funded contract exceeds Ten Thousand Dollars (\$10,000.00), then all the terms and conditions of the Affirmative Action Requirements shall be in effect. These requirements are included in the Contract Documents as APPENDIX C and form a part thereof.

Contingency- Engineering Capital Improvement Construction Projects-No Change in Scope

Article 6.5. A contingency allotment of up to 5% of the bid price for work to be performed on the Engineering Department's Capital Improvement Construction Projects may be added into the total Contract award. This contingency shall not be used for any change in the project scope contemplated by this Contract. This contingency will be used for unforeseen conditions and any additional work required to complete the original project scope described in this Contract. For work done within each such contingency, the Director of Engineering may authorize work in one or more occurrences, without approval of the Board of Commissioners, in an amount not to exceed One Hundred Thousand Dollars (\$100,000.00) per occurrence. However, for all such work, the Contractor shall follow and be bound by the procedures, requirements, and conditions set forth below in Articles 7 and 8. Once the contingency is exhausted, only the Board of Commissioners may approve additional or extra work.

Change Orders - Extra Work.

Article 7. On all Contracts other than those described in Article 6.5, the Contractor shall perform such extra work as the Engineer may direct in his written order, provided that no extra work, the total price or cost of which is in excess of Ten Thousand Dollars

(\$10,000.00), shall be performed by the Contractor until the Engineer is authorized by the Board of Commissioners of said Water Reclamation District to issue a written order therefore, and shall have issued such written order.

All extra work shall be performed at such time as the Engineer directs. All claims for extra labor, rental of equipment or material furnished by the Contractor or for damages from any cause whatsoever, must be reported to the Engineer in writing within a reasonable time after such labor, equipment or material is furnished or such damages occur and they must in any event be presented to the Engineer in writing within thirty (30) days after the end of the month during which such extra work was performed or such damages occurred. Whenever so required, the Contractor shall deliver to the Engineer each day a signed statement of the claimed extra labor, equipment and material furnished during that day. The written order of the Engineer to the Contractor to perform any extra work therein mentioned, and the written notices and statements of the work performed herein above and hereinafter required from said Contractor, are conditions precedent to any recovery on the part of said Contractor for any extra work performed.

Whenever work is required to be done other than that which is now contemplated, and covered by the prices herein specified, the Engineer shall fix such prices for the work as he shall consider just and equitable, and the Contractor shall abide by such prices, provided he enters upon such work with a full knowledge of the prices so fixed by said Engineer; and if extra work, or other work than that provided for in this Contract, is performed by the Contractor before prices have been fixed for such work, then the Engineer shall estimate the same at such prices as he shall deem just and reasonable, and his decision shall be final and binding upon both parties to this Contract and the said Contractor shall accept such prices in full satisfaction of all demands against the Water Reclamation District for said extra work; provided, that, if the extra work done under this Contract is of such a nature, being distinct from other work being done by said Contractor, that the Engineer can determine the actual cost of the same, then the Contractor shall receive and the District shall pay, in full satisfaction for the same, the actual cost of the work as determined by the Engineer plus an amount not to exceed fifteen (15) percent added to labor items and ten (10) percent to material items to cover superintendence, overhead, and for profit, except as hereinafter provided in Article 8; provided further, that nothing shall be deemed extra work which in the opinion of the Engineer can be classified and measured or estimated under the provisions of this Contract, and

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paid for at unit prices herein provided. No percentage shall be added to any unit or lump sum price specified or to any unit or lump sum price fixed by the Engineer for extra work performed by the Contractor.

Estimating Change Orders.

Article 8. It is further agreed that in all cases of question or dispute arising or growing out of this Contract in any way regarding the cost or value of extras, variations, allowances or deductions, or the amount of damages in any manner growing out of the violation of any of the provisions of this contract, or as to whether any materials furnished or work performed shall be classified and paid for as extra work, or shall be covered by the specified lump sum price, the decision of the Engineer shall be final and binding on both parties hereto.

In estimating the actual cost of either extra or deleted work, the cost of the labor, material and rental of equipment shall be included.

The Contractor, when so requested by the Engineer shall provide a detailed cost proposal for extra or deleted work conforming to the provisions of Articles 7 and 8 within fifteen calendar days of receipt of such request unless such period of time is extended in writing by the Engineer.

The cost of labor shall be taken as the amount paid for labor and foremen employed directly on the work as shown by the payrolls of the Contractor with the cost of Workmen's Compensation and Commercial General Liability insurance added when such can be shown to have been paid. To this total shall be added an amount not to exceed fifteen (15) per cent for superintendence, overhead and profit. The rates charged for labor shall in no case, however, exceed the rates paid by the Contractor for the same class of labor employed by him to perform work under the regular items of the Contract, plus such other additional and directly related costs as are actually and immediately incurred as a result of contractual, legal and/or State and Federal government requirements, and are a direct result of the work performed and pay calculations. No reimbursement shall be made for clerical expenses or the cost of preparation of payrolls or future payments or reserves.

The cost of material shall be actual cost delivered at the site of the work. To this cost shall be added an amount not to exceed ten (10) per cent for overhead and profit.

The rentals charged for equipment employed on extra

work shall not exceed the usual rentals charged for the use of similar equipment of the same size and capacity in the region of work as determined by the Engineer. Such rental charges shall include the cost of necessary supplies and repairs for the proper operation and maintenance of such equipment.

Should equipment used on any extra work be located at or adjacent to the site of the work hereunder so as to be available for use on such extra work, no charge against the Water Reclamation District shall be made for any part of the cost of transporting such equipment either to or from the site of the work. If such equipment is not at the site of the work and is required for use for such extra work only, the cost of transporting such equipment to and from the site of the work, at the usual rates charged therefore in the region of work, shall be considered a part of the cost of such extra work. No allowance or any percentage will, however, be added to rental charges for equipment or to transportation charges on same.

No charge for the cost of administration, office overhead, field superintendence, bidding expense, bond or miscellaneous risk insurance will be allowed except as covered by the not-to-exceed allowances of fifteen (15) per cent added to labor items and (10) per cent to material items for superintendence, overhead and profit.

The cost of all credits to the Contract shall be estimated in the same manner as extra work and shall be computed in accordance with the methods herein specified.

If the extra work is being performed by a subcontractor, the Contractor shall be allowed an amount not to exceed ten (10) per cent of that subcontractor's expense to cover the overhead, supervision and profit of the Contractor hereunder. No allowance in excess of this ten (10) per cent shall be made for intermediate tier subcontractors. Said subcontractor's expense for the cost of labor, material and equipment employed by him on the extra work shall be based on rates not in excess of the rates paid for work of a similar character under regular items of the Contract and the cost shall be charged in complete accordance with methods herein specified.

The Contractor, if requested by the Engineer, shall exhibit to the Engineer and shall permit reproductions to be made by the Water Reclamation District of the actual bills for all materials used and the payrolls of all labor furnished and of all equipment used in performing such extra work, and, if requested by the Engineer, shall certify by his affidavit to the correctness of the amounts paid for material, labor and insurance, and rentals

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shown on any extra bills presented by him to the Water Reclamation District.

Cost of Work.

Article 9. All books and accounts kept by the Contractor in connection with this Contract shall be open to the inspection of the Engineer or his authorized representative.

The Contractor shall furnish the Engineer reasonable facilities for obtaining such information as he may desire regarding the progress and execution of the work and the character of the materials including all information necessary to determine the cost of the work, such as the number of men employed, their pay, the time during which they have worked on the various classes of construction, the cost of repairs to machinery, and other information required by the Engineer. The Contractor shall, on request, furnish the Engineer with copies of receipts for transportation charges of all machinery, material and supplies shipped to or from work under this Contract.

The Contractor shall furnish daily to the Engineer a true copy of the daily record of his and his subcontractor's records of labor, material and equipment. This record shall be presented on a form approved by the Engineer and shall indicate a detailed breakdown for each item included in this Contract.

Night, Saturday, Sunday and Holiday Work.

Article 10. Whenever the Contractor shall be permitted or directed to perform work at night, or on Saturdays, Sundays or a holiday, or to vary the period of hours during which any work is carried on each day, he shall give at least 24 hours written notice to the Engineer so that proper inspection may be provided. Such work shall be done under regulations to be furnished in writing by the Engineer, and no extra compensation shall be allowed therefore, unless expressly provided for in the Detail Specifications.

Precautions.

Article 11. The Contractor shall take any precautions that may be necessary to render any portion of the work secure in every respect or to decrease the probability of accidents from any cause, or to avoid contingencies which are liable to delay the completion of the work. The Contractor shall furnish and install, subject to the approval of the Engineer, all necessary facilities to provide safe means of access to all points where work is being performed hereunder and make all necessary provisions to insure the safety of all persons

during the performance of said work. The Contractor will be required to conduct his work so as not to obstruct or render dangerous public highways, bridges, railroads and navigable waterways.

Superintendence.

Article 12. The Contractor shall at all times have a competent foreman, superintendent or other representative on the work who shall have full authority to act for the Contractor and to receive and execute orders from the Engineer, who shall receive shipments of material to the Contractor, and who shall see that the work is executed in accordance with the specifications and plans and the orders of the Engineer hereunder.

Personnel, Security.

Article 13. The Contractor shall employ competent personnel and shall remove from the Contract, at the sole discretion of the Engineer, any incompetent or uncooperative individuals in the Contractor's employ, including any Subcontractor employees. Only persons expert in their respective branches of work shall be employed where special skill is required; No person shall be employed on this Contract unless they are a citizen of the United States, a national of the United States under Section 1401 of Title 8 of the United States Code, an alien lawfully admitted for permanent residence under Section 1101 of Title 8 of the United States Code, an individual who has been granted asylum under Section 1158 of Title 8 of the United States Code, or an individual who is otherwise legally authorized to work in the United States (70 ILCS 2605/11.15). At the sole discretion of the Engineer, the Contractor shall remove from the Contract any individual in the employ of the Contractor, including any Subcontractor employees, whose performance is unacceptable or who engages in conduct that violates any MWRDGC policy.

The Contractor shall actively cooperate with the MWRDGC's Police in security efforts as the Department of Homeland Security's threat level may indicate. Prior to starting work on the Contract, the Contractor shall provide the MWRDGC's Chief of Police with a list of all individuals in the employ of the Contractor, including any Subcontractor employees, performing any function on the Contract, as well as a copy of the driver's license or other acceptable identification of all such individuals.

The MWRDGC may conduct such background and employment checks, including criminal history checks and work permit documentation, as the MWRDGC may deem necessary, on any individual in the employ of the

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Contractor, including any Subcontractor employees. The MWRDGC has the right to require the Contractor to supply or provide access to any additional information the MWRDGC deems relevant to its security concerns or in the interest of workplace safety.

The MWRDGC may preclude any individual in the employ of the Contractor, including any Subcontractor employees, from performing work on the Contract if the MWRDGC determines that any such individuals pose a security risk or potential threat to workplace safety. The Contractor must immediately report any information to the MWRDGC relating to any threat to the MWRDGC's personnel, its infrastructure, facility, equipment, or its treatment processes, and must fully cooperate with the MWRDGC and all governmental entities investigating any such threat. All individuals in the employ of the Contractor, including any Subcontractor employees, shall be accountable to the Engineer while working on the Contract and shall abide by all security or workplace safety regulations imposed by the MWRDGC.

All individuals in the employ of the Contractor, including any Subcontractor employees, performing any function on the Contract shall at all times wear an easily identifiable identification badge bearing the name of the Contractor or Subcontractor and the number assigned to each such individual. The specifications of the identification badge are subject to the approval of the MWRDGC's Engineer.

Sanitation.

Article 14. The Contractor shall enforce among his employees such regulations in regard to cleanliness and the disposal of garbage and wastes as shall be conducive to their health, and tend to prevent the inception and spread of contagious and infectious disease among them, and shall provide an ample supply of suitable pure drinking water, and shall take such means as the Engineer may direct to effectively prevent the creation of a nuisance on any part of the site or adjacent streets or property. Necessary sanitary conveniences for the use of the laborers on the work, properly secluded from public observation, shall be constructed and maintained by the Contractor in such manner and at such points as shall be approved, and their use shall be strictly enforced.

Patents.

Article 15. Contractor hereby agrees to defend, at his own expense, the Water Reclamation District, and indemnify and hold and save it harmless in any suit or action brought against the Water Reclamation District

for alleged infringement of any patents relating to any material, machinery, devices, equipment, apparatus, or processes furnished, used or installed by said Contractor, and the Contractor shall pay any and all expenses including attorneys' fees, costs, damages, judgments or awards, and satisfy any and all liabilities which may arise against said Water Reclamation District on account thereof.

The Water Reclamation District shall promptly notify the Contractor in writing of the filing of any such suit or action and give such needed information and assistance as may be within its control.

The Contractor agrees that in the event he shall fail or refuse to so defend the Water Reclamation District as herein provided, the Water Reclamation District may do so and collect from the Contractor any and all attorneys' fees, costs and other expenses, including any judgments and awards, and in such case the Water Reclamation District shall have the right to retain, from any sums of money due or to become due to the Contractor, sufficient funds to so reimburse it.

If the Contractor utilized any material, machinery, device, equipment, apparatus or process covered by a patent, the Contractor shall submit to the District written proof of a valid, current license under the patent prior to commencing work.

It is understood that the obligations imposed on said Contractor by this Article 15 shall not apply to claims for infringements of patents on the processes of treatment of sewage and sludge generally used in the project for which the work under this Contract is a part.

Damages and Indemnity.

Article 16. The Contractor covenants and agrees that he shall be solely responsible for and will pay for injuries, deaths, loss, damages, claims, patent claims, suits, liabilities, judgments, costs and expenses, which may in anywise accrue against the Water Reclamation District, its commissioners, officers, agents and employees, arising out of or in consequences of the performance of this work by the Contractor, or which may in anywise result therefrom.

The Contractor hereby agrees to defend, indemnify and hold harmless the Water Reclamation District, its commissioners, officers, agents and employees, against all injuries, deaths, loss, damages, claims, patent claims, suits, liabilities, judgments, costs and expenses, which may in anywise accrue against the Water Reclamation District, its commissioners, officers, agents and employees, arising out of or in consequence

of the performance of this work by the Contractor, or which may in anywise result therefrom, and the Contractor shall, at his own expense, appear, defend and pay all charges of attorneys and all costs and other expenses arising therefrom or incurred in connection therewith, and, if any judgment shall be rendered against the Water Reclamation District, its commissioners, officers, agents and employees, in any such action, the Contractor shall, at his own expense, satisfy and discharge the same. The Contractor expressly understands and agrees that any performance bond or insurance protection required by this Contract or otherwise provided by Contractor shall in no way limit this responsibility to indemnify, keep and save harmless and defend the Water Reclamation District, its commissioners, officers, agents and employees, as herein provided.

The Contractor further agrees that so much of the money due him under and by virtue of this Contract, as shall be considered necessary by the Board of Commissioners of the Water Reclamation District, may be retained by the Water Reclamation District to protect itself against loss until such claims, suits or judgments shall have been settled, and evidence to that effect shall have been furnished to the satisfaction of the Board of Commissioners of the Water Reclamation District.

Insurance.

Article 17. The Contractor, at his sole expense and prior to engaging upon the work agreed to be done, shall procure, maintain and keep in force during the entire term of the Contract such required insurance as specified below. The specific type(s) and amount(s) of coverage for this Contract are specified in the Detail Specifications.

(A) Completed Value Builder's Risk in the sum of 100% of the amount of the Contract, including subsequent modifications thereto. Such insurance shall be provided on an "all risk" (including flood and earthquake) and replacement cost basis. This insurance shall be maintained until final acceptance of the work by the Water Reclamation District. The Metropolitan Water Reclamation District of Greater Chicago shall be designated as the named insured.

(B) Statutory coverage as provided for in the Workmen's Compensation Act and Occupational Diseases Act of the State of Illinois, and Employers' Liability coverage, in the minimal acceptable limits indicated in the Detail Specifications.

(C) Commercial General Liability on an "occurrence form" in which the Contractor is the named insured.

Such insurance shall provide coverage for bodily injury, personal injury, property damage, premises and operations, explosion, collapse and underground hazards, products and completed operations, contractual liability, independent contractors, broad form property damage (including products and completed operations), and liability arising from the "Illinois Structural Work Act." and its successors The Metropolitan Water Reclamation District of Greater Chicago, its commissioners, officers, agents and employees shall be included as additional insureds, with coverage no more restrictive than Insurance Services Office (ISO) Form Number CG 2009.

(D) Business Auto Liability in which the Contractor is the named insured for liability arising from the ownership, maintenance or use of owned, hired and non-owned vehicles, including coverage for contractual liability. The Metropolitan Water Reclamation District of Greater Chicago, its commissioners, officers, agents and employees shall be included as additional insureds.

(E) Professional Liability Errors and Omissions Liability in which the Contractor is a named insured for liability arising from acts, errors or omissions of the Contractor and its subcontractors.

(F) Environmental Impairment Liability in which the Contractor is a named insured for liability arising from bodily injury, property damage and environmental clean-up. If the Contractor uses vehicles to transport hazardous materials, such insurance shall also apply to accidents during transportation. The Metropolitan Water Reclamation District of Greater Chicago, its commissioners, officers, agents and employees shall be included as additional insureds.

The insurance required herein shall be maintained during the entire course of the Contract, except Commercial General Liability, Professional Errors and Omissions Liability, and Environmental Impairment Liability insurance (if required) which shall be maintained for one (1) year following final acceptance.

Any deductibles or other forms of retention set forth in Contractor's insurance policies are the responsibility of the Contractor. All deductibles and self-insured retentions are subject to the approval of the Water Reclamation District.

Prior to being permitted to engage upon the work, the Contractor shall furnish unto the Water Reclamation District certificates which evidence the required insurance, original insurance policies or certified copies of the insurance policies. If coverage is evidenced by certificates of insurance, the Contractor must provide

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the actual insurance policies or certified copies thereof within sixty (60) days after the starting date of the Contract. Unless otherwise agreed to in writing by the District, the insurer(s) providing the required insurance shall be licensed in Illinois and shall be rated A-, Class VII or better in the most recent edition of Best's Key Rating Guide.

Not less than two weeks before the expiration of any insurance coverage required by the Contract, the Contractor must provide certificates which evidence renewal or continuation of the required insurance policies or certified copies of such insurance policies. If renewal of coverage is evidenced by certificates of insurance, the Contractor must provide the actual insurance policies or certified copies thereof within (60) days of the expiration of coverage.

Upon failure to provide such evidence of coverage and/or policies or certified copies of insurance within the time periods required, the District may direct the Contractor to cease all operations until the required documents have been provided to the District. Such certificates of insurance and insurance policies must be accompanied by any required additional insured endorsements, and provide that coverage may not be canceled, non-renewed, or materially reduced without providing thirty (30) days advance written notice by the insurer(s) to the Water Reclamation District. All certificates of insurance, insurance policies and the insurance companies providing the coverage required herein are subject to the approval of the Water Reclamation District.

Responsibility of Contractor and Execution of Work.

Article 18. The Contractor shall be responsible for the entire work until completed and accepted by the Water Reclamation District. The Contractor shall give his personal attention to the fulfillment of this Contract and to the execution of the work. He shall keep the same under his control, and shall not sublet any part of it, except as hereinafter specified. The Water Reclamation District will not recognize any parties engaged on the work covered by this Contract other than the Contractor and his employees.

No assignment by the Contractor of any construction contract, or any part or rights thereof, or of the funds to be received by the Contractor, will be recognized by the Water Reclamation District unless such assignment has had the prior approval of the Director of Procurement and Materials Management and the consent of the Surety.

No assignment will receive approval unless the instrument of assignment contains a clause to the effect that it is agreed that the funds to be paid the assignee under the assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said Contract in favor of all persons, firms or corporations rendering such services or supplying such materials.

In case the Contractor, by his own acts or the acts of any person or persons in his employ shall unnecessarily delay, in the opinion of the Engineer, the work of the Water Reclamation District or other contractors by not properly cooperating with them, or affording them sufficient opportunity or facilities to perform work, as hereinbefore specified, the Contractor shall, in that case, pay all costs and expenses incurred by such parties, due to any such delays, and hereby authorizes the Water Reclamation District to deduct the amount of such costs and expenses from any sums of money due or to become due the Contractor under this Contract. The Engineer shall decide the extent of such delay or delays and amount of such costs and expenses and his decision shall be final and binding upon both parties to this Contract. Nothing contained in the paragraph shall, however, relieve the Contractor from any liability or damages resulting to the Water Reclamation District on account of such delay or delays.

Subletting Work.

Article 19. The Contractor shall not sublet any part of said work to any entity that is not competent, experienced and financially able to properly carry out and execute the same. The Contractor will not exceed the limits on the portion of the Work sublet, either in aggregate or individually, as identified in the bid documents and Contract. It is further agreed that such subletting shall not directly or indirectly release or modify the responsibility of the Contractor for the satisfactory completion of all said work, and that the Water Reclamation District shall not be liable to any subcontractor for any lien on the sums of money due or to become due to the Contractor or for any other lien, claim or damages whatsoever. In case any party or parties, to whom any work under this Contract shall have been sublet, shall disregard the directions of the Engineer or his duly authorized representatives, or shall furnish any unsatisfactory work, or shall fail or refuse in any way to conform to any of the conditions of this Contract, then in that case, upon the written order of the Engineer, the Contractor shall require said party or parties in default to discontinue work under this Contract. Any defective work done by any such subcontractor shall be replaced by work which is satisfactory to the Engineer.

Liens.

Article 20. If at any time during the progress of said work the Contractor shall fail or neglect to pay for any labor performed, material furnished, or tools, machinery, appliances, fuel, provisions or supplies of any sort or kind used or consumed in, upon, or on account of said work, for ten (10) days after payment for same shall become due, then the Water Reclamation District shall have the power to pay such indebtedness, and the amount so paid shall be retained out of the money due or to become due the Contractor. The Water Reclamation District may refuse to make the payment hereinafter specified to the extent of such indebtedness until satisfactory evidence in writing has been furnished that said indebtedness has been discharged. In any such case the Director of Procurement and Materials Management is hereby authorized and empowered by said Contractor to ascertain the amount due or owing from the Contractor to any laborer or laborers, or to any person or persons, or corporations, for labor, equipment, material, tools, machinery, appliances, fuel, provisions or supplies of any sort or kind consumed upon, in or on account of the work covered by this Contract in such manner and upon such proofs as Director of Procurement and Materials Management may deem sufficient.

Cooperation.

Article 21. It is understood and agreed that all work shall be executed in such manner and in such order as will permit the commencement and carrying on of work of the Water Reclamation District and of other contractors engaged in work on the same site, which may be prosecuted at the same time, with the least interference possible under a reasonable procedure whenever it is necessary or desirable to prosecute said work, either simultaneously with the work under this Contract or otherwise. To this end the Contractor shall cooperate with and assist the Water Reclamation District and other contractors engaged in work on the same site in every reasonable way and shall interfere as little as possible with their work. The Contractor shall so arrange his work, plant (stationary construction equipment directly used in the prosecution of the Work) and equipment that work of the Water Reclamation District and of other contractors for the Water Reclamation District shall be kept accessible at any time and can be performed without unnecessary or unreasonable expense on account of the work, plant or equipment of the Contractor hereunder. The Contractor shall move, free of charge, his plant and equipment or any part of the same whenever the Engineer shall consider it reasonable and necessary for the work of the

Water Reclamation District or other contractors. The Contractor, when requested by the Engineer, shall also furnish the Water Reclamation District and other contractors with material and with the use of plant and equipment of the Contractor at reasonable rates therefore, whenever, in the opinion of the Engineer, such use of such plant and equipment will not unreasonably delay or interfere with the work under this Contract.

The Contractor shall not be entitled to any damages or anticipated profits on work deleted or extra compensation from the Water Reclamation District on account of any work performed by the Water Reclamation District, or other contractors, that is contemplated in the specifications or on the plans or that is necessary for carrying on or completing or that in any way affects the work under this Contract, provided that such work of the Water Reclamation District and other contractors, in the opinion of the Engineer, is performed in a proper and expeditious, or a necessary manner. The Engineer shall decide all questions between the Contractor and the Water Reclamation District or other contractors, and the order of carrying on the work shall always be subject to the Engineer's direction and approval.

Time and Progress Requirements.

Article 22. It is understood and agreed that TIME is of the essence in this Contract. The Contractor agrees to begin the work covered by this Contract on the day after approval of the Contractor's bond, unless specifically specified otherwise, to prosecute the work with all due diligence, and to complete the work within the time(s) stated in the Agreement. The Contractor shall provide sufficient labor, material and equipment as may be necessary to fulfill the Contractor's obligations with respect to these time and progress requirements.

If the rate of progress of the Contractor is less than necessary to insure completion of the work to the extent specified within the time or times specified in the Agreement, then the Water Reclamation District may withhold the monthly payments herein specified, until such time as the rate of progress is such, in the opinion of the Engineer, as to comply with the requirements of said Agreement.

The word "deliver" as used in this Contract shall be understood to mean delivery f.o.b. cars or trucks at the specified job site, including unloading, unless otherwise specified.

Work Schedule and Execution of Work.

Article 23. The computer generated "As-Planned" Work Schedule and Quarterly Revisions to the Work Schedule shall be submitted on a computer disk in the appropriate format. For Engineering Department contracts, the Contractor's planning, scheduling and execution of the work shall be disclosed to the District, unless otherwise directed by the Engineer, by submittal of a computer generated "As-Planned" Work Schedule prepared by the critical path method, quarterly computer generated revisions to the Work Schedule, and Monthly Work Plans. The Contractor shall utilize Primavera Project Planer P3, or Primavera for all Work Schedule preparation and submittals unless otherwise allowed by the Engineer.

The Work Schedule shall be comprised of CPM diagrams, activity reports and schedule narratives. The Work Schedule shall at all times be consistent with the Contractor's overall approach and plan for completing the work. The Work Schedule shall be employed to report progress or schedule recovery actions, to evaluate requests for partial payments, and to justify requests for extensions of time.

The Work Schedule shall: a) show the sequencing of Activities with which the Contractor intends to accomplish the work or work remaining; b) anticipate events or site conditions that may in any manner affect the schedule; c) reflect the means, methods, techniques, sequences, and procedures of construction chosen by the Contractor; d) divide the work into Activities such that the progression from commencement to completion of the work is clearly defined and separable by site-related work; e) indicate items of materials or equipment, including allowances for the resubmittal and re-review of complex shop drawings; f) indicate items of interface with work performed by other parties; g) indicate specified construction start-up, training, operation tests, punchlist activities and final clean-up; and h) highlight all significant activities related to performance that must be reviewed, and approved, or executed by the District.

Site-related activities shall not combine work located in separate structures or distinct areas or differing elevations within a structure, work corresponding to different Sections of the Specifications, work performed by different subcontractors (first and second tiers), or rough-in and finish work of the same trade. Unless otherwise specified, a site-related activity shall span forty (40) working days or less. Other activities shall be at a level of detail compatible with that for site-related activities.

After checking and verifying that the Work Schedule is responsive to the requirements of this Article 23, the Contractor shall deliver to the Engineer two (2) copies signed by the Contractor and, when requested by the Engineer, a copy of the Work Schedule on a computer disk. Such submittal shall include a written representation to the District that the Contractor has determined and verified all data on that Work Schedule and assumes full responsibility for it, and that the Contractor, subcontractors and suppliers have reviewed and coordinated the activities and sequences in the Work Schedule with the requirements of the Contract Documents.

The Contractor's obligations to plan, schedule, or execute the work in accordance with the Contract Documents will not be changed by the Engineer's review of any Work Schedule submittals or his decision to raise or not to raise any objections about such submittals. Neither the Contractor, subcontractors, suppliers nor any other parties shall in any way become third-party beneficiaries of the Work Schedule reviews by the Engineer.

Maintenance of Schedule.

The Contractor shall promptly undertake appropriate action to get back on schedule whenever he fails to complete activities within the late dates or when his rate of progress is less than that necessary to complete the work within the time limits of the Contract when due to acts or events under his control. After falling behind his schedule, and unless otherwise directed by the Engineer, the Contractor shall submit a written recovery statement with the next payment request or on the date such pay request is due if a pay request is not being submitted at such time.

The recovery statement shall describe the cause for the delayed progress and the actions planned by the Contractor to recover schedule. Appropriate schedule recovery actions may include, but not be limited to, assignment of additional labor, subcontractors, or equipment, shift or overtime work, expediting of submittals or deliveries, or any combination of the foregoing.

Refusal, failure, or neglect by the Contractor to take appropriate recovery action or submit a recovery statement when required as specified herein shall constitute reasonable evidence that the Contractor is not prosecuting the work with all due diligence, and shall represent sufficient basis for the Engineer to increase retention monies by an amount equal to the amount of potential liquidated damages.

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The Contractor shall not be entitled to any compensation or damages from the District on account of any action undertaken by the Contractor to prevent or mitigate any avoidable delay or by the District's determination to increase retention monies.

Use of Float.

Total Float and Contract Float, whether or not expressly disclosed in the Work Schedule, are not for the exclusive benefit of the Contractor or the District, and shall be available to both the District and the Contractor, to accommodate delays, however caused, which extend performance or completion of all or any part of the work, subject to the following paragraph.

Total Float and Contract Float will be available to the Engineer to effect proper interfacing of work performed by the District or other parties, to accommodate the performance of work added by change orders, or to mitigate any other unavoidable delays.

CPM Diagrams and Schedule Narratives.

The charts depicting the Work Schedule in graphic form shall be based on the precedence network (PDM) format and shall be plotted on a time-scaled calendar on standard size drawings. CPM diagrams shall expressly identify all activities and restraints or relationships between activities, the Contract's start and completion dates, and the critical path(s). Activities shall be shown on their early dates with their Total Float times noted beside them. Activity descriptive data shall include activity code, activity description fully conveying the work included, and special codes. The use of start or finish restraint dates shall be annotated as to the basis for the chosen restraints. Connections or restraints between activities, whether on the same or different sheets, shall identify predecessor and successor work.

Schedule narratives shall summarize the Contractor's analysis of the Work Schedule being submitted and highlight important or key aspects regarding the Contract work. As a minimum, the schedule narratives shall, where applicable, a) compare current late dates to those in the "As-Planned" Work Schedule; b) discuss the progress accomplished since the previous Work Schedule submittal; c) identify any assumptions made in incorporating work activities for approved change orders; d) include any schedule recovery statements, when applicable; e) itemize separately those activities which have been completed, including actual durations, those activities which have been partially completed, those activities which have been added or deleted, and all additions/deletions or modifications to relationships between activities.

Activity Reports

The activity reports shall include for each activity: code; description; duration in work days; computed early and late dates, in calendar format; Total Float; and special codes. Additional data on incomplete or completed activities shall consist of actual start/completion dates, actual or remaining activity durations, and percent complete. The computations of early and late dates shall be based on a calendar recognizing legal holidays and the limitations of work during hours other than normal working hours. Completion of the Contract work within the time limits stated in the Agreement shall be set as a restrained late date. The date of commencement of work under the Contract shall be set as a restrained early date. Activity reports to be provided with each submittal of the Work Schedule shall include specific tabulations, as follows:

- a) Activities in order of ascending activity codes;
- b) Activities in order of ascending Total Float values and within the same Total Float values by ascending early start dates and by ascending codes within equal early start dates;
- c) Activities in order of ascending early start dates, and by ascending codes within equal early start dates, and
- d) Activities in ascending late finish dates, and by ascending codes within the same late finish dates.

If the CPM diagram is based on the precedence format, a report shall be provided showing for each activity a listing of its preceding and succeeding activities, the relationship type and the associated lead times.

"As-Planned" Work Schedule

The Contractor's first Work Schedule submittal is to be identified as the "As-Planned" Work Schedule and shall consist of charts (one copy on size D or E sheets, one copy on reproducible media when requested by the Engineer) highlighting the critical path(s) sequences of work, specific Activity reports, and a supporting schedule narrative. Also an electronic copy of the CPM files comprising the "As-Planned" scheduled capable of being fully restored by Primavera will be submitted. The "As-Planned" Work Schedule submittal shall become due within thirty (30) calendar days after the approval of the Contractor's bond.

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The "As-Planned" Work Schedule submittal shall only reflect the work as awarded and shall exclude any substitute means, methods, techniques, sequences, or procedures of construction, even if the Contractor elects to pursue a substitution. Incorporation of any such substitutions into the Work Schedule shall not be made unless approved by the Engineer pursuant to the requirements in the contract documents and not before the "As-Planned" Work Schedule has been finalized.

If a resubmittal of the "As-Planned" Work Schedule is required, the Contractor shall respond within fifteen (15) calendar days. Once the Contractor is advised in writing that the "As-Planned" schedule submitted does not require further revision it will be considered as the official "As-Planned" Work Schedule and, as such, becomes the basis for (a) the monitoring of the Contractor's progress against the time limits of the Contract, and (b) the evaluation and reconciliation of extensions of time.

Revisions to the Work Schedule

Four (4) months after approval of the Contractor's bond and every three (3) months thereafter, the Contractor shall submit a newly updated and revised work schedule submittal labeled as Revision 1, Revision 2, etc. Each quarterly submittal of the revised Work Schedule shall include, in addition to the information required for the "As-Planned" Work Schedule, the actual start/completion dates and actual activity durations for work completed to-date and actual start dates and/or remaining durations for uncompleted work. The Contractor shall also incorporate activities associated with approved change orders issued since the previous submittal. The Contractor is also required to submit a final "As-Built" Work Schedule upon completion of all work and prior to final payment.

Work Schedule Revisions shall include any changes in construction sequences, any prior errors and/or omissions, and any changes required to recover schedule, so that the Work Schedule stays current with the Contractor's newly updated chosen plan for performing and finishing the work remaining, or to recover schedule.

If a partial or complete resubmittal is required, the Contractor shall respond within fifteen (15) calendar days. Once the Contractor is advised in writing that the revised submittal or resubmittal does not require further revision, it shall represent the most current Work Schedule for the work as of the date of the submittal and shall be the basis for the monitoring, measurement and verification of the Contractor's performance and progress.

Monthly Work Plan Requirements

Each month, the Contractor's next month's scheduling of the work shall be disclosed in significant detail by means of a Monthly Work Plan (MWP). These submittals may be in CPM or barchart form and shall be submitted directly to the Resident Engineer.

The first MWP submittal shall become due prior to the start of field work. Subsequent submittals shall become due with the monthly pay request or on the date such pay request is due if a pay request is not being submitted at such time.

The MWP shall break down the related Work Schedule activities into more detailed activities as necessary to clearly identify all individual parts of the work involved and activities or events which may in any manner affect the progress of the Contractor for the period covered by the plan. The activities represented on the MWP shall indicate to which Work Schedule activity they are related, indicate all manpower requirements with specific crews (whether engaged in erection, installation, testing, or punchlist activities) planned per activity, and planned major equipment usage. MWP submittals shall not combine work of different subcontractors, nor work associated with different Sections of the General and Detailed Specifications. MWP submittals shall also include at a level of detail correlated to the site-related activities, items related to the preparation, submittal, fabrication, delivery, receipt and inspection, and storage of materials and equipment. All site-related activities represented on the plan shall span fifteen (15) working days or less. If resubmittals are required, the Contractor shall respond within five (5) calendar days thereafter.

Compliance with Submittal Requirements

It is understood and agreed that the Contractor has included in the price or prices stated in the Agreement all costs in connection with the responsibilities and obligations specified in this Article, however incurred. It is further understood and agreed that the specified mobilization amount will not be released until a responsive "As-Planned" Work Schedule is submitted.

Failure of the Contractor to provide timely submittals of responsive Quarterly Work Schedules and responsive Monthly Work Plans, as specified in this Article 23, will indicate the Contractor's lack of planning of his work and will constitute reasonable evidence that the Contractor is not prosecuting the work with all due diligence to complete the work within the time

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specified. Such failure to provide these timely submittals will result in added expense, loss and damage to the District. Because of the peculiar nature of such expense, loss and damage, it is difficult, if not impossible, to accurately ascertain and definitely determine the amount thereof.

It is therefore agreed that in case the Contractor shall fail to provide any of said submittals in accordance with the schedules set forth in this Article 23, then the Contractor shall and will pay to the District the sum specified for liquidated damages in the Agreement for the days that the Contractor is not in compliance during each such failure.

Liquidated Damages

Article 24. It is understood and agreed that TIME is of the essence in this Contract, and that a failure on the part of said Contractor to complete the work herein specified within the time or times specified will result in added expense, loss and damage to said Water Reclamation District, and that on account of the peculiar nature of such loss or damage it is difficult, if not impossible, to accurately ascertain and definitely determine the amount thereof.

It is therefore agreed that in case the said Contractor shall fail or neglect to complete the work included in this Contract within the time or times specified in the Agreement, said Contractor, even though he is allowed to complete his work, shall and will pay to said Water Reclamation District the sum specified for liquidated damages in said Agreement for each and every day said Contractor shall be in default of the time or times of completing such work.

Said sum is hereby agreed upon, fixed and determined by the parties hereto, as the liquidated damages that the said Water Reclamation District will suffer by reason of such default, and not by way of a penalty.

In case the said Contractor does not complete the work under this Contract within the specified time or times for such completion, or within said time or times as extended by the Engineer, said Engineer shall determine the number of days the said Contractor is in default, and the decision of said Engineer shall be final and binding on both parties hereto.

It is further agreed that if said Water Reclamation District shall accept any work or make any payment or payments under this Contract after any such default or defaults, such acceptance, payment or payments shall not in any respect constitute a waiver or modification of

any of the provisions of this Contract and particularly of the provisions in regard to TIME and LIQUIDATED DAMAGES for delays.

Alterations or Additions and Time Extensions.

Article 25. In the event that any material alterations or additions are made as herein specified, which, in the opinion of the Engineer, will require additional time for the execution of any work under this Contract, then in that case the time for the completion of the work shall be extended by such a period of time as may be fixed by the Engineer, and his decision shall be final and binding upon both parties hereto, provided that in such case the Contractor, within thirty (30) days after being notified in writing of such alterations or additions, shall request in writing an extension of time, but no extension of time shall be given for any minor alterations or additions, and the Contractor shall not be entitled to any damages or compensation from the Water Reclamation District on account of such additional time required for the execution of the work or due to any delay related to such work. All claims for time extensions shall be based upon and include the results of all analyses of the Work Schedule.

Notice to Suspend Work.

Article 26. The Contractor shall delay or suspend the progress of the work, or any part thereof, whenever he shall be so required by written order of the Engineer, and for such periods of time as the Engineer may order, provided that in the event of such delay or delays or of such suspension or suspensions of the progress of the work or any part thereof, the time for the completion of the work so suspended or of work delayed by such suspension or suspensions, shall be extended for a period equivalent to the time lost by reason of such suspension or suspensions, but such order of the Engineer shall not otherwise modify or invalidate in any way any of the provisions of the Contract and the Contractor shall not be entitled to any damages or compensation, except as mentioned in Article 27, from the Water Reclamation District on account of such delay or delays, suspension or suspensions.

Unavoidable Delay.

Article 27. Should the Contractor be obstructed or delayed in the commencement, prosecution or completion of the work hereunder by any act or delay of the District, or by inability, with the exercise of due diligence, to obtain necessary railroad and transportation facilities, or by unavoidable acts or delays on the part of transportation companies in

transporting, switching or delivering material for said work, or by any act or delay of the agencies of the Federal Government, or by acts of public authorities, or by riot, insurrection, war, pestilence, fire, lightning, earthquake, cyclone, strikes, or through any delays or defaults of other parties under contract with said District or due to unavoidable delays in obtaining the specified materials or equipment for said work due to strikes, or by delays hereinbefore specified which result in performing work under abnormal weather conditions beyond such as usually occur during the times specified herein that cause unavoidable delays in performing said work, or to other causes, which causes and delays mentioned in this Article 27, the Engineer shall determine to be entirely beyond the control of the Contractor, then the times fixed in the Agreement for the completion of said work to the extent specified shall be extended for a period equivalent to the time lost by reason of any of the aforesaid causes mentioned in this Article 27. No such allowance of time shall be made, however, unless notice in writing of a claim therefore is presented to the Engineer before the last day of each succeeding month of all delays occurring within the preceding month, and the Contractor shall satisfy the Engineer that the delays so claimed are unavoidable and substantial and could not be reasonably anticipated or adequately guarded against. All claims for time extensions shall be based upon and include the results of an analysis of the Work Schedule.

It is expressly understood and agreed that the Contractor shall not be entitled to any damages or compensation from the District except on account of any delay or delays resulting from any act or delay of the District or other parties under contract with the Water Reclamation District, and such damages shall be limited solely to additional premiums actually paid by the Contractor on his bond and insurance and for wages and salaries of employees and other extra expenses of the Contractor that are necessary only for the proper maintenance of the work and equipment of the Contractor at the site during the delay caused by the District, or other contractors working for the District and only when such delay results in a complete stoppage of contract work on the job site. The Engineer shall determine the number of days, if any, that the Contractor has been so delayed and the amount of such extra costs to the Contractor due to said delay or delays and the amount of extra compensation to be paid to the Contractor therefore, and his decision shall be final and binding upon both parties to this contract. It is further expressly understood and agreed that any damages or compensation allowed under this Article 27 shall specifically exclude any anticipated lost profits and all costs for home office overhead.

The provisions of the preceding paragraph notwithstanding, it is further expressly understood and agreed that the Contractor shall not be entitled to any damages or compensation from the District under this Article 27 if the Contractor is concurrently delayed by any of the aforesaid causes mentioned in this Article 27 or by any act or event within the control or due to the fault or negligence of the Contractor.

It is further expressly understood and agreed that the Contractor shall not be entitled to any compensation or damages from the District on account of any delay or delays resulting from any act or delay caused by agencies of the Federal Government, or by acts of other public authorities or by inability, with the exercise of due diligence, to obtain necessary railroad and transportation facilities or by unavoidable acts or delays on the part of transportation companies in transporting, switching or delivering material for said work or by riot, insurrection, war, pestilence, fire, lightning, earthquake, cyclone, or due to strikes or by delays which result in performing work under abnormal weather conditions beyond such as usually occur during the time of performance specified in the Agreement that cause unavoidable delays in performing the work.

Forfeiture of Contract

Article 28. It is further agreed by and between the parties hereto that if the Contractor fails financially, or abandons this Contract, or fails, refuses or neglects to prosecute the work hereunder, so as to achieve the progress necessary to complete said work within the time or times specified, or as extended under the terms of this Contract, or if in the opinion of the Engineer said work has been or is being delayed by the Contractor so that said work cannot be completed within the time or times specified, or as so extended, or if from any other cause, whatsoever, the Contractor is unable to carry out the terms and conditions of this Contract and complete said work within the time or times specified or if the Contractor shall sublet, in whole or in part, the work under this Contract in violation of Article 19 herein, then the Water Reclamation District may declare this Contract forfeited either as to a portion of the same or the whole thereof.

Upon the happening of any of the conditions hereinbefore specified in this article, the Water Reclamation District shall have a lien upon all the buildings, materials, supplies, machinery, implements and tools of the Contractor for the purpose hereinafter specified; and the Water Reclamation District may thereupon immediately take possession of all said buildings, materials, supplies, machinery, implements and tools, for the use and purpose hereinafter set forth;

thereupon the Water Reclamation District shall have the power to, and may at the cost of the Contractor, complete the said work by letting a new contract, and in completing the said work by contract, the Water Reclamation District may use such buildings, materials, supplies, machinery, implements, tools and plant as may be the property of the Contractor, and make the necessary repairs and replacements thereto.

The cost of fully completing all the work provided for under any new contract shall include the sum or sums of money paid by the Water Reclamation District to other contractors, all administrative costs and all cost of repairs and replacements upon machinery, implements, tools and plant of the Contractor hereunder and also all sums of money paid by the Water Reclamation District for first aid, medical, surgical, and hospital services and compensation for occupational diseases, accidental injuries or death suffered by the employees of any new contractor in the course of their employment in completing said work under the Workman's Occupational Disease Act and the Workmen's Compensation Acts of the State of Illinois now in force.

The cost and expense of fully completing said work, as aforesaid, shall be charged to the Contractor and the amount of such cost or expense so charged shall be deducted from any sums of money that may be due or may thereafter become due to the Contractor under and by virtue of this Contract, as far as the same may suffice therefore.

Should the amount remaining unpaid of the original Contract price be insufficient to reimburse the Water Reclamation District for the cost and expense of fully completing said work, then the Water Reclamation District may sell all buildings, sheds, materials, supplies, machinery, implements and tools obtained from the Contractor then on hand, at public sale on giving said Contractor twenty (20) days notice of the time and place of such sale, and the proceeds derived from the sale of said property at such sale, less expenses incurred thereby, shall be credited to the Contractor, and should the amount received from said sale be then insufficient to pay such deficiency, the Contractor and his bondsmen shall be liable to pay the amount of said deficiency; and at any such sale of said property, the Water Reclamation District may bid and become a purchaser of any or all of said property. It is further understood and agreed that the terms and provisions of this Article 28 shall apply to and be binding upon all subcontractors of the Contractor hereunder.

Contractor's Bond.

Article 29. The Contractor shall furnish a bond in the sum of one hundred (100) per cent of the awarded amount of this Contract as security for the performance of the work under this Contract and for the payment of all persons performing labor and furnishing materials and equipment in connection with the Contract unless otherwise specified in the Agreement.

The payment bond and performance bond shall remain in full force and effect for a period of one year from and after the final acceptance of the entire completed work by the Water Reclamation District.

The above bond shall be underwritten with a good and sufficient surety or sureties, the same to be satisfactory to the Director of Procurement and Materials Management of the Water Reclamation District, conditioned upon the faithful performance of all the terms and conditions of this Contract; and should the sureties on said bond at any time fail financially or be, in the opinion of the said Director of Procurement and Materials Management, insufficient security for the penalty of said bond, then in that case said Director of Procurement and Materials Management may, on giving ten (10) days notice thereof in writing, require the Contractor to furnish a new and additional bond in place of the bond so having become insufficient, with such sureties thereon as shall be satisfactory to said Director of Procurement and Materials Management.

If the Contract is considered "Non-Construction" type and the required Contractor's bond is less than \$100,000.00, it is permissible to substitute cash, a certified bank instrument, or certificate of deposit. If a certificate of deposit is furnished, it must have a fixed rate and fixed amount from a financial institution acceptable to the Director of Procurement and Materials Management. The maturity date shall be later than the Contract completion date and must be accompanied by an "Assignment of Certificate of Deposit" or "Assignment of Savings Account" in the name of the Water Reclamation District on forms to be supplied by the District.

Maintenance Bond.

Article 30. For Engineering Department contracts, the Contractor shall furnish the maintenance bond or bonds, when called for under the Contract, in the amount and for the term specified in the Detail Specifications, to make good at his own expense any excessive wear to any parts or any defects in or damages to any equipment or work specified which may arise from faulty materials, contractor design or construction, or from the inability of the equipment or

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work to successfully perform all the requirements of the specification.

Said bonds shall be furnished with good and sufficient surety, the same to be satisfactory to the Director of Procurement and Materials Management of the Water Reclamation District and the approval of same shall be a condition precedent to the final payment specified in Article 35.

Should any item, for which the maintenance bond is required, be taken over for permanent operation by the Water Reclamation District in accordance with Article 34, a separate maintenance bond shall be furnished, and the term of the maintenance bond shall begin on the date when said item of work is placed in permanent operation by the Water Reclamation District.

The cost of furnishing the maintenance bond or bonds shall be included in the price or prices specified in the Agreement.

Prices.

Article 31. The Contractor agrees to accept and the Water Reclamation District agrees to pay the price or prices stated in the Agreement as full compensation for furnishing all the labor, tools, materials and appurtenances necessary to make full and faithful performance and completion of all the work, free of all claims, liens and charges whatsoever and in full compliance with the plans and specifications and the requirements of the Engineer. Said Contractor further agrees that he is not entitled to any money for losses or consequential damages arising out of the nature of the work, the action of the elements, any unforeseen obstructions or difficulties encountered in the prosecution of the work and any risks, of every kind, nature and description, connected therewith.

The specified price or prices shall cover the cost of all machinery, plant and tools and all work, labor and materials of whatsoever kind that shall be furnished or needed to complete the entire work for the purposes for which it is intended. Said prices shall also cover all royalties for patents, and patented materials, appliances and processes used in the work, except as hereinbefore specified in Article 15. Before final payment is made the Contractor shall furnish a satisfactory guarantee against all claims on account of work performed, tools and plant employed, and material and labor furnished hereunder, and against all claims for patents, patented materials, appliances and processes, except as hereinbefore specified in Article 15, used in or on account of the work under this Contract.

Progress Payments.

Article 32. Once each month the Contractor may submit to the Engineer a request for partial payment for work completed. Payments will be made by the District on or about the 2nd or the 4th Friday of the month and the Contractor must submit payment requests at least 15 working days prior to either of these dates in order to receive payment on that date. Such payment requests shall be submitted on partial payment voucher forms furnished by the Water Reclamation District and in the number specified. These forms shall be prepared by the Contractor including the completion of the affidavit on the back of the original form. The work completed as shown on these forms shall be subject to approval by the Engineer and may be revised by the Engineer if necessary.

Cash Flow Estimate Schedule

With each invoice for payment, the Contractor shall submit an estimate of all future monthly progress payment amounts anticipated for the duration of the contract. This estimate is a required portion of all payment request submittals, and no payment request will be considered complete without such an estimate. The Contractor's estimate will not be binding upon his or her actual future progress payment requests, but will be used solely by the District to estimate monthly disbursements and cash flow requirements.

For other than Engineering Department contracts, the Water Reclamation District agrees to pay the Contractor the sum or sums stated in the Agreement in partial installments from time to time as the work progresses upon certificates signed by the Engineer, but said certificates shall in no way lessen the total and final responsibility of the Contractor. Whenever practicable, partial payments will be made monthly.

Progress payments for all contracts shall be made in accordance with Article 33 and the final payment shall be made in accordance with Article 35. Payment of any sums shall in no way lessen the total and final responsibility of the Contractor. It is further expressly agreed that the payment of any monies hereunder shall in no way lessen the liability of the Contractor to replace defective equipment, material and work, though the same may not have been detected at the time such payment was given or acted upon. All progress payments being made merely upon approximate estimates shall be subject to correction on the final estimate voucher.

The Contractor shall also submit separate payment request forms for all extra work performed in

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accordance with Articles 7 and 8.

Progress Payments and Reserves.

Article 33. For Engineering Department contracts, as the work progresses, a reserve shall be withheld from the amount to be paid on the progress payment vouchers. If the Contract value is \$10,000,000 or less, an amount shall be withheld of 10 percent of the payment requested until work is 50 percent complete. When work is 50 percent complete, the withholding shall be reduced to 5 percent of the dollar value of all work satisfactorily completed to date until the work is 90 percent complete. When the work is 90 percent complete, the withholding shall be reduced to 4 percent of all work satisfactorily completed to date. The Water Reclamation District may reinstate up to 10 percent withholding if the Engineer determines that the Contractor is not making satisfactory progress or there is any other specific cause for such withholding.

If the Contract value is more than \$10,000,000 an amount shall be withheld of 7.5 percent of the payment requested until the work is 50 percent complete. When work is 50 percent complete, the withholding shall be reduced to 5 percent of the dollar value of all work satisfactorily completed to date until the work is 75 percent complete. When the work is 75 percent complete, the withholding shall be reduced to 4 percent of the dollar value of all work satisfactorily completed to date until the work is 90 percent complete. When the work is 90 percent complete, the withholding shall be reduced to 3 percent of all work satisfactorily completed to date. The Water Reclamation District may reinstate up to 7.5 percent withholding if the Engineer determines that the Contractor is not making satisfactory progress or there is other specific cause for such withholding.

For all contracts, when the dollar value of the work satisfactorily completed has reached 95 percent and the Engineer determines that the work under the contract is substantially complete, the Water Reclamation District may further reduce the reserves to 2 percent of the dollar value of the work completed.

It shall be the decision of the Engineer as to the dollar value of the work completed, the percentage of completion, and whether or not the work is substantially complete, and that decision shall be final and binding on both parties.

All sums withheld shall be reserved by the Water Reclamation District as part security for the faithful performance hereof. The final payment voucher shall not become due the Contractor until the expiration of

forty-five (45) days after the completion of all work and approval of the Engineer, and after payment by the Contractor on all claims for labor and material furnished in the performance of work under this Contract and as covered under Article 35.

The release of any portion or all of the sums withheld provided for under this Article 33 shall not be construed as a waiver by the Water Reclamation District of its right to hold the Contractor and his Surety liable for any and all obligations under the terms of the Contract and bond.

For each pay item the Contractor, unless otherwise directed, shall furnish the Engineer with a balance statement showing in detail the breakdown of the price into proper sub-items including labor and material. Such statements, if presented on computer generated spreadsheets, shall conform to the standard American Institute of Architects document format. Such statements, if approved or revised by the Engineer, will be used in determining the value of the work performed under that item.

Taking Over Completed Work.

Article 34. Upon the completion of any part of the work specified prior to the final completion of the entire work, on or before the time specified in the Agreement, the Water Reclamation District shall have the right to take over for operation or use the said completed part of the work upon written notice to the Contractor from the Engineer that such action will be taken.

Final Payment.

Article 35. The Contractor further agrees that he shall not be entitled to demand or receive final payment for any portion of the work or materials, except in the manner set forth herein, nor until all the stipulations, provisions and conditions hereinbefore mentioned are complied with; whereupon the Water Reclamation District, after the expiration of forty-five (45) days after such completion, will pay, and hereby binds itself to pay, the Contractor the whole amount of money accruing to said Contractor under this Contract, except such sum or sums of money as may have been already paid, and as may be lawfully retained under any of the provisions of this Contract.

If at any time it shall appear that the Water Reclamation District has made any illegal, improper, or excess payments to the Contractor which may have been included in a progress estimate or in the final estimate of the Engineer, then the Contractor hereby

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agrees to repay on demand to the Water Reclamation District the amount or amounts so paid.

Upon satisfactory completion of the work performed under this Contract, as a condition before final payment under this Contract, or as a termination settlement under this Contract, the Contractor shall execute and deliver to the Water Reclamation District a release of all claims against the Water Reclamation District arising under or by virtue of this Contract, except claims which are specifically exempted by the Contractor to be set forth therein. Unless otherwise expressly agreed to by the parties to this Contract, final payment under this Contract or settlement upon termination of this Contract shall not constitute a waiver of the Water Reclamation District's claims against the Contractor or his sureties under this Contract or applicable performance and payment bonds.

Guarantees.

Article 36. The Contractor guarantees all work performed and all material and equipment furnished and installed under the Contract against defects in materials and workmanship for a period of one year from the date of completion of all work including successful completion of the 60 day operation test, all punchlist items, and final clean-up and formal acceptance of the completed work by the Water Reclamation District.

The Contractor shall, within a reasonable time after receipt of written notice thereof, make good any defects in materials, equipment, and workmanship which may develop within periods for which said materials, equipment, and workmanship are guaranteed and also make good any damage to other work caused by the repairing of such defects at his own expense and without cost to the Water Reclamation District.

Financial Interest Provisions.

Article 37. The provisions of the Purchasing Act, 70 ILCS 2605/11.1-11.24 are applicable to this Contract.

The Contractor's attention is specifically directed to Section 11.18 thereof, which provision, in part, states:

"**No officer or employee of a sanitary district organized pursuant to this Act shall be financially interested, directly or indirectly, in any bid, purchase order, lease or contract to which such sanitary district is a party. For purposes of the Section, an officer or employee of the sanitary district is deemed to have a direct financial interest in a bid, purchase order, lease or contract with the district if the officer or employee is

employed by the district and is simultaneously employed by a person or corporation that is a party to any bid, purchase order, lease or contract with the sanitary district.

Any officer or employee convicted of a violation of this section shall forfeit his office or employment and in addition shall be guilty of a Class 4 felony.**"

The Contractor shall comply with each and every section of said Act which may be applicable to this Contract.

The provisions of said Act shall be included in, and be applicable to any subcontract made by the Contractor.

The Contractor will also comply with the Water Reclamation District's ethic's ordinance (MWRDGC Ord. O22-004, and as amended in the future) in all dealings with all District employees. The Contractor is responsible for insuring that all subcontractors receive copies of this ordinance with their subcontract and shall insure the compliance of subcontractors, at all levels on the project, with the ordinance.

This Contract, at the option of the Water Reclamation District, may be terminated and canceled in the event the Contractor or subcontractor breaches any of the provisions of said Act or Ordinance. Other actions the District may take for violations is banning of subcontractors or individuals from working on the project or the project site. The Contractor bears full responsibility and liability for the consequences of the District's response to ethics and purchasing violations

Ownership.

Article 38. It is understood and agreed by and between the parties hereto, that it is the intention of the parties hereto that the Water Reclamation District shall acquire exclusive ownership of the materials and work which have entered or are fabricated to enter into the material or equipment covered by this Contract upon the payment by the Water Reclamation District for any sum or sums of money specified in this Contract to be paid on itemized progress certificates, and the Contractor hereby agrees that he will, when such payments are made, execute and deliver, on demand, to the Water Reclamation District, a bill or bills of sale of the material or equipment or parts of equipment included on such certificate, whether in an uncompleted or fully completed condition, as evidence of such ownership.

The Contractor hereby further agrees to segregate the

work intended for the Water Reclamation District from all other work and attach to the material or equipment appropriate signs, marks or evidence to the effect that the material or equipment, whether uncompleted or completed, is the exclusive property of the Water Reclamation District.

It is further understood and agreed, by and between the parties hereto, that the payment by the Water Reclamation District of any sum or sums of money herein specified to be paid on progress certificates and the acquired ownership of the material or equipment or parts thereof shall not operate as a bar to subsequent inspection and rejection of all or any portion of such materials and workmanship as may be unacceptable under the terms of this Contract in the judgment of the Engineer, and further, that such payments and acquired ownership shall not in any respect constitute a waiver or modification of any of the terms and provisions of this Contract and particularly shall not affect the provisions hereof in regard to time for delays.

Table of Statutes in General Conditions

70 ILCS 2605/11.15 6

An Act to create Sanitary Districts and to remove obstructions from the Des Plaines and Illinois Rivers," approved May 29, 1889, in force July 1, 1889, and all acts amendatory thereof and supplementary thereto (70 ILCS 2605)..... 2

Copeland "Anti-Kickback" Act (18U.S.C.874). 4

Employment of Illinois Workers on Public Works Act, 30 ILCS 570/0.01 2

Illinois Environmental Protection Act. (415 ILCS 5/) 2

Illinois Human Rights Act, Art.2, 775 ILCS 5/2-101-5/2-105 2

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Section 1101 of Title 8 of the United States Code..... 6

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Water Reclamation District’s ethic’s ordinance (MWRDGC Ord. O22-004, and as amended in the future..... 19

Workmen’s Compensation Act..... 8

SPECIAL PROVISIONS

The following Special Provisions supplement the documents entitled “General Specifications” and shall take precedence in case of conflict. Other hierarchy requirements are as listed in Paragraph (1).

(1) CONTRACT DOCUMENT HIERARCHY

A. The documents included in the contract are intended to be complementary and to describe the complete work. If the District determines a conflict exists between the Contract Documents, the following hierarchy will be applied and the Contractor shall complete the work according to the interpretation made by the District.

1. Detailed Specifications
2. Plans
3. General Conditions
4. Special Provisions
5. General Specifications

(2) CHANGES AND AMENDMENTS TO THE GENERAL SPECIFICATIONS

A. Under Section (1) “Definitions” in the General Specifications, add the following: “General Specifications – Wherever this term appears in the Contract Documents, it shall be interpreted to mean the General Specifications, Sections (1) through (35) inclusive; the General Specifications (Sewers), Sections (1) through (37) inclusive; and General Specifications (Concrete), Sections (1) through (25) inclusive.

(3) AVAILABLE GEOTECHNICAL/ENVIRONMENTAL INFORMATION

A. The Contractor shall be fully aware of the geotechnical/environmental conditions at the site of work. No additional compensation will be allowed due to delays or additional costs to the Contractor, or any subcontractor, in any way arising from or caused by insufficient awareness of actual geotechnical/environmental conditions at the site. The following is a reference list of documents pertaining to relevant geotechnical/environmental information for the project. This information is provided in Volume 3 of the Contract Documents. The Contractor shall review such information so as to understand the geotechnical/environmental conditions expected to be encountered under this Contract.

1. O’Brien & Associates, Inc. – Revised Geotechnical Report for the Proposed Flood Control Project, Metropolitan Water Reclamation District of Greater Chicago, Robbins, Illinois (2019).
2. 2IM Group – Phase II Environmental Site Assessment Report (2022).

B. The Contractor shall determine if the information of these documents sufficiently accounts for the actual geotechnical/environmental conditions of this Contract. The Contractor shall perform additional geotechnical/environmental investigations as necessary, at no additional cost to the District, to become fully aware of the actual geotechnical/environmental conditions of this Contract.

(3) RESOLVING PROPERTY DAMAGE DISPUTES

- A. The below-described provision is hereby made a term of this Contract. The arbitration program will respond to complaints about property damage claims under \$5,000.00 that allegedly occurred during the performance of the work under this Contract.
- B. This provision does not change, modify or alter the Contractor's responsibility to follow the insurance requirements of the Contract as contained in Article (17) of the General Conditions and Section 01 11 05 Insurance. Neither does this provision change, modify or alter the Contractor's responsibility to defend, indemnify and hold harmless the Metropolitan Water Reclamation District of Greater Chicago from all types of claims that may arise "out of or in consequence of the performance of this work by the Contractor, or which may in any wise result there from" as that duty is stated in Article (16) of the General Conditions. Furthermore, this provision does not change, modify or alter the Contractor's responsibility to follow the provisions requiring a Contractor's bond as those terms are stated on Article (29) of the General Conditions. The Contractor agrees to follow the procedure below for resolving all property damage disputes that arise during the performance of the work under this Contract.
- C. The Contractor agrees the following arbitration program is the way the Contractor will hold harmless the Metropolitan Water Reclamation District of Greater Chicago for property damage claims under \$5,000.00:

Procedure for Resolving Property Damage Disputes

- 1. If the Contractor receives a claim for property damage allegedly caused by its performance of work under this Contract, the Contractor shall, within 3 working days from receipt of such claim:
 - o Acknowledge the claim to the property owner,
 - o Send a copy of said claim and acknowledgment to the District, and
 - o Forward the claim to the Contractor's insurance carrier.
- 2. The insurance carrier or Contractor shall either settle or deny claims within 60 calendar days. Claims not approved within the 60-day period shall be deemed denied.
- 3. The Contractor shall advise property owners of the decision to deny their claims and it shall include in the notice the name and address of the person authorized to accept service of process on behalf of the Contractor. If a claim is for an amount less than \$5,000.00, the Contractor will advise the owner of the option to submit the claim to a dispute resolution process binding upon both the Contractor and the owner. To be eligible for this process, a property damage claim must be submitted to the Contractor or the District for dispute resolution within 6 months of the date on which the claim was denied. A property owner can submit only one damage claim to the dispute resolution process, which is put into effect by this Contract.
- 4. If the property owner chooses to follow the dispute resolution process, he/she will so indicate on the form provided by the Contractor. The property owner will be instructed to return the dispute resolution request to the District with a \$75.00 application fee. When the District receives the property owner's request form and the \$75.00 application fee, the

District will file a request for mediation/arbitration with an appropriate dispute resolution organization. The District will give notice of this action to the Contractor and the property owner. The Contractor will pay all costs involved in the dispute resolution process whether or not the claim is allowed.

5. The mediation/arbitration organization will appoint a qualified, independent Hearing Officer to conduct a hearing within 60 calendar days of the District's receipt of the property owner's request for a hearing. The hearing will be informal and without attorneys, and it must be concluded in a timely manner. Either party can request that the Hearing Officer view the damaged property. The owner will be expected to submit at the hearing two estimates of the cost of repairing the alleged damage. The Contractor can use his insurance company's written evaluation of the claim as his evidence in the hearing. The hearing will be conducted in accordance with the established rules of the dispute resolution organization. If mediation does not resolve the claim, the parties will proceed to arbitrate the dispute. Within 7 calendar days of the hearing, the mediator or arbitrator will issue a one-page decision on whether the owner's claim will be upheld; and, if so, what amount of damages, up to a limit of \$5,000.00, should be awarded. Before the mediation/arbitration process commences, the property owner, Contractor, and the District will all agree in writing that the issuance of the Hearing Officer's award will be a final and binding determination on all disputes presented for resolution.
6. At any time prior to the mediation/arbitration hearing, once the Contractor receives a notice of a request for dispute resolution, the Contractor can conduct an evaluation of the claim and inspection of the alleged damage. The Contractor retains the right to negotiate with the property owner and reach agreement on the amount of damages. If the Contractor pays these damages, the owner and the Contractor will agree in writing that this payment is a final and binding determination of the property owner's claim.
7. The District will advance the fees and expenses charged by the dispute resolution organization.
8. When a claim is allowed in any amount, the Contractor shall, within 30 calendar days of the award, pay to the property owner the amount of the award plus the \$75.00 application fee. For both allowed and disallowed claims, the Contractor shall reimburse the District within 30 calendar days of the award, all fees and expenses advanced by the District to the dispute resolution organization. Whether or not the claim was upheld, if the Contractor does not make these payments to the property owner and/or the District within the 30-day period, the District is authorized to make these payments for the Contractor and then deduct the amounts paid from the next payment due the Contractor.

(2) PUBLIC INFORMATION PROGRAM

The Contractor shall establish a public information program that shall include, in addition to the requirements of Right-of-Way documents, the following:

- A. Formulate, furnish and implement a public information program designed to inform area residents and municipalities.

- B. Designate an individual (name and telephone number) who will be in charge of the Contractor's public information program.
- C. Submit reports on the monthly status of the public information program including complaints and disposition of the same.
- D. The Contractor will notify the villages of the construction procedure by arranging a meeting with the appropriate officials and make such written reports as required.
- E. If necessary, the Contractor shall prepare and distribute a brochure describing the overall project including construction procedures and name and telephone number of the Contractor's representative.
- F. The Contractor shall schedule and hold public meetings explaining this project and the construction activities involved as requested by the District, local community groups, or the villages.
- G. The Contractor shall provide three (3) 4' x 8' project signs to describe the work ongoing at the project site. The signs shall be constructed of wood and printed in color on a weather-resistant surface. The signs shall be placed at locations determined by the District and contain the following information:
 - 1. Contract number and name
 - 2. General project details (to be provided by MWRD)
 - 3. Anticipated construction start and end dates
 - 4. Partner agencies and logos
 - 5. Web address for additional information

END OF SECTION

SPECIAL PROVISION FOR TRAFFIC SIGNAL WORK GENERAL

Effective: 5/1/21

Revised: 2/1/21 (Revised Phone Number)

All work and equipment performed and installed under this contract, shall be governed and shall comply to the State of Illinois "Standard Specifications for Road and Bridge Construction" latest edition, herein referred to as the Standard Specifications and the "District One Standard Design Details"; the State of Illinois "Manual on Uniform Traffic Control Devices for Streets and Highways", latest edition; the "National Electrical Code" latest edition herein referred to as the NEC; the National Electrical Manufacturers Association, herein referred to as NEMA (all publications for traffic control items) latest editions; the International Municipal Signal Association, herein referred to as IMSA "Official Wire & Cable Specifications Manual" latest edition; the Institute of Transportation Engineers, herein referred to as the ITE, Technical Report No.1, "A Standard for Adjustable Face Vehicular Traffic Control Heads"; AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals" and the "Supplemental Specifications" and "Recurring Special Provisions" noted herein.

The following Special Provisions supplement the above specifications, manuals, and code. The intent of these Special Provisions is to prescribe the materials and construction methods commonly used for traffic signal installations. All material furnished shall be new unless otherwise noted herein. The locations and the details of all installations shall be as indicated on the Plans or as directed by the Engineer. Traffic signal construction and maintenance work shall be performed by personnel holding IMSA Traffic Signal Technician Level II certification. The work to be done under this contract consists of furnishing and installing all traffic signal work as specified in the Plans and as specified herein in a manner acceptable and approved by the Engineer. In case of conflict with any part or parts of said documents, these Special Provisions shall take precedence and shall govern.

In order to reduce possible vehicular conflicts with fixed objects and avoid public criticism, it is necessary to require that no posts, poles, heads, or controller cabinets be installed until all traffic signal control equipment is brought to and located on the job site.

The construction, installation and/or removal work shall be accomplished at all the intersections within the limits of this project or as shown in the plans.

Description of Work. The work to be done under this contract consists of furnishing and installing all traffic signal work as specified on the Plans and as specified herein in a manner acceptable and approved by the Engineer.

Control of Traffic Signal Materials.

All work shall meet the requirements of the "Standard Specifications for Road and Bridge Construction", except as follows:

The controller and all control equipment shall be of a manufacturer that is approved by this Department. All equipment shall have a representative and shop located in the six (6) county Chicago areas. All equipment installed in the controller cabinet shall be from a single supplier. The supplier shall be responsible for service and support for this equipment.

The intent of this Section is to prescribe the materials and construction methods commonly used for traffic signal installations. All material furnished shall be new unless otherwise noted herein. Traffic materials and equipment shall bear the U.L. label whenever such labeling is available.

All iron and steel products, which are to be incorporated into work shall be domestically manufactured or produced and fabricated. The contractor shall obtain from the iron or steel producer and/or fabricator, in addition to the mill analysis, a certification that all iron or steel materials meet these domestic source requirements.

The application of all coatings, epoxy, galvanizing, painting, etc., to metal products shall be domestically applied.

Metal material other than iron and steel, which are not domestically produced, may be accepted provided:

- (a) The contractor notifies the Department in advance of his/her intention to use other than domestically manufactured or produced material.
- (b) Written evidence is provided in English of compliance with all requirements of the specifications.
- (c) Physical tests conducted by the department verify the acceptability of the material.

Before any signal equipment, including mast arm assemblies, poles, controller cabinets, all control equipment and signal heads, are delivered to the job site, the Contractor shall obtain and forward to the Engineer a certified, notarized statement from the manufacturer, containing the catalog numbers of the equipment and/or material, guaranteeing that the equipment and/or material, after manufacture, comply in all respects with the requirements of the Specifications and these Special Provisions.

All material approval requests shall be within thirty (30) consecutive calendar days after the Contract is awarded, or at the pre-construction meeting, whichever is first. A list of major traffic signal items can be found in Article 801.05. Material or equipment which is similar or identical shall be the product of the same manufacturer, unless necessary for system continuity. Traffic signal materials and equipment shall bear the U.L. label whenever such labeling is available.

All cost of work and materials required to comply with the above requirements shall be included in the pay item bid prices, under which the subject materials and signal equipment are paid, and no additional compensation will be allowed. Materials and signal equipment not complying with the above requirements that have been installed on the job will be done at the Contractor's own risk and may be subject to removal and disposal at the Contractor's expense.

The Contractor must submit the following for approval by the Engineer:

- Four (4) complete set of manufacturer's descriptive literature, drawings, and specifications of the traffic signal equipment, handholes, junction box, cable, conduit and all associated items that will be installed on the contract. If the literature contains more than one item, the Contractor shall indicate which item or items will be furnished.
- Partial or incomplete submittal will be returned without review.

- The contractor shall supply samples of all wire and cable, and shall make up and supply samples of each type of cable splice proposed for use in the work for the-Engineer's approval.
- Seven (7) complete shop drawings of the mast arm assemblies and poles including combination mast arm poles are required, showing in detail the fabrication, anchor bolts, reinforcing materials, design material, thickness of sections and weld sizes. These drawing shall be approved by IDOT at least 11" x 17" (275mm x 425mm) in size and adequate quality for microfilming.
- Certain non-standard mast arm poles and assemblies will require additional review. The Contractor shall account for additional review time in their schedule.
- Seven (7) copies of a letter from the Traffic Signal Contractor on company letterhead listing contract number or permit number, project location limits, pay item number and description and listing the manufacturer's name and model numbers of the proposed equipment to be supplied and stating that the proposed equipment meets all Contract requirements. The letter will be reviewed by the Engineer to determine whether the equipment to be used is approvable. The letters will be stamped as approved or not approved accordingly and returned to the Contractor.
- Five (5) copies of a letter from the Traffic Signal Contractor listing the System Coordination and Timing (SCAT) consultant's name shall be supplied. The letter will be reviewed by the Engineer to determine whether the SCAT consultant to be used is approved. The letters will be stamped as approved or not approved accordingly and returned to the Contractor.
- Where certifications and/or warranties are specified. The information submitted for approval shall include certifications and warranties. Certifications involving inspections and/or tests of material shall be complete with all test data, dates and times.
- All above shall be stamped with the Section Number, Permit Number, or Contract Number and Intersection(s) name(s). Pay item numbers shall also be included. If the above required information is not on each sheet of the above literature or letters, the equipment and material cuts will not be reviewed and shall be returned to the Contractor.
- All submitted items reviewed and marked 'APPROVED AS SUBMITTED', 'APPROVED AS NOTED', 'DISAPPROVED', 'INCOMPLETE' or ' NOT REVIEW' are to be resubmitted in their entirety, unless otherwise indicated within the submittal comments, with a disposition of previous comments to verify contract compliance at no additional cost to the contract.
- Exceptions, Deviations and Substitutions. In general, exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the Contractor's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing to the Engineer. In general, substitutions will not be acceptable. Requests for substitutions must demonstrate that the proposed substitution is superior to the material or equipment required by the Contract Documents. No exceptions, deviations or substitutions will be permitted without the approval of the Engineer.
- After the engineer reviews the submittals for conformance with the design concept of the project, the Engineer will stamp the drawings indicating their status. The Engineer's review is for conformance with

design concept only. It is the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop working, layout drawings, or other documents by the Departments approval thereof. The Contractor must be in full compliance with contract and specification requirements.

- Contractor shall not order major equipment such as mast arm assemblies prior to Engineer approval of the Contractor marked proposed traffic signal equipment locations to assure proper placement of contract required traffic signal displays, push buttons and other facilities. Field adjustments may require changes in proposed mast arm length and other coordination.

Marking Proposed Locations.

Revise the following to Article 801.09 of the Standard Specifications:

Revise "Marking Proposed Locations for Highway Lighting System" to read "Marking Proposed Locations for Highway Lighting System and Traffic Signals."

It shall be the contractor's responsibility to verify all dimensions and conditions existing in the field prior to ordering materials and beginning construction. This shall include locating the mast arm foundations and verifying the mast arms lengths.

Maintenance and Responsibility.

Revise Article 801.11 to read as follows.

- a) Existing traffic signal installations and/or any electrical facilities at all or various locations may be altered or reconstructed totally or partially as part of the work on this Contract. The Contractor is hereby advised that all traffic control equipment, presently installed at these locations, may be the property of the State of Illinois, Department of Transportation, Division of Highways, Cook County Highway Department, Private Developer, or the Municipality in which they are located. Once the Contractor has begun any work on any portion of the project all traffic signals within the limits of this contract or those which have the item "Maintenance of Existing Traffic Signal Installation", "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation", shall become the full responsibility of the Contractor. Automatic Traffic Enforcement equipment is not owned by the County and the Contractor shall not be responsible for maintaining it during construction. The Contractor shall supply the engineer and the Department's Electrical Maintenance Contractor a 24-hour emergency contact name and telephone number.
- b) When the project has a pay item for "Maintenance of Existing Traffic Signal Installation", "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation", the Contractor must notify both the Design Engineer at (312) 603-1734 and the Department's Electrical Maintenance Contractor, of their intent to begin any physical construction work on the Contract or any portion thereof. This notification must be made a minimum of seven (7) working days prior to the start of construction to allow sufficient time for inspection of the existing traffic signal installation(s) and transfer of maintenance to the Contractor. If work is started prior to an inspection, maintenance of the traffic signal installation(s) will be transferred to the Contractor without an inspection. The Contractor will become responsible for repairing or replacing all equipment that is not operating properly or is damaged at no cost to the owner of the traffic signal. Final repairs or replacement of

damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection otherwise the traffic signal installation will not be accepted.

- c) Regional transit, County and other agencies may also have equipment connected to existing traffic signal or peripheral equipment such as PTZ cameras, switches, transit signal priority (TSP and BRT) servers and other devices that shall be included with traffic signal maintenance at no additional cost to the contract.
- d) Contracts such as pavement grinding or patching which result in the destruction of traffic signal loops will require a maintenance transfer. The Contractor is required to notify of intent to work and an inspection. A minimum of seven (7) working days prior to the loop removal, the Contractor shall notify the Design Engineer at (312) 603-1734, the Department's Electrical Maintenance Contractor and the owner of automatic traffic enforcement prior to the loop removal, at which time arrangements will be made to adjust the traffic controller timing to compensate for the absence of detection. Damaged Automatic Traffic Enforcement equipment, including cameras, detectors, or other peripheral equipment, shall be replaced by others, per Permit agreements or other agreements, at no cost to the contract except for City of Chicago projects in which the detectors shall be replaced. See additional requirements in these specifications under Inductive Loop Detector.
- e) The Contractor is further advised that the existing traffic signal(s), and/or the existing temporary installation(s), must remain in operation during all construction stages except for the most essential down time. Any shutdown of the traffic signal installation(s), for a period to exceed fifteen (15) minutes, must have the prior approval of the Engineer. Such approval will generally only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Shutdowns will not be allowed during inclement weather or during Holiday periods. Any other traffic signal shutdown, either for periods in excess of one (1) hour or outside of the 10:00 a.m. to 3:00 p.m. weekday period must have prior approval of the Engineer. The Contractor, prior to the commencement of his work, shall notify the State Electrical Maintenance Contractor, the Cook County Electrical Maintenance Contractor, or the concerned Municipality, of his intent to perform this work.
- f) The Contractor shall be fully responsible for the safe and efficient operation of the traffic signals. Any inquiry, complaint or request by the Department, the Department's Electrical Maintenance Contractor or the public, shall be investigated and repairs begun within one hour. Failure to provide this service will result in liquidated damages of \$1000 per day per occurrence. In addition, the Department reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$1000 per month per occurrence. Unpaid bills will be deducted from the cost of the Contract. The Department's Electrical Maintenance Contractor may inspect any signaling device on the Department's highway system at any time without notification.
- g) Any proposed activity in the vicinity of a highway-rail grade crossing must adhere to the guidelines set forth in the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) regarding work in temporary traffic control zones in the vicinity of highway-rail grade crossings which states that lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the railroad tracks. If the queuing of vehicles across the tracks cannot be avoided, a

uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

- h) The Contractor shall be responsible to clear snow, ice, dirt, debris or other condition that obstructs visibility of any traffic signal display.
- i) The Contractor shall maintain the traffic signal in normal operation during short or long-term loss of utility or battery back-up power at critical locations designated by the Engineer. Critical locations may include traffic signals interconnected to railroad warning devices, expressway ramps, intersection with an SRA route, critical corridors or other locations identified by the Engineer. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries.

Damage to Traffic Signal System.

Add the following to Article 801.12(b).

- a) Any damaged equipment or equipment not operating properly from any cause whatsoever shall be replaced with new equipment provided by the contractor at no additional cost to the Contract and/or owner of the traffic signal system all as approved by the Engineer. Final repairs or replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection otherwise the traffic signal will not be accepted. Cable splices outside the controller cabinet will not be allowed.
- b) Temporary replacement of damaged or knockdown of a mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals will not be permitted.
- c) Automatic Traffic Enforcement equipment, such as Red-Light Enforcement cameras, detectors, and peripheral equipment, damaged or not operating properly from any cause whatsoever, shall be the responsibility of the municipality or the Automatic Traffic Enforcement Company per Permit agreement or other agreements.

Traffic Signal Inspection (Turn – On).

Revise Article 801.15b to read as follows.

- a) The Contractor must have all electric work completed, the electrical service installation connected by the utility company and equipment field tested by the Vendor prior to the Department's "turn-on" field inspection. If in the event the Engineer determines the work is not complete and the inspection will require more than two (2) hours to complete, the inspection shall be canceled and the Contractor will be required to reschedule at another date. The maintenance of the traffic signals will not be accepted until all punch list work is corrected and re-inspected. The Department will not grant a field inspection until written certification is provided from the Contractor stating the equipment has been field tested and the intersection is operating according to Contract requirements.

- b) When the road is open to traffic, except as otherwise provided in Section 850 of the Standard Specification, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request must be made to the Design Engineer at (312) 603-1734 a minimum of seven (7) working days prior to the time of the requested inspection. The Department will not grant a field inspection until notification is provided from the Contractor that the equipment has been field tested and the intersection is operating according to Contract requirements. The Contractor must invite local fire department personnel to the turn-on when Emergency Vehicle Pre-emption (EVP) is included in the project. When the contract includes the item RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM, OPTIMIZE TRAFFIC SIGNAL SYSTEM, or TEMPORARY TRAFFIC SIGNAL TIMINGS, the Contractor must notify the SCAT Consultant of the turn-on schedule, as well as stage changes and phase changes during construction.
- c) The Contractor must have all traffic signal work completed and the electrical service installation connected by the utility company prior to requesting an inspection and turn-on of the traffic signal installation. The Contractor shall be responsible to provide a Police Officer to direct traffic at the time of testing.
- d) The Contractor shall provide a representative from the control Equipment Vendor's office to attend the traffic signal inspection for both permanent and temporary traffic signal turn-ons. Upon demonstration that the signals are operating and all work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Engineer will then allow the signals to be placed in continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.
- e) Acceptance of the traffic signal equipment by the Department shall be based upon inspection results at the traffic signal turn-on, completeness of the required documentation and successful operation during a minimum 72 hour "burn-in" period following activation of the traffic signal. If approved, traffic signal acceptance shall be verbal at the turn-on inspection followed by written correspondence from the Engineer. The Contractor shall be responsible for all traffic signal equipment and associated maintenance thereof until Departmental acceptance is granted.
- f) All equipment and/or parts to keep the traffic signal installation operating shall be furnished by the Contractor. No spare traffic signal equipment is available from the Department.
- g) All punch list work shall be completed within two (2) weeks after the final inspection. The Contractor shall notify the Design Engineer at (312) 603-1734 to inspect all punch list work. Failure to meet these time constraints shall result in liquidated damage charges of \$500 per month per incident.
- h) All cost of work and materials required to comply with the above requirements shall be included in the pay item bid prices under which the subject materials and signal equipment are paid and no additional compensation will be allowed. Materials and signal equipment not complying with the above requirements that have been installed on the job will be at the Contractor's own risk and shall be subject to removal and disposal at the Contractor's expense.
- i) The Contractor shall furnish the Cook County Highway Department with any special tools or wrenches that may be required for assembling or maintaining the control equipment and traffic control signal head assemblies.

- j) All control cable, when complete in place but before permanent connection, shall be subject to insulation tests at the discretion of the Engineer. The tests shall be made with approved insulation resistance testing equipment rated at 500 volts D.C. and witnessed by the Engineer. Results of these tests shall be submitted to the Department in written form, bearing the Engineers signature and shall become part of the project records. A final inspection of the traffic signal installation shall not be held until results of this insulation test have been received.
- k) All equipment such as new controllers and allied central equipment with the exception of cable, conduit, and other materials which require the use of the State of Illinois Materials Testing Laboratories, shall be built in the suppliers shop and inspected by a representative of this Department prior to the installation of such equipment, and upon approval of this equipment an inspection ticket will be issued to the Contractor by the inspection agency (State of Illinois Material Testing Laboratory or the Cook County Highway Mechanical-Electrical Section). The controller and allied control equipment shall be prepared in the suppliers shop and run under a load of a minimum of 500 watts per phase for at least 48 hours before it is inspected for proper operation and sequencing. After it passes this test an inspection ticket will be issued by the Cook County Highway Mechanical-Electrical Section representative and it can then be delivered to the job site for installation.
- l) Upon completion of the installation, a final inspection will be carried out by qualified representatives of the Highway Agencies involved.
- m) If the Contractor fails to comply with any of the requirements, the County shall impose such sanction as it may determine to be appropriate including but not limited to withholding all payments to the Contractor on this contract until the provisions of this special provision are complete with and/or implementation of article 108.10 of the standard specifications.

At the final inspection it will be required that the Contractor will have submitted to the Engineer all necessary inspection tickets for all new equipment and materials installed under this Contract. If the Contractor has not obtained the inspection tickets on any portion of the new equipment and materials, the representative of this Department will have the authority to postpone the final inspection until the above has been satisfied. Any postponement of the final inspection for this reason shall not relieve the Contractor of his full maintenance responsibilities until such time as the installation is re-inspected and accepted by the County.

The County requires the following Final Project Documentation from the Contractor at traffic signal turn-ons in electronic format in addition to hard copies where noted. A CD/DVD shall be submitted with separate folders corresponding to each numbered title below. The CD/DVD shall be labelled with date, project location, company and contract or permit number. Record Drawings, Inventory and Material Approvals shall be submitted prior to traffic signal turn-on for review by the Department as described here-in.

The County requires the following from the Contractor at traffic signal turn-on.

- 1) The Contractor shall, at the turn-on furnish one hard copy set of signal plans (24"x36") of record with field revisions marked in red ink to the maintaining agency.
- 2) Field Testing. Written notification from the Contractor and the equipment vendor of satisfactory field testing with corresponding material performance measurements, such as for detector loops and fiber optic systems (see Article 801.13). One hard copy of all contract required performance measurement testing shall also be provided.

- 3) A knowledgeable representative of the controller equipment supplier shall be required at the permanent and temporary traffic signal turn-on. The representative shall be knowledgeable of both cabinet design and controller functions and shall have sufficient test and spare equipment to make the traffic signal installation operational.
- 4) Pictures. Digital pictures of a minimum 12M pixels of each intersection approach showing all traffic signal displays and equipment. Pictures shall include controller cabinet equipment in enough detail to clearly identify manufacture and model of major equipment.
- 5) Materials Approval. The material approval letter. A hard copy shall also be provided.
- 6) Manuals. Operation and service manuals of the signal controller and associated control equipment. One hard copy shall also be provided.
- 7) Cabinet Wiring Diagram and Cable Logs. Five (5) hard copies 11" x 17" of the cabinet wiring diagrams shall be provided along with electronic pdf and dgn files of the cabinet wiring diagram. Five hard copies of the cable logs and electronic excel files shall be provided with cable #, number of conductors and spares, connected device/signal head and intersection location.
- 8) Controller Programming Settings. The traffic signal controller's timings; backup timings; coordination splits, offsets, and cycles; TBC Time of Day, Week and Year Programs; Traffic Responsive Program, Detector Phase Assignment, Type and Detector Switching; and any other functions programmable from the keyboard. The controller manufacturer shall also supply a printed form, not to exceed 11" x 17" for recording that data noted above. The form shall include a location, date, manufacturer's name, controller model and software version. The form shall be approved by the Engineer and a minimum of three (3) copies must be furnished at each turn-on. The manufacturer must provide all programming information used within the controller at the time of turn-on.
- 9) All Manufacturer and Contractor warranties and guaranties required by Article 801.14.
- 10) GPS coordinate of traffic signal equipment as describe in the Record Drawings section herein.

RECORD DRAWINGS

The requirements listed for Electrical Installation shall apply for Traffic Signal Installations in Article 801.16. Revise the 2nd paragraph of Article 801.16 of the Standard Specifications to read:

- a. When the work is complete, and seven days before the request for a final inspection, the full-size set of contract drawings. Stamped "RECORD DRAWINGS", shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor's supervising Engineer or electrician. The record drawings shall be submitted in PDF format on CDROM as well as hardcopy for review and approval. If the contract consists of multiple intersections, each intersection shall be saved as an individual PDF file with TS# and location name in its file name.
- b. In addition to the record drawings, copies of the final catalog cuts which have been Approved or Approved as Noted shall be submitted in PDF format along with the record drawings. The PDF files shall clearly indicate the pay item either by filename or PDF Table of Contents referencing the respective pay item

number for multi-item PDF files. Specific part or model numbers of items which have been selected shall be clearly visible.”

Add the following to Article 801.16 of the Standard Specifications:

“In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following traffic signal components being installed, modified or being affected in other ways by this contract:

- All Mast Arm Poles and Posts
- Traffic Signal Wood Poles
- Rail Road Bungalow
- UPS
- Handholes
- Conduit roadway crossings
- Controller Cabinets
- Communication Cabinets
- Electric Service Disconnect locations
- CCTV Camera installations
- Fiber Optic Splice Locations
- Conduit Crossings

Datum to be used shall be North American 1983.

Data shall be provided electronically and in print form. The electronic format shall be compatible with MS Excel. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

1. File shall be named: TSXXX-YY-MM-DD (i.e. TS22157_15-01-01)
2. Each intersection shall have its own file
3. Row 1 should have the location name (i.e. 103rd Street at Central Avenue)
4. Row 2 is blank
5. Row 3 is the headers for the columns
6. Row 4 starts the data
7. Column A (Date) – should be in the following format: MM/DD/YYYY
8. Column B (Item) – as shown in the table below
9. Column C (Description) – as shown in the table below
10. Column D and E (GPS Data) – should be in decimal form, per the County special provisions

Examples:

Date	Item	Description	Latitude	Longitude
01/01/2015	MP (Mast Arm Pole)	NEQ, NB, Dual, Combination Pole	41.580493	-87.793378
01/01/2015	HH (Handhole)	Heavy Duty, Fiber, Intersection, Double	41.558532	-87.792571
01/01/2015	ES (Electrical Service)	Ground mount, Pole mount	41.765532	-87.543571
01/01/2015	CC (Controller Cabinet)		41.602248	-87.794053
01/01/2015	RSC (Rigid Steel Crossing)	IL 31 east side crossing south leg to center HH at Klausen	41.611111	-87.790222

01/01/2015	PTZ (PTZ)	NEQ extension pole	41.593434	-87.769876
01/01/2015	POST (Post)		41.651848	-87.762053
01/01/2015	MCC (Master Controller Cabinet)		41.584593	-87.793378
01/01/2015	COMC (Communication Cabinet)		41.584600	-87.793432
01/01/2015	BBS (Battery Backup System)		41.558532	-87.792571

Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 1 feet. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified.

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have a minimum 1-foot accuracy after post processing GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years.”

Location of Underground State and County Maintained Facilities.

Revise Article 803 to read as follows.

County traffic signal facilities are not part of any of the one-call locating service such as J.U.L.I.E or Digger. If this contract requires the services of an electrical contractor, the Contractor shall be responsible at his/her own expense for locating existing IDOT and CCHD facilities prior to performing any work. If this contract does not require the services of electrical contractor, the Contractor may request one free locate for existing IDOT and CCHD electrical facilities from the Electrical Maintenance Contractor(s) prior to the start of any work. Additional requests may be at the expense of the Contractor. The location of underground traffic facilities does not relieve the Contractor of their responsibility to repair any facilities damaged during construction at their expense.

The exact location of all utilities shall be field verified by the Contractor before the installation of any components of the traffic signal system. For locations of utilities, locally owned equipment, and leased enforcement camera system facilities, the local Counties or Municipalities may need to be contacted, in the City of Chicago contact D.I.G.G.E.R. at (312) 744-7000 and for all other locations contact J.U.L.I.E. at 1-800-892-0123.

Restoration. All areas and plant material damaged by the installation of Traffic Signal posts, mast arm poles, underground cables or conduits, handholes and control cabinets shall be replaced as follows:

- Grass Areas: Replace top soil to a depth of four (4) inches (100 mm), re-grade shoulders, ditch slopes, and open areas back to former existing grades, fertilize, seed and mulch all damaged areas.

- Sod Areas (areas adjacent to residential, commercial and industrial properties and any other areas as directed by the engineer): Fertilize and re-sod damaged areas.
- Plant Materials: Remove and replace damaged trees, shrubs and vines with the same varieties that existed prior to damage.
- Shoulders other than Stabilized and Backslopes, medians, sidewalks, pavement, etc.: Replace shoulder to original condition and restore edge of backslope to original lines and grades. Medians, sidewalks and pavement shall be replaced in kind.
- All brick pavers disturbed in the work area shall be restored to their original configuration or as directed by the Engineer. All damaged brick pavers shall be replaced with a comparable material approved by the Engineer

All damaged landscape shall be replaced in accordance with Section 250 through 254 of the Standard Specifications.

Any damage, due to the installation of traffic signal equipment; or necessary removal at handholes, jacking pits, and inspection openings, of sidewalks, curbs, gutters, median and island paving, and/or pavement, shall be repaired or replaced by the Contractor. Repair or replacement shall be made with a like material of like thickness to the existing surface. Restoration of traffic signal work area shall be included in related pay items such as foundation, conduit, handhole, trench and backfill, etc.

Bagging Signal Heads.

Light tan colored traffic and pedestrian signal reusable covers shall be used to cover dark/un-energized signal sections and visors. Covers shall be made of outdoor fabric with urethane coating for repelling water, have elastic fully sewn around the cover ends for a tight fit over the visor, and have a minimum of two straps with buckles to secure the cover to the backplate. A center mesh strip allows viewing without removal for signal status testing purposes. Covers shall include a message indicating the signal is not in service.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

GENERAL SPECIFICATIONS

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

GENERAL SPECIFICATIONS

Definitions

(1) Whenever the following terms in quotation appear in the Contract documents, they shall be interpreted as follows:

"Water Reclamation District" or "District" – The Metropolitan Water Reclamation District of Greater Chicago, party of the first part.

"Contractor" spelled with a capital "C" - The Contractor under this Contract, party of the second part.

"Engineer" - The Director of Engineering or Acting Director of Engineering, Director of Maintenance and Operations or Acting Director of Maintenance and Operations, any District Officer or Acting Officer, Director of Administrative Services or Acting Director of Administrative Services, of the Metropolitan Water Reclamation District of Greater Chicago, or any other Engineer or subordinate designated by the aforementioned who functions to administer the contract after it has been duly executed by the Director of Procurement and Materials Management.

"Director of Procurement and Materials Management" – The duly authorized Officer of the District, carrying out the functions assigned to him/her by the Purchasing Act (70 ILCS 2605/11.111.24) and the Board of Commissioners to bid and bind the District in contracts.

"He," "him," "she," "he," "it" or "it's" designating the "Contractor" - The individual, firm or corporation awarded the Contract for the work hereunder.

"The Work" - The work to be performed hereunder, including all material, labor, equipment, tools, and all appliances and appurtenances necessary to perform and complete everything specified or implied in the Contract or shown on the plans and specifications furnished by the Water Reclamation District, and the additional plans and information furnished by the Contractor, and accepted by the Engineer, in full compliance with all the terms and conditions hereof.

"Site" - The location(s) described in the Agreement where the work under this Contract is to be performed, or to which deliveries are to be made.

"Plans" – The contract listed in the Agreement and the additional plans, prints and drawings furnished by the Contractor in accordance with this Contract, and accepted by the Engineer.

"Written Order" - A written order signed by the Engineer, delivered by messenger to the Contractor or mailed to the

Contractor at the address designated in his proposal or to such other address as he may designate in writing as his official place of business.

"Change Order" – A written order authorizing an addition, deletion or revision in the work and/or the time of completion of the executed Contract.

"Substantial Completion" - That point in time when, in the opinion of the Engineer, the work is sufficiently complete, in accordance with the contract documents, so that the work can be utilized for the purposes for which it was intended.

"Or equal" or "or equal thereto" - Wherever a particular process, material, device, detail or part is specified herein followed by these words or by similar or equivalent expressions, such words or expressions shall be understood to mean and permit the use of another process, material, device, detail or part that the Engineer shall determine is fully equal in suitability, quality, durability and in all other respects, to the process, material, device, detail or part herein specified for such use and shall approve for such use in the work hereunder.

"Designated," "ordered," "permitted," "approved"- These words or others of similar import, unless specifically modified, shall be taken to mean, designated, ordered, permitted or approved by the Engineer.

"Critical Path" - A sequence of directly dependent activities controlling achievement of the time(s) as specified in the Agreement.

"Activity" -An element in the Work Schedule or Monthly Work Plan representing the duration, schedule, and resources required for performing a part of the work, or a requisite step for a part of the work.

"Total Float" – Number of working days by which a part of the work in the Work Schedule may be delayed from its early dates without necessarily extending the time stated in the Agreement.

"Contract Float" - Number of working days between the Contractor's anticipated or forecasted date for completion of the work, or part thereof, and the corresponding time stated in the Agreement.

"Early (Late) Dates" - Early (Late) times of performances for start or completion of Activities identified on the Work Schedule.

Powers of the Engineer

(2) It is covenanted and agreed that the Engineer and his properly authorized agents shall measure and calculate the quantities and amounts of the several kinds of work performed under this Contract and on whose inspection all work shall be accepted or rejected. The Engineer, or other Agents designated by him, shall have full power to reject or condemn all materials furnished or work performed under this Contract, which in his opinion do not conform to the terms and conditions herein expressed.

To prevent all disputes and litigations, it is further agreed by and between the Water Reclamation District and the Contractor that the Engineer shall in all cases decide every question of an engineering character which may arise relative to the execution of the work under this Contract on the part of the Contractor, and his decision shall be final and conclusive on both parties hereto; and such decision, in case any question may arise, shall be a condition precedent to the right of the Contractor to receive any money or compensation for anything done or furnished under this Contract.

Material and Equipment, Contractor's Plans, Data and Samples

(3) Unless otherwise specified in the Contract Documents, within thirty days after the approval of the Contractor's bond by the Director of Procurement and Materials Management, the Contractor shall submit to the Engineer for approval, eight (8) sets of plans of the equipment, material and apparatus included under this Contract and the foundations for same (other than those for which details are given in the plans attached hereto by the Water Reclamation District), as listed under the Detail Specifications, together with all other information in such detail as may be necessary to permit the Engineer to inform himself whether the same will comply with the specifications, and to determine the character of the various equipment, material and apparatus which the Contractor proposes to use. The time for submitting Contractor's plans may be extended by the Engineer at his discretion, if in his opinion such extension will not delay the progress of work under the Contract. The drawings for equipment to be furnished under this Contract shall include the Water Reclamation District protective coating designation and the location where the protective coating will be applied.

All such plans shall be sizes to be designated or approved by the Engineer and shall be clearly identified by item number, if any, and location of the equipment, material and apparatus in the work. The general character and arrangement of the shop and working plans shall be subject to the approval of the Engineer and before submitting such plans the Contractor, if requested, shall confer with the Engineer regarding the character, scale, arrangement, and completeness of such plans. The detailed shop drawings shall give views, dimensions, instructions and references so that duplicate parts for repairs can be ordered and made from the drawings at any

time in the future. The assembly and working drawings shall show all necessary details, including plans and elevations with dimensions, instruction and references for proper erection, installation and adjustment of the equipment. Approval given on data or shop drawings which subsequently are found to be deviations from the Contract Documents shall be considered null and void unless such deviations are specifically brought to the attention of the Engineer in writing and are acknowledged in writing to be acceptable. Any work that progresses based upon shop drawing or data which does not meet the requirements of the Contract Documents, and therefore is in nonconformity with the Contract requirements, the Contractor will be required to remove or modify until it meets the full satisfaction of the Engineer.

Unless required by Detail Specifications or otherwise specifically instructed by the Engineer, the Contractor need not submit, for approval by the Engineer, copies of shop drawings, layouts, construction and installation procedures, calculations, catalogue data, samples and other required miscellaneous information and data which are identical in all respects to the respective items(s) described in the contract specifications or shown in the contract plans. In the event that the Contractor intends to submit an item or procedure which differs from the details and/or intent set forth in the contract documents, then the Contractor shall submit all necessary shop drawings, calculations, catalogue data, samples and such other information that the Engineer may require for the detailed review of and approval by the Engineer.

The Contractor shall submit to the Engineer a minimum of eight copies of each submittal. Such submittals shall be complete and show all parts of the relevant structures or equipment, and all parts connected therewith. All drawings related to the same or related components shall be submitted at the same time. After the plans have been examined by the Engineer, one print of each will be returned to the Contractor by the Engineer with the latter's approval indicated thereon, or marked with notations or corrections and changes that may be required. Any plans not approved by the Engineer shall be corrected or revised by the Contractor as the Engineer shall direct and shall be re-submitted in the same manner.

Nothing herein shall relieve the contractor of his responsibility to prepare, furnish and deliver any O & M manuals which may be required by the terms of this contract.

The Contractor shall furnish to the Engineer a tabulated list of the equipment for which plans may not be required, showing the name of the manufacturer and the catalog number and type of equipment proposed, together with such dimensions, specifications, samples, or other data, as may be required to permit intelligent judgement of the acceptability of the same.

Machinery, equipment, accessories or parts to be furnished under this Contract must be of current manufacture unless otherwise specified. Such material, whose manufacture has been discontinued or is scheduled to be discontinued within the life of the Contract or the duration of the maintenance bond, will not be accepted unless otherwise specified.

The Contractor shall upon request furnish a certified statement from the manufacturer that any equipment, accessories or parts being furnished under the Contract are in current production and that there are no present or near future plans to discontinue production of the item or items in question.

The Contractor warrants that, for the length of time following execution of this Contract, which is equal to the normal useful life of the equipment to be furnished hereunder, all supplies, replacement parts and technical service customarily needed for the proper operation and maintenance of such equipment will be made available at reasonable prices and within a reasonable time to the Water Reclamation District upon request. Nothing contained in the immediately preceding sentence relieves the Contractor from any obligations which he may have under other sections of the Contract regarding guarantees, defects, maintenance bonds, etc.

All equipment and materials and parts thereof furnished under the Contract shall, for purposes of interchangeability and general maintenance, comply with the most widely accepted standards currently in use in United States industry, unless such compliance would conflict with other specifications contained in the Contract.

In the event that the Contractor requests approval of a substitution for any requirement of this Contract, his change order request must be accompanied with the following information:

1. Technical data demonstrating the quality performance equivalency from that requirement which is specified.
2. A cost proposal indicating the price adjustment to the Contract if the substitution is approved.
3. A statement that the substitution, if approved, will be made with no change in the Contract time.

If the Contractor requests the approval of an "or equal" rather than the particular process, material, device, detail or part that is specified, then his request must include sufficient technical data to demonstrate the quality and performance equivalency of the proposed process, material, device detail or part. The Engineer reserves the right to require the Contractor to provide such testing and inspection as is necessary to verify the quality and performance equivalency, all at the Contractor's own expense.

All structures to be provided by the Contractor (except those structures for which details are shown on the Contract plans) shall be designed and constructed under the supervision of a structural engineer, licensed in the State of Illinois, acting for and retained by the Contractor. Drawings and calculations for such structures shall

be prepared and stamped by the structural engineer and submitted to the Engineer for approval. A clear outline of the proposed construction procedure shall be shown on the drawings. A statement in writing by the structural engineer attesting that he has visited the site of the work, that the design does satisfy the conditions as actually encountered and that the actual construction conforms to the drawings and calculations as submitted and approved must be submitted to the Engineer before the work related to such structures will be considered complete.

All temporary structures, including sheeting and bracing for excavations, which affect the safety of the public, workmen, inspectors or Water Reclamation District personnel shall be regarded as structures which require structural design.

Approval of Contractor's Plans

(4) The plans submitted by the Contractor for approval, as specified in Section (3), will be examined by the Engineer and it is understood by the Contractor in submitting the plans, that a reasonable amount of time will be necessary for their examination by the Engineer before they can be approved by him or returned for correction.

Unless otherwise instructed, the Contractor shall submit to the Engineer for examination three prints of each plan, and, as far as possible, all plans of any particular part of the structures or equipment, and of parts connected therewith, shall be submitted at the same time. After the plans have been examined as above mentioned, one print of each plan will be returned to the Contractor by the Engineer with his approval thereon, or marked with notations or corrections and changes that may be required. All plans not approved by the Engineer shall be corrected or revised by the Contractor the Engineer shall direct and shall be re-submitted in the same routine as before.

No orders for any work, materials or equipment shown on any plans shall be given by the Contractor without the written consent of the Engineer prior to the time when such plans or equipment have been approved by him as specified. Plans, calculations, and procedures for all temporary structures, including sheeting and bracing for excavations, shall be approved prior to the start of related field work. Prior to the approval of any such plans, any work which the Contractor may do on the structures or equipment covered by the same shall be at his own risk, except that work on temporary structures and excavations requiring sheeting and bracing as specified above shall not be started without the written approval of the Engineer, as the Water Reclamation District will not be responsible for any expense incurred by the Contractor in changing structures or equipment to make the same conform to the plans as finally approved. No alterations of any plans shall be made by the Contractor after they have been approved except by the written consent of the Engineer.

The Contractor shall furnish the Water Reclamation District, as requested, and without extra charge therefor, such number of

complete sets of prints of all plans, as approved, as the Engineer shall request and in general not less than eight, for office files and for use in the field. Erection plans shall have all match marks shown thereon.

After the work has been completed, the tracings of all plans for any and all work hereunder, made by or for the Contractor, shall be corrected by him so as to show all work as actually completed.

The Contractor shall furnish to the Engineer record prints, in duplicate, of such drawing submitted by the Contractor, as the Engineer may request.

Upon approval of the plans, lists, samples and other data submitted by the Contractor, the same shall become a part of this Contract, and the equipment furnished shall be in conformity with the same; provided, that the approval of the above plans, lists, specifications, samples or other data shall in no way release the Contractor from his responsibility for the proper design, installation and performance of any material or equipment, or from his liability to replace the same should it prove defective.

Additional Water Reclamation District Plans

(5) The Water Reclamation District will, when specifically noted in the Detail Specifications, prepare working plans supplementary to the plans previously listed herein, showing such additional and revised details for construction purposes not shown on the Contract plans or which are shown as typical only and require revision and additions for construction purposes, as are required for furnishing and erecting the structures and equipment required under this Contract. These working plans will be furnished to the Contractor by the Water Reclamation District within a reasonable time after approval by the Director of Procurement and Materials Management of the bond of the Contractor, and as required from time to time for the prosecution of the work.

The Contractor shall advise the Engineer in writing sufficiently in advance of the time when such plans will be required for the orderly progress of various portions of the work to permit their preparation and shall make no claims for damages for delays that may result from his failure to so notify the Engineer. These plans will include such details as are not shown on the Contract plans and which the Contractor is not required to furnish.

Checking Plans

(6) The Contractor shall check all plans furnished by the Water Reclamation District and by himself for dimensions, quantities and coordination with other parts of the work under this Contract, and shall notify the Engineer of all errors or omissions which he may discover by examining and checking the same. He will not be allowed to take advantage of any error or omission on the plans, as full instructions will be furnished by the Engineer

should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified. The work is to be made complete and to the satisfaction of the Engineer, notwithstanding any minor omissions in the specifications or plans.

Keeping Plans and Specifications on the Work

(7) The Contractor shall keep on hand at each site of work for reference a complete copy of these specifications and a complete set of all plans of the work, and also copies of all plans furnished by the Contractor, all revised plans furnished by the Water Reclamation District and all orders issued to the Contractor by the Engineer that relate to the work under this Contract.

Lines and Grades

(8) A surface horizontal and vertical control system as required for the layout of the work under this Contract shall be given by the Engineer. This horizontal and vertical control system must be verified by the Contractor and the Contractor will be entirely responsible for its correctness. All other horizontal and vertical control required for the complete layout and performance of the work under this Contract shall be done by the Contractor at the Contractor's expense. The Contractor must verify and will be completely responsible for the correctness of all lines and grades including any given by the Engineer.

In tunnel construction, each shaft shall be "plumbed" (line and grade transferred from the surface into the tunnel section) by the Contractor. The Contractor shall inform the Engineer, a reasonable time in advance, of the times and places at which he intends to do work

The Engineer, at his discretion, will make occasional field checks of control work done by the Contractor. The Contractor shall correct any mistakes due to errors or omissions at his own cost and expense as ordered by the Engineer. Unless otherwise noted, all elevations shown on the plans and mentioned in the specifications are referred to Chicago City Datum (C.C.D.). The Water Reclamation District considers Chicago City Datum to be at Elevation 579.48 above New York Mean Sea Level, USC & GS 1929 adjustment (MSL 1929 adj.).

Inspection and Testing of Materials and Equipment

(9) Whenever the Contract Documents provide that the Contractor is to furnish test results, laboratory analyses, manufacturer's certifications, weight tickets, or similar evidence of quality, quantity, and/or Contract compliance, the Contractor shall bear the entire cost of same, unless such provisions specifically state otherwise.

All material and equipment furnished under this Contract shall be subjected at all times during manufacture, fabrication and erection to such inspection and tests by the Engineer or his authorized representatives, as will give due assurance that the

terms of the specifications are being complied with in all respects. Such inspection and tests shall be performed at the points of manufacture or fabrication, or in the field, as are herein specified therefor or as otherwise designated by the Engineer. Where inspection or tests are to be made at the point of the manufacture or fabrication, the Contractor shall in all cases give ample notice to the Engineer to permit such inspection and tests to be performed before painting is done and shipment is made and shall furnish to the Engineer copies, in triplicate, of mill test reports, material certifications, certified test reports and manufactures' letters of compliance to the specifications.

All inspecting and testing of materials furnished under this Contract will be performed by the Engineer or his duly authorized inspection engineers or inspection bureaus without cost to the Contractor unless otherwise expressly specified herein.

When inspection of materials and equipment is authorized in writing by the Engineer, it shall be the sole responsibility of the Contractor hereunder to keep the Engineer, or such duly authorized inspection engineers or inspection bureaus, fully informed as to when and where the material or equipment is to be inspected. All approved subcontractors shall be appropriately advised of this requirement. If any material or equipment is shipped to the site of the work without authorized inspection, it may be subject to rejection. Any additional expense to the Water Reclamation District for inspection of such material or equipment at the site of the work shall be done by the Contractor.

All machining and preparation of test samples, required by the ASTM or other specifications and cited as standard for this Contract, shall be done by the Contractor at his own expense.

All specifications of any society, institute or association hereafter referred to are hereby made a part of this Contract the same as if written in full.

The following societies, institutes and associations hereinafter designated, by their initials, as follows:

Name	Acronym
American Association of State Highway and Transportation Officials	AASHTO
American Concrete Institute	ACI
Institute of Electrical and Electronics Engineers	IEEE
American Institute of Steel Construction	AISC
Air Moving and Conditioning Association Inc.	AMACA
American Petroleum Institute	API
American National Standards Institute	ANSI
American Society of Mechanical Engineers	ASME
American Society for Testing Materials	ASTM
American Welding Society	AWS
American Water Works Association	AWWA
Edison Electric Institute	EEI
Standard Specifications for Road and Bridge Construction of the Department of Public Works	IDOT

and Buildings, Division of Highways, State of Illinois	
Illinois Environmental Protection Agency	IEPA
Insulated Power Cable Engineers Association	IPCEA
Manufacturer's Standardization Society of the Valve and Fitting Industry	MSS
Metropolitan Water Reclamation District of Greater Chicago	MWRD
National Electrical Manufacturer's Association	NEMA
Occupational Safety & Health Act	OSHA
Steel Structures Painting Council	SSPC
U.S. Environmental Protection Agency	USPA
Underwriters Laboratory	UL

Where reference is made to standard specifications of any of the above societies, institutes or association, these references refer to the latest Standards and Tentative Standards of said society, institute or association in force on the date when bids on this Contract were received; except that, if a revised specification is issued by said society, institute or association before completion of a part of the work affected by said specifications, the Contractor may, if approved by the Engineer, perform the part of the work affected in accordance with the revised specifications. In interpreting said standard specifications, the "Purchaser" shall be understood to mean the Water Reclamation District, and the "Manufacturer," the Contractor hereunder of any person or persons or corporation furnishing materials for or performing work under this Contract.

For any material not covered by the designed specification of some designated society, institute or association, appropriate methods of testing and inspection to be designated by the Engineer shall be followed.

All samples for analysis and tests shall be taken in such manner as to be truly representative of the entire lot under test and shall not be worked on in any way to alter the quality before testing. Where expressly permitted by the Engineer in the case of materials taken from stock or for use in minor parts, certified analysis and tests of the manufacturer, furnished in triplicate, may be accepted in lieu of the tests prescribed above. In case the records of physical and chemical tests of stock materials are not available, a reasonable number of tests shall be furnished to the Engineer free of charge as required by the Engineer to satisfy himself as to its quality.

Inspection and tests of fabricated parts and manufactured articles shall be made by such methods and at such times as to insure compliance with the specifications in all respects. Inspection of all metal work shall be made before painting.

The Contractor shall furnish, upon request of the Engineer, certifications for all materials and equipment not inspected, stating that they meet the requirements of the specifications.

Should the preparation of the material be at far distant or inaccessible points, or should it be divided into unreasonably small quantities, or widely distributed to an unreasonable extent, or should the percentage of rejected material be unreasonably large, the additional cost of extra inspection resulting therefrom shall be borne by the Contractor, the Engineer being sole judge of what is to be deemed extra inspection.

The Engineer or his authorized representative shall have full power to reject any and all material or equipment which fails to meet the terms of the specifications and such material or equipment shall be promptly removed from the work hereunder. All material or equipment which develops defects during the life of the Contract, either before or after erection, shall be removed and replaced, notwithstanding that it may have passed the prescribed inspection and tests.

This Contract shall be subject to all provisions of the "Steel Products Procurement Act", (30ILCS 565/1 et. seq.), as it may be amended from time to time.

Steel Products used or supplied in the performance of this Contract or any subcontract thereto shall be manufactured or produced in the United States.

For purposes of this Section "United States" means the United States and any place subject to the jurisdiction thereof and "steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed or processed by a combination of two or more such operations from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making processes. Willful violation of this Section may result in the filing and prosecution of a complaint by the Attorney General of the State of Illinois and shall subject the violators to a fine of the greater of \$5000.00 or the payment price received as a result of such violation.

Inspection and Tests of Workmanship

(10) It is the intent, under this Contract, to secure high class workmanship in all respects and that structures be substantially watertight. By substantially watertight is meant concrete structures with no appreciable leaks from cracks, porous places, holes, expansion or construction joints, and metal structures or pipe lines with no leaking or sweating joints or leaks through defective pipe materials.

Any imperfect work that may be discovered before the final acceptance of the work shall be corrected immediately. The inspection of any work shall not relieve the Contractor of any of his obligations to perform proper and satisfactory work, as herein specified, and all work, which, during its progress may become damaged from any cause, or fails for any reason to satisfy the requirements of the specifications shall be removed and replaced by the good and satisfactory work without extra charge therefore.

The Contractor shall perform all tests which are specified under the various items of the Contract. Any changes or repairs necessary to put all work and equipment in satisfactory adjustment and operating condition (except for repairs or adjustments of equipment furnished by the Water Reclamation District), at no additional expense to the Water Reclamation District other than that specified to be paid under the various unit and lump sum prices of the Contract. Power for testing equipment will be furnished by the Water Reclamation District, to the extent permitted by the Engineer, if Water Reclamation District power is available at the site of work.

Measurement for Payment

(11) When unit prices are specified, all measurements of quantities for payment under the unit price item or items of this Contract shall be made by the Engineer in the manner specified, and the price or prices paid shall include the furnishing, delivering, erecting and connecting up of all tools, materials, equipment, apparatus and appurtenances; the furnishing of all labor and performance of all work required for the installation; and all plans, testing, painting, Contractor's bond, maintenance bonds where required, and collateral work necessary to complete the work as specified in the Detail Specifications. The cost of performing all work specified in the General Specifications and General Conditions shall be included in the unit and/or lump sum price or prices specified in the Agreement (unless otherwise directly specified) and no additional payment will be made by the Water Reclamation District to the Contractor for performing said specified work. No "extra" or "customary" allowances for payment will be made under any item, unless directly specified therein, and no additional payment for work included under any item of this Contract will be made under other items unless directly so specified.

Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the Engineer or his authorized representative, unless otherwise specified.

Intent of Specifications and Plans

(12) The specifications and plans are intended to cover the complete installation. It is not the intent to give every detail in the specifications and plans. The Water Reclamation District will not be responsible for the absence of any detail the Contractor may require, or for any special construction work, equipment, material or labor which may be found necessary as the work progresses. No additional compensation will be allowed the Contractor for any such special construction work, equipment, material or labor which may be found necessary for performing or completing any work hereunder unless it can be clearly shown, to the satisfaction of the Engineer, that such special construction work, equipment, material or labor is beyond the intent and scope of the plans and specifications, or is not included under the lump sum or unit prices

specified in the Agreement. If this is shown, the payment for such special construction work, equipment, material or labor shall be made under Articles 7 and 8 of the General Conditions, after the additional cost has been agreed upon and a written change order by the Engineer has been issued.

Ground Surface and Underground Conditions

(13) Where existing ground conditions are shown on the plans hereto attached, the elevations are believed to be reasonably correct but are not guaranteed to be absolutely so, and, together with any schedule of quantities, are presented only as an approximation. The Contractor shall satisfy himself, however, by actual examination of the site of the work, as to the existing elevations and the amount of work required under this Contract.

Where test pits and borings have been dug, the results supplied to the District by the soils engineer may be given on the plans or are in file in the Engineer's office for the information of the Contractor. The District does not guarantee the accuracy or correctness of this information. If the Contractor desires any additional information relating to the soils investigation, he should contact the soils consultant to obtain such information. The District does not guarantee the accuracy or correctness of any such information supplied by the soils consultant to the prospective bidder. The Contractor must satisfy himself by making borings or test pits or by such other methods as he may prefer to determine the character, location and amounts of water, peat, clay, sand, quick sand, gravel, glacial drift, boulder, conglomerate, rock gas and other material to be encountered and work to be performed.

Existing and Future Structures

(14) Various underground and overhead utilities and other structures are shown on the plans hereto attached. The location, material and dimensions of such structures, where given, are believed to be reasonably correct, but do not purport to be absolutely so. All known structures both under and above ground, either existing or under construction, except Contractor's plants, are plotted on the plans and profiles for the information of the Contractor or are on file in the office of the Engineer, but information so given is not to be construed as a representation that such structures will be found or encountered as plotted, or that no other such structures will be found or encountered. Other structures may also be encountered which may be built under existing or future contracts, or by other parties, which are not shown on the plans. The plans may not show the location of existing underground or overhead utilities serving the properties adjacent to the work site, or highway drainage systems. The Contractor, therefore, shall satisfy himself, by such means as he may deem proper, as to the location of all structures that may be encountered in the construction or the work. All structures encountered shall be protected and supported, and if damaged, repaired by the Contractor without charge therefore to the Water Reclamation

District. The Contractor shall arrange with the owners of said structures for the shifting, temporary removal and restoration and protection of same where necessary for the prosecution of work under this Contract, at no additional expense to the Water Reclamation District except as otherwise specified herein.

Where all or part of the site on which work is to be performed has been utilized under former contracts, the Contractor shall make no claim for extra cost of his work due to encountering debris or other obstructions resulting from such use.

Space for Material, Equipment and Plant

(15) The Contractor shall have the use of such available areas on unoccupied and unused property of the Water Reclamation District adjacent to or near the site of the work, for the storage of material and for field erection of plant and equipment as are not needed for other structures to be built under existing or future Contracts, or for delivery of material and equipment under existing or future Contracts, or for other purposes of the Water Reclamation District. All areas on Water Reclamation District property shall be used under conditions to be approved by the Engineer, and in no case will the Contractor be permitted to block access to other parts of the work under construction or to the treatment plant or other District facilities. The Contractor shall submit drawings showing the proposed layout of his plant to the Engineer for approval, if required. All other necessary or additional storage facilities shall be provided by the Contractor.

When considered necessary and ordered by the Engineer, the Contractor shall immediately remove or relocate any of his tracks, equipment, buildings or other structures which, in the opinion of the Engineer, constitute an obstruction or interfere with the proper carrying on of any other work, without additional charge to the Water Reclamation District.

Where the Water Reclamation District has prepared areas at the site of the work for use as parking spaces for the Contractor's forces, the parking of the cars of the Contractor's forces in locations other than in such parking areas will not be permitted.

The Contractor shall assume full responsibility for the security and safety of everything he may have on the property of the Water Reclamation District or other owners.

Cleaning Work Sites and Restoration

(16) The Contractor shall keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove from any portion of the site, if, in the opinion of the Engineer, such material, debris or rubbish that interferes with the operation of the existing plant or other contractors, constitutes a nuisance, or is objectionable in any way to the public. The Contractor further agrees to remove all machinery, materials, implements, barricades, staging, false work, debris and rubbish connected with or caused by said work

immediately upon the completion of the same and to clean all structures and work constructed under this Contract to the satisfaction of the Engineer, re-grade all areas which have been rutted or disturbed so that the areas will drain without pockets; and to leave the premises, upon completion of the Contract, in at least as good condition as when he entered upon them.

Restoration work shall follow construction as the work progresses and be completed as soon as possible. Restoration work shall not be delayed, and shall be completed no later than thirty (30) days after the work is in place, or as directed by the Engineer. Any testing or further inspection necessary for final completion and inspection of the work shall not be cause for any delay of restoration work required under this Contract. This provision for restoration shall include all public, private, and District property which was affected by the Contractor's construction operations. Such final restoration that cannot be performed within the thirty day period due to adverse weather conditions may, upon written request including a proposed procedure and time schedule, be performed as approved by the Engineer. Any delayed restoration will be contingent upon providing suitable safe temporary facilities without inconvenience or nuisance in the interim.

The Contractor shall maintain existing surface and subsurface drainage conditions in all areas along the line of the work, including highway ditches, storm sewers, culverts, natural terrain, field tile systems, etc.

Whenever public, private or District property is damaged or destroyed, the Contractor shall, at his own expense, restore such property to a condition equal to that existing before such damage or injury was done by repairing, rebuilding, or replacing it as may be directed, or he shall otherwise make good such damage or destruction in a manner acceptable to the Engineer. If he fails to do so, the Engineer may give the Contractor notice and after the expiration of a period of thirty (30) calendar days proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary. The cost thereof shall be deducted from any compensation due, or which may become due, the Contractor under this Contract.

This provision for restoration work shall apply to all work under this Contract.

Provisions for Delivery at Site

(17) The Contractor shall make his own arrangements for delivery of materials and equipment to the site, except as may be otherwise stated in the Contract Documents.

Where the Water Reclamation District has railroad connections serving the site, the Contractor will be permitted the use of such tracks only to the extent that it does not interfere with the Water Reclamation District's operations. Any damage to plant tracks due to the Contractor's use other than normal wear shall be promptly corrected by repair or replacement to the satisfaction of the Engineer.

The Contractor, subject to the approval of the Engineer, will be allowed reasonable use of any existing roadways that are under the jurisdiction of the Water Reclamation District. The Contractor will perform repairs or maintenance necessary to keep and return the roadway in its original condition to the District at no expense to the District. The Contractor's use of the roads shall be strictly in conformity with conditions to be prescribed by the Engineer and shall not interfere with their use by the Water Reclamation District or other contractors. The Contractor shall so conduct his work as to keep all existing roads in continuous service, except as otherwise specified.

The Contractor shall provide and maintain at his own expense such other roadways or other means to obtain access to the work as he may require. Such roadways and other means of access may also be used by the Water Reclamation District or other contractor now or hereafter engaged upon work on this site.

Procedure and Methods

(18) The attention of the Contractor is particularly called to the time allowed for the completion of the work included under this Contract. To avoid delay in the completion of work hereunder, he shall submit the names of all subcontractors and suppliers of material and equipment within 10 days after the date of approval of his bond and shall place all orders for material and equipment within 5 days after approval by the Engineer. The Contractor's attention is further called to the fact that the Water Reclamation District may take over certain parts of the work under this Contract for permanent operation as rapidly as completed in advance of the completion of the Contract as a whole.

The Contractor shall determine the procedure and methods and also design and furnish all temporary structures, sheeting, bracing, tools, machinery, implements and other equipment and plant to be employed in performing the work hereunder, and shall promptly submit layouts and schedules of his proposed methods of conducting the work to the Engineer for his approval. The use of inadequate or unsafe procedures, methods, structures or equipment will not be permitted, and the Engineer may disapprove and reject any of same which seem to him to be unsafe for the work hereunder, or for other work being carried on the vicinity or for work which has been completed or for the public or for any workmen, engineers and inspectors employed thereon, or that interferes with the work of the Water Reclamation District or other contractors, or that will not provide for the completion of the work within the specified time, or that is not in accordance with all the requirements herein specified.

The Contractor shall employ and assign to work only on this Contract a qualified technical engineer, satisfactory to the Engineer of the Water Reclamation District, to act as contact man with the Engineer.

Before starting construction, the Contractor shall submit his proposed order of procedure to the Engineer for approval. The construction of the various parts of the work shall be performed in such sequence that interference with operations of the Water Reclamation District or other contractors will be kept to a minimum.

The acceptance or approval of any order of procedure, methods, structures or equipment submitted or employed by the Contractor shall not in any manner relieve the Contractor or any responsibility for the safety, maintenance and repairs of any structure or work, or for construction, maintenance and safety of the work hereunder, or from any liability whatsoever on account of any procedure or methods employed by the Contractor, or due to any failure or movement of any structures or equipment furnished by him. When constructed, even though in accordance with the approval of the Engineer, should any structure or equipment installed hereunder afterwards prove insufficient in strength or fail on account of poor workmanship or any procedure or methods employed by the Contractor, such failure shall in no way form the basis of any claim for extra compensation for delay, or for damages or expenses caused by such failure, or for extension of time for completion of this Contract, or for material, labor or equipment required for repairing or rebuilding such structure or equipment, or for repairing or replacing any other work that may be damaged in any way by the failure or movement of any structure or equipment or by any other happening.

The Contractor shall, at his own expense, provide any necessary temporary blocking, supports or protection for all structures already constructed or to be constructed, with which his work comes in contact, to prevent injury to the same, and shall make good at his own expense any damage done by him to any part of said structures or their appurtenances in unloading and installing any of the work, materials, apparatus or equipment included under this Contract, or in removing plant or other property or in cleaning up.

The Contractor shall furnish such protection as may be necessary against damage in any way to the work, material, apparatus or the equipment included under this Contract before and after the same have been installed (including all necessary protection for structures and equipment which may be damaged by winter conditions), and shall be fully responsible for such equipment until its final acceptance.

Handling Water at Treatment Plant Sites

(19) The Contractor shall make all arrangement for handling and disposing of water entering the work to maintain safe, dry and satisfactory working conditions. The Contractor shall comply with the storm water permit requirements for the construction site and prepare an erosion control plan, as required by the IEPA. He will

be permitted a reasonable use of existing drainage ditches and the drains and appurtenances constructed under various items of this Contract for the disposal of water under conditions satisfactory to the Engineer, except as otherwise specified. In using the drainage ditches and drains, the Contractor shall keep them free from concrete, clay or other deleterious substances, and if such substances area allowed to enter the drains, their use may be forbidden altogether by the Engineer. The discharge of water containing clay or other solid matter into the drainage system will under no circumstances be allowed. The Contractor shall be responsible for the care of all drains and appurtenances constructed under this Contract during its entire life, and just prior to its completion, all drains and appurtenances shall be thoroughly cleaned of all debris, deposits or other substances which will interfere with their proper operation and all broken or damaged parts shall be replaced or repaired without cost to the Water Reclamation District.

Openings and Cutting and Fitting

(20) The Contractor shall provide all openings and recesses in the concrete, brickwork and other parts of the work that may be required for any class or part of the work to be furnished or performed hereunder, or that are ordered by the Engineer. He shall do all drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of work hereunder go together in a proper, workmanlike and finished manner.

All such work shall be performed with proper and suitable tools in a workmanlike manner. No cutting will be allowed except by the permission of and subject to the direction or approval of the Engineer. Where holes are to be cut through concrete walls or floor slabs, a core drill or saw shall be used to prevent spalling of the concrete.

The Contractor shall cut all openings required for setting inserts in concrete or brick masonry placed under other contracts. All cutting shall be confined closely within the limits required for installing the inserts. Any concrete or brick masonry removed beyond the required limits and any damage to existing structures or equipment resulting from the cutting of concrete or brick masonry, shall be promptly replaced or repaired by the Contractor at his own expense in such a manner as ordered by the Engineer. Inserts shall be grouted in, and the cutting shall be done so that the grout can be thoroughly bounded and keyed to the existing structure. Grout shall be so placed as to make watertight joints and shall be neatly finished off flush with the surface of the adjoining structure. Reinforcement steel which may interfere with the setting of inserts shall be removed from all opening cut in the concrete, unless otherwise specified or ordered.

The cost of making all pipe connections to work performed under other contracts shall be included as part of the work under the appropriate unit and lump sum items of this Contract unless otherwise specified.

Water, Power and Water Reclamation District Equipment

(21) For Engineering Department contracts, the Contractor shall arrange for his own water supply, which shall be quality to be approved by the Engineer, free from contamination.

The Contractor, if he so desires, will be permitted to use water from the Water Reclamation District mains where it is available and does not interfere with the work of the Water Reclamation District or the requirement of other Contractors on the site. The Water Reclamation District, however, will not be responsible for any interruption of service, or possible inadequacy of the supply. The Contractor will be required to pay for the water so used from the Water Reclamation District to the various municipalities for purchase of water, and shall, at his own expense, install a meter or meters of approved type for the measurements of the water so used. He will be required to make such temporary connections as he may need, subject to the approval of the Engineer, and to restore all existing facilities prior to the completion of the work at no additional expense to the Water Reclamation District.

The Contractor shall arrange for his own supply of power unless otherwise provided for in the Detail Specifications.

The Contractor will be permitted the use, without charge, of washrooms and toilets in existing Water Reclamation District buildings, as approved by the Engineer.

The Contractor shall provide, in total, his own field office and facilities therefore:

The Contractor will not be permitted to use any Water Reclamation District equipment or facilities except in case of emergency or as specified herein. If such equipment or facilities are used in case of emergency, the Engineer shall first give his permission and shall determine the cost of such use.

The cost for use of its facilities shall be paid to the Water Reclamation District on bills rendered monthly.

Safety

(22) The Contractor shall be responsible for the safety of the Contractor's employees, Water Reclamation District personnel and all other personnel at the site of work. The Contractor shall designate a responsible member of the Contractor's organization, knowledgeable of the site(s) and work being performed daily, as the safety representative. That person shall be provided with an appropriate office on the job site to maintain and keep available safety records and up-to-date copies of all pertinent safety rules and regulations.

The identity and resume of the qualifications of the safety representative must be submitted to the District prior to the start of

any field work. This resume shall include such items as; experience, education, special safety and first aid courses completed, and safety conferences attended. The Contractor shall submit alternate safety representatives to insure compliance with the intent of these specifications.

The safety representative shall:

Have successfully completed and be currently certified in the American Red Cross Adult First Aid/CPR/AED Course and the OSHA (Occupational Safety and Health Act) 30 Hour Construction Safety Course or their equivalents.

Be completely familiar with all applicable health and safety requirements of all governing legislation and ensure compliance with same.

Schedule and conduct safety meetings and safety training program as required by law.

Be present on the job at all times whenever work is being performed unless a safe work program is established and the safety representative is assured that workers are able to perform the work in accordance with the program.

Post appropriate notices regarding safety and health regulations at locations which afford maximum exposure to all personnel at the job site.

Post the name, address, and hours of the nearest medical doctor, name and address of nearby clinics and hospitals, and the local telephone numbers of the fire and police departments.

Post appropriate instructions and warning signs in regard to all hazardous areas or conditions.

Have proper safety and rescue equipment adequately maintained and readily available for any contingency. This equipment shall include such applicable items as proper fire extinguishers, first aid kits, safety ropes and harnesses, stretchers, life ring with standard rope lanyard, resuscitators, gas detectors, oxygen deficiency indicators, explosimeters, etc.

Make inspection to ensure that all machines, tools and equipment are in a safe operating condition; that all work methods are safe; and that work areas are free of hazards and make available to the Engineer a daily report of all activities and findings.

Make available to the Engineer copies of all safety records and submit all safety inspection report and certifications from regulating agencies.

The Engineer shall be permitted to examine all reports, recommendations, and records of the safety representative and

upon request shall be given copies of any such reports, recommendations, and records.

The Contractor shall report to the Engineer all accidents involving injury to personnel or damage to equipment and structures. In addition, the Contractor shall furnish to the engineer a copy of all accident or health hazard reports prepared for OSHA as well as copies of all notices of apparent violations that may be issued by OSHA and all disposition reports on any hearings, appeals findings, etc.

All personnel employed by the Contractor or Sub-contractors whenever entering the job site, any shaft, or tunnel headings shall be required to wear approved safety hats.

The Contractor shall comply with all requirements relating to noise levels as specified in OSHA.

The Contractor shall comply with the latest provisions of "State of Illinois Manual of Uniform Traffic Control Devices" or other pertinent governing regulations for traffic control. When the Contractor shall provide all necessary traffic control for protection of the traveling public.

Where work is being performed in tunnels, sewers, pipe, underground structures or other confined spaces, the Contractor shall provide all necessary and appropriate safety equipment.

Atmospheric tests shall be taken as often as deemed necessary by the safety representative as required by applicable regulations.

In tunnel work an additional explosimeter shall be provided at the heading at all times which will continuously monitor for the presence of explosive gases. This explosimeter shall be the type that automatically provides both visual and audible alarms.

No employee will be allowed to work in areas where concentrations of airborne contaminants exceed 1992 American Conference of Governmental Industrial Hygienists (A.C.G.I.H.) threshold limits as amended. Respirators shall not be substituted for environmental control measures and shall be used only as prescribed by OSHA.

Internal combustion engines other than mobile diesel powered equipment shall not be used underground. All mobile diesel powered equipment used underground shall be certified by the Bureau of Mines as prescribed in OSHA.

All Internal combustion equipment shall be operated in such a manner as to prevent any health hazards to personnel from exhaust fumes.

All haulage equipment such as hoists, cages and elevators operating in excavations and shafts shall conform to all requirements described in OSHA.

Furthermore, Overhead Protection Part 1926, Subpart W, Section 1000,1001 and 1002, of OSHA is applicable to all skidsteer equipment and self-propelled compactor equipment. They shall be equipped with roll over protective structures as provided by part 1926.1000, and with seat belts as provided by part 1926.602 as designed and installed following the recommendations of the original equipment manufacturer. Any such equipment not meeting the above requirement shall not be allowed on the job site. Side boom pipe laying tractors are exempt.

Prior to the use of any materials, the Contractor shall provide the Engineer with an appropriate material safety data sheet for any material requiring one.

In addition to the safety requirements herein set forth, the Contractor shall comply with the health and safety laws, rules and regulations of federal, state and local governments, including but not limited to:

Safety Rules-Metropolitan Water Reclamation District of Greater Chicago, dated March 1, 1970 and as subsequently amended;

The Federal Occupational Safety and Health Act of 1970, together with all Amendments thereto and all rules and standards implementing said Act;

Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices current edition as issued by the American Conference of Governmental Industrial Hygienists.

Copies of the rules and regulations listed above shall be maintained at the job site by the Contractor's safety representative throughout the duration of the Contract.

Where a conflict exists between any standards, the most stringent will apply.

As-Built Drawings

(23)For Engineering Department contracts, upon completion of the work under this Contract, the Contractor shall furnish to the Water Reclamation District one complete set of As-Built drawings.

The original reproducible Contract Drawings will be made available to the Contractor by the Engineer upon which the Contractor shall make the necessary additions and corrections to show the As-Built conditions. The changes shall be made by using opaque black ink and standard drafting techniques. Each drawing changed or unchanged shall bear the notation "AS-BUILT" near the title block and shall be signed as to its correctness by the Contractor and submitted to the Engineer for approval.

The Contractor shall keep and maintain at the construction site a working set of plans for recording as-built conditions. This set of record drawings shall be kept up to date and available for the Engineer's use. It shall have marked or noted thereon all field information, properly dated; recording as-built conditions that may differ from the plans. These drawings shall be utilized to prepare the As-Built Drawings as herein specified.

The Contractor shall include in the appropriate pay items of this Contract, all engineering and drafting costs required to produce these As-Built Drawings.

Open Burning

(24) The Contractor shall not dispose of any material, debris or rubbish by open burning on the site of the work or on any other site, and shall comply with all rules and regulations of the Illinois Pollution Control Board (IPCB) in effect and as may be amended during the course of the Contract.

Posting of Project Signs

(25) Prior to the start of construction, the Contractor shall erect two 4' x 8' signs on the job site for public viewing at locations designated by the Engineer. These signs shall be erected in accordance with regulations of the USEPA and IEPA for grant-funded projects and in accordance with regulations of the Water Reclamation District for all other projects. These signs will be furnished to the Contractor by the Water Reclamation District at storage locations on District property.

For each sign, the Contractor shall furnish and install (2) 6" x 6" x 14' long dense structural grade Southern Pine mounting posts which are to be set 4 feet into the ground and 5 feet apart (center line to centerline). The bottom of the signs shall be 6 feet above ground. The Contractor shall also furnish (4) 3/8" x 10" long mounting bolts with nuts and washers for each sign.

These signs shall be maintained by the Contractor for the duration of the Contract. Upon completion of this Contract and acceptance by the Water Reclamation District, the Contractor shall dismantle the installed signs and deliver them to a place to be designated by the Engineer. All material furnished by the Contractor shall become his property and the site shall be restored to its original condition.

Proprietary Designations

(26) When proprietary specifications are used in the Contract documents followed by an " or equal" clause, they are intended to establish a standard of quality and not to inhibit the use of products of other manufacture.

Therefore, all processes, materials, devices, details, or parts specified by proprietary name shall be understood to mean and permit the use of other processes, materials, devices, details, or

parts that the Engineer shall determine to be fully equal in suitability, quality and durability to the processes, materials, devices, or parts herein specified. The Engineer shall be sole judge in determining equals of proprietary specifications and his decision shall be final and binding to both parties.

The foregoing shall be adhered to unless specifically noted to the contrary in the Detail Specifications. Such note will refer to this section.

Fire or Other Emergency

(27) In the event of fire or other emergency occurring at or about the site of the work, the Water Reclamation District, at its option, may summon such aid as it deems necessary. The Water Reclamation District reserves the right to pay any third party for emergency services so rendered, and the Contractor shall promptly reimburse the Water Reclamation District for the amount of such payment. No liability on the part of the Water Reclamation District for cause of damage shall be inferred as a result of such aid being summoned, nor as a result of payment being made for such aid, and the Contractor hereby agrees to indemnify, keep and save harmless the Water Reclamation District from all claims, judgments, awards and cost which may in anywise come against the Water Reclamation District by reason of its summoning such aid and/or paying charges therefore. In the event that the Contractor summons emergency aid, the Water Reclamation District, at its option, may pay any party for emergency services rendered, and the Contractor shall be promptly reimburse the Water Reclamation District for the amount of such payment. No liability on the part of the Water Reclamation District shall be inferred as a result of such payment being made, and the Contractor hereby agrees to indemnify, keep and save harmless the Water Reclamation District from all claims, judgement, awards and costs which may in anywise come against the Water Reclamation District by reason of its paying for emergency services rendered.

Care of Structures and Property

(28) All poles, trees, shrubbery, fences, pavements, railroads, sewer, water, gas or pipes, wires, conduits, culverts, drainage ditches, manholes, tunnels, tunnel shafts, buildings and all other structures and property at or adjacent to the site of the work shall be supported and protected from damage or injury by the Contractor during the construction until the completion of said work. The Contractor shall be liable for all damages to structures and property and shall save and keep the Water Reclamation District harmless from any liability or expense for damage or repairs to the same.

In open cut work wherever existing pipes or conduits cross the excavation but do not conflict with the structure to be built under this Contract, the Contractor shall support said such pipes

and conduits without damage to them and without interrupting their use during the progress or work under this Contract.

Where existing pipes or conduits cross the excavation and do conflict with the structures or sewer to be built under this Contract, the Contractor shall notify the private individuals, utility company, city, village, or township who owns the pipes or conduits in order to move or rearrange them and shall cooperate with said owner in preserving service through said pipes or conduits, and all in accordance with the provisions or the ordinances, easements, and permits of the Contract Documents.

The Contractor shall conduct the work so that no equipment, material, or debris will be placed on or allowed to fall upon private property in the vicinity of the work, unless he shall have first obtained the owner's written consent thereto, and shall have shown his written consent thereto, and shall have shown his written consent to the Engineer.

All areas affected by the Contractor's work shall be thoroughly cleaned of all surplus materials, earth, and rubbish placed thereon by the Contractor, and such areas shall be restored to as good condition as existed before the commencement of the work. Where sod has been removed or damaged, new live sod shall be laid as hereinafter provided. Where the areas are to be seeded, top soil equal to that removed shall be placed, the area fertilized, seeded, and rolled to the satisfaction of the owner of the land, as hereinafter provided. All trees shrubs, and plants damaged shall be replaced during the proper season of the year with live growing stock of the same variety and reasonable size as that which was damaged.

The Contractor shall make such changes in the location of all electric power conduits and cables and police and fire alarm electrical wires of the municipalities as may be render necessary by the performance of the work specified under this Contract. Such changes shall be made at the places and in the manner designated by and be subject to the approval of the proper municipal officials, and the provisions of the ordinances, easements and permits of the Contract documents.

The Contractor shall arrange with all persons, partnerships or corporations for the support, removal, relocation and/or maintenance of any conduits wires, poles, pipes, gas mains, cables, or other structures within any portion of the streets, public alleys and highways and easements to be occupied or used during the performance of the work specified under this Contract, and shall do all work necessary for such support, removal, relocation and/or maintenance of such conduits, wires, poles, pipes, gas mains, cables, or other structures encountered, as may be rendered necessary by the construction of said work.

The Contractor shall furnish all material and supplies, plant, staging and falsework, machinery, tool and implements, vehicles, cars and railroad track; in fact, all material and appliances of every sort or kind that may be necessary for the full and complete

performance of this Contract, and shall furnish and maintain, subject to the approval of the Engineer, all necessary barricades, and other protections, lights and signs, necessary for the proper protection of the public. The Contractor shall also furnish watchmen not only to protect the public, but to protect all materials, tools, machinery, and equipment and all work performed by the Contractor until said work has been completed and accepted by the Engineer.

On all connection items, the Contractor shall make a preliminary trench excavation to locate the existing sewers and other utilities before he begins the actual work of excavation for the connection to be built at each location.

The Contractor shall, at his own expense, repair any damage to machinery, equipment, masonry buildings, or other property of the Water Reclamation District, or other owners or work under construction by other contractors occasioned by the Contractor in the execution of this Contract.

All of the described work under this Section shall be done with no additional expense to the Water Reclamation District.

Historic and Scientific Specimens

(29) The Contractor shall preserve and deliver to the Engineer any specimens of historic or scientific value encountered in the work as directed by the Engineer.

Operation and Service Equipment Manuals

(30) In addition to the requirements specified in Section (3) of the General Specifications, unless otherwise specified in the Detail Specifications, the Contractor shall provide 9 copies of the Equipment Manual for all equipment furnished. The Manual shall consist of bulletins, certified manufacturers' prints, schematic diagram, as-built drawings of equipment, and other pertinent data which provide all information necessary to install, service, maintain, repair, and operate each piece of equipment, and shall include parts lists, service and maintenance instructions and performance data. The data, instructions and parts list for each piece of equipment shall necessarily include all accessories and controls furnished with the equipment.

The Manual must be submitted and approved at least four weeks prior to operating personnel training as specified in Section (31) of the General Specifications. Only 2 copies of the Manual will be required for purpose of review by the Engineer with 9 approved copies to be delivered to the Engineer prior to operation testing and personnel training.

The Manuals shall be bound in vinyl multi-ring binders bearing the contract title and number on the cover and in the window on the binder backbone. The inserts shall be 8-1/2" x 11"

in size, with any larger sized inserts folded to 8-1/2" x 11". The Manuals must include an index and tabbed sheets which will contain item numbers and descriptions in sufficient detail for easy reference to any particular piece of equipment included in the Manual.

Operating Personnel Training

(31) For Engineering Department contracts, it shall be the Contractor's responsibility to furnish necessary training and instruction to make supervisory and operating personnel completely familiar with the operation and maintenance of all equipment installed under this Contract. This training and instruction must be completed prior to the start of any operation tests that are required on this Contract. This training and familiarization shall include coordination of new with existing controls. Such instruction may, when deemed necessary by the Engineer, include instruction by factory-trained representatives of the manufacturer. The costs for all necessary instruction shall be included in the price or prices to be paid under the terms of the Contract.

Such time as is necessary shall be devoted to this requirement and a log shall be kept up to date by the Contractor of such training including date, duration, equipment and/or systems covered and party or parties conducting and attending the instructions. When all Operating Personnel Training is completed, the Contractor shall submit the certified log to the Engineer.

Operator training is to be provided on all three shifts, with all shifts receiving full and equal training.

Training schedules are to be approved by the Engineer two weeks prior to the starting of training.

Technical/Maintenance training is to be given on the day shift, during normal plant working hours. This training is to be separate from the operators' training.

Operation Tests

(32) For Engineering Department contracts, as soon as conditions will permit, and after safety devices, controls, and other components are checked, the Water Reclamation District, in cooperation with the Contractor, will place the equipment finished and/or installed under this Contract in operation, to such an extent that the Water Reclamation District may deem necessary, and will continue to operate and maintain lubrication where necessary, for at least sixty (60) calendar days. During this operation test period, the Contractor shall make such changes, betterments, or replacement in the equipment furnished and installed under this Contract as may be required to comply with the specifications, or to replace any defective work.

When, in the opinion of the Engineer, said changes, betterments, or replacements in the equipment are substantial, then

the test period shall be reinitiated and continue for at least sixty (60) calendar days upon completion of the changes.

Prior to the above operation test period, the Contractor shall comply with Section (30) and (31) of the General Specifications. During the above operation test period, the Contractor shall furnish sufficient supervision to instruct the District in the maintenance and operation of the equipment furnished and installed under this Contract.

Acceptance

(33) If, in the opinion of the Engineer, it has been demonstrated in the operation test that the equipment furnished and installed under this contract meets the performance requirements of the Contract, then the equipment furnished and installed under this Contract shall be accepted by the Water Reclamation District; however, if, in the opinion of the Engineer, it has been demonstrated in the operation tests that the equipment furnished and installed under this Contract does not meet the performance requirements of the Contract, then the Contractor shall, at his own expense, make all necessary changes, betterments, or replacements in the equipment so that it will meet the performance requirements when again tested.

If the Contractor fails or refuses to make changes, improvements, or betterments, or if the improved equipment when placed in operation, shall again fail to meet the performance requirements, the Water Reclamation District, notwithstanding its ownership of work and material which have entered into the equipment, shall have the option of rejecting the equipment or of accepting the equipment at such reduced prices as may be agreed upon by the parties hereto.

In case the Water Reclamation District exercises its option and rejects the equipment, then the Contractor shall repay the Water Reclamation District all sums of money paid to him on progress payment vouchers or on account of the prices herein specified, and upon receipt of said sums of money, the Water Reclamation District will execute and deliver to the Contractor a letter relinquishing its right, title, and interest in and to the equipment. However, that the equipment shall not be removed from the premises of the Water Reclamation District until the Water Reclamation District obtains from other sources other equipment to take the place of that rejected. The Water Reclamation District agrees to obtain the other equipment within a reasonable time, and the Contractor agrees that the Water Reclamation District may use the equipment furnished and installed by him without rental or other charges until the other new equipment is obtained.

Removal of Equipment, Material and Debris

(34) Unless otherwise specified in the Detail Specifications all reusable or salvageable equipment and material specified to be

removed in the Detail specifications shall be delivered to the Water Reclamation District storekeeper or to a location on the site designated by the Engineer. The Contractor shall be responsible for the loading, transporting, and unloading of this equipment and material. Equipment, ductwork, or piping with insulating materials intact after removal may be considered, for practical purposes, as having salvage value.

All debris consisted of loose insulation materials, firebrick, broken concrete, etc., shall be removed from the Contractor's work site by the Contractor.

Maintenance Management System Manuals

(35) In addition to the requirements specified in Section (30) of the General Specifications, the Contractor shall furnish copies of Maintenance Management System (MMS) Manuals containing information/data as indicated by each of the items specified below. No later than one-third into the time of completion of this contract (or the one-third point of construction on performance specification contract), the Contractor shall provide a complete list of all equipment furnished under this contract. If the required listing is not provided, the District will withhold progress payments until the Contractor complies. From this list, the District will develop and forward to the Contractor EQUIPMENT LISTING sheet(s) that will define which equipment is to be included in the MMS Manuals. These sheets will also indicate the required naming and numbering conventions to be used for each piece of equipment. The Contractor shall utilize these EQUIPMENT LISTING sheet(s) for preparation of the MMS Manuals. The information/data specified below shall be furnished individually for each item of equipment entered on the EQUIPMENT LISTING sheet(s). The equipment included in the MMS Manuals need not be included in the manuals required under Section (30).

The Manuals shall be bound in vinyl D-ring binders bearing the contract title and number on the cover and in the window of the spine. The Manuals shall be sized for 8-1/2" x 11' SHEETS, WITH ANY LARGER SIZED SHEETS FOLDED TO 8-1/2" X 11". Manuals shall include an index and tabbed insert sheets labeled for each item of equipment on the EQUIPMENT LISTING Sheet(s). The information/data within each tabbed section shall be organized in the order as it appears below.

All drawings and documents provided for the manuals shall have each individual sheet stamped/identified with the proper equipment number(s) as established in the EQUIPMENT LISTING sheet(s).

The Manuals shall be submitted and approved no less than two months prior to final acceptance of the work or two months prior to any personnel training (Section (31)) and/or operation tests (Section 32)) the Contractor is required to perform, whichever is sooner. Only two copies of the Manual will be required for purposes of review by the Engineer prior to approval.

The information/data required for the MMS Manuals is specified as follows:

- Completed **EQUIPMENT DATA** sheet;
- Completed **MOTOR DATA** sheet;
- Completed **EQUIPMENT MANUFACTURER/SUPPLIER INFORMATION** sheet;
- Lubrication Information: a listing (for each lube point) specifying the generic type of lubricant used, the lubricant supplier, the lubrication frequency based on runtime hour and/or calendar day intervals, and the amount of lubricant used;
- Parts List: consisting of the manufacturers and generic part name, identification number and quantity of each component part of the equipment;
- Spare Parts List: consisting of the manufacturer's recommendations as to which parts from the above parts list should be inventoried, how many of each, and any special storage requirements;
- Control Diagrams: providing schematics showing complete internal and connection wiring;
- Installation Procedure: consisting of the manufacturer's recommendations of step-by-step procedures for proper installation of the equipment;
- Operating Procedures: consisting of equipment manufacturer's recommended step-by-step procedures for starting (including pre-start checks), operating, and stopping the equipment under specific modes of operation. Shut-down procedures (with checklists) for both long and short term outages and operating precautions that include safety for personnel and equipment shall be included;
- Preventive Maintenance Procedures: consisting of the equipment manufacturer's recommended steps and schedules (based on runtime hour and/or calendar day intervals) for inspecting and maintaining the equipment;
- Repair/Overhaul Maintenance Procedures: consisting of the manufacturer's directions for the disassembly, repair, and reasonably of the equipment with all safety precautions that must be observed while performing the work; The procedures shall include instructions for the adjustment, calibration, and troubleshooting of equipment;
- Predictive Maintenance Procedures: consisting of the manufacturer's criterion and recommendations for predictive maintenance including descriptions and parameters of all applicable diagnostic test/analysis to be performed and the recommended testing intervals based on runtime hours and/ or calendar days;

-Drawing; exploded or cut views of the equipment shall be provided if available as a standard item of manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with details callouts.

If CAD drawings are available in electronic format they shall be delivered on electronic or optical media in a format readable by the Water Reclamation District's current CAD systems. If the drawings were originally created using AutoCAD, it is preferred that the files be delivered in .DWG format. If the files are from some other CAD package, then .DXF format is acceptable. As-Built information will be segregated on a separate drawing layer so as to not be mixed with original design or design revision information.

Copies of the **EQUIPMENT DATA** sheet, the **MOTOR DATA** sheet and the **EQUIPMENT MANUFACTURER/SUPPLIER INFORMATION** sheet appear in these contract documents. The Contractor may reproduce the sheets or upon written request, obtain copies from the District.

EQUIPMENT LISTING

EQUIPMENT NUMBER	EQUIPMENT LOCATION
<input type="text"/>	<input type="text"/>
EQUIPMENT DESCRIPTION	PROGRAM NO.
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EQUIPMENT NUMBER	EQUIPMENT LOCATION
<input type="text"/>	<input type="text"/>
EQUIPMENT DESCRIPTION	PROGRAM NO.
<input type="text"/>	<input type="text"/>

EQUIPMENT MANUFACTURER/SUPPLIER INFORMATION

CONTRACT NO. (if applicable)				P.O. NUMBER				ITEM NO.				EQUIPMENT NUMBER							

MANUFACTURER INFORMATION:

MANUFACTURER NAME															
ADDRESS															

ZIP CODE				TELEPHONE NUMBER			

CONTACT PERSON				FAX NUMBER			

SUPPLIER INFORMATION:				SUPPLIER NUMBER			

SUPPLIER NAME															

ADDRESS															

ZIP CODE				TELEPHONE NUMBER			

CONTACT PERSON				FAX NUMBER			

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15	Construction Joints	C-8-9
16	Water Stops	C-9
17	Parts Set in the Concrete	C-9
18	Surface Finish	C-9-10
19	Curing	C-10
20	Concrete Compression Test Cylinders	C-10-11
21	Grouting Sewers in Tunnels	C-11
22	Defective Work and Patching	C-11-12
23	Damaged Work	C-12
24	Cold Weather Concreting	C-12
25	Hot Weather Concreting	C-12

Classes of Concrete.

(1) The following twelve classes of concrete shall be used in construction of sewage treatment plant structures, sewers, pavements, bridges, tunnels and miscellaneous structures:

Table 1-Concrete Mix Designs

- Class R** - Dense, watertight, durable concrete for structures in contact with sewage, sewage gas or vapor.
- Class RA** - Similar type of concrete as described in "Class R" with the addition of an ASTM C-494 MWRD approved water reducing admixture.
- Class RAP** - Similar to Class RA except modified for placement by pumping.
- Class P** - Dense, watertight, durable concrete for use where specified for pavement, walkways and architectural concrete work not in contact with sewage or sewage gas and when a uniform appearance (color) is desired.
- Class PA** - Similar to Class P except with the addition of an ASTM C-494 MWRD approved water reducing admixture.
- Class S** - To be used where a high strength concrete is required.
- Class T** - Concrete with reduced size aggregate for use where specified for topping or other special types of concrete work.
- Class TA** - Similar to Class T except with the addition of an ASTM C-494 MWRD approved water reducing admixture.
- Class GB** - Non-structural grout.
- Class GS** - Structural grout.
- Class GSA** - Similar to Class GS except with the addition of an ASTM C-494 MWRD approved water reducing admixture.

Class F - Concrete used as fill concrete and mud coat where specified.

The class of concrete to be used for any particular location shall be as specified in the Plans or the Detail Specifications. When not otherwise specified, concrete shall be Class R or Class RA.

Concrete Mixtures.

(2) The Contractor shall use the proportions or weights of the ingredients as specified in Table 1 for each given class of concrete used.

If for a special purpose the Contractor proposes to use a concrete mix different than the designs listed in Table 1, he must submit the mix design to the Engineer for approval. The Contractor shall make trial batches and have the necessary tests performed as directed by the Engineer at no cost to the District. The tests shall be repeated as required until the proposed mix is approved by the Engineer. The concrete mix shall at all times be subject to modification by the Engineer on the basis of the Character of work in which the concrete is to be used, variation in aggregates, subsequent tests, and inspection of the work performed. Where mix designs necessitate increased water requirements (to accommodate higher slumps, increased percent of sand, special aggregates, etc.) cement contents shall be increased proportionately for any increase in water.

For concrete of a given class, the cementitious materials and fine and coarse aggregate shall be so proportioned and mixed as to produce homogeneous concrete of such consistency that it may be readily placed under the conditions of use, completely filling the forms or space into which it is placed, without voids and without separation of the ingredients.

All ingredients of concrete shall be weighed and not measured by bulk, except that full bags of portland cement weighing 94 pounds per bag and full bags of fly ash of the proper weight to produce the blend specified in Table 1 may be taken into the batch without further weighing.

TABLE 1-CONCRETE MIX DESIGNS

Class of Concrete		Class "F"		Class "GB"		Class "GS"			Class "GSA"		Class "P"		Class "PA"	
Type of Aggregate		Gravel	Crushed Stone	Limestone Screenings	Sand	Sand	Sand	Sand	Sand	Gravel	Crushed Stone	Gravel	Crushed Stone	
Top Size of Aggregate		1"	1"	-	-	-	-	-	-	1"	1"	1"	1"	
Cement Sacks/cu. yd.		2.55	2.87	4.50	4.50	12.0	11.1	11.0	10.2	7.0	7.0	6.5	6.5	
Cement lbs./cu. yd.		240	270	423	423	1128	1045	1034	959	658	658	611	611	
Fly ash lbs./cu. yd.		40	45	100	100	-	125	-	125	-	-	-	-	
Coarse Agg. lbs./cu. yd.		1900	1780	2750	-	-	-	-	-	1900	1750	1900	1750	
Fine Agg. lbs./cu. yd.		1500	1520	-	2700	2020	1955	2020	1955	1109	1245	1150	1290	
Water lbs./cu. yd. max.		260	260	487	487	508	526	465	488	296	296	257	257	
Air Entr. % of Vol.		4 to 6	4 to 6	+	+	8 to 10	8 to 10	8 to 10	8 to 10	4 to 6	4 to 6	4 to 6	4 to 6	
Water Reducing		-	-	*	*	-	-	*		-	-	*	*	
Admixture oz./sack														
Crushing Strength psi Minimum	7 Days	-		-		2800								
	28 Days	1200		1500		4000								

Class of Concrete		Class "R"		Class "RA"		Class "RAP"		Class "S"		Class "T"	Class "TA"
Type of Aggregate		Gravel	Crushed Stone	Gravel	Crushed Stone	Gravel	Crushed Stone	Gravel	Crushed Stone	Gravel	Gravel
Top Size of Aggregate		1"	1"	1"	1"	1"	1"	1"	1"	3/8"	3/8"
Cement Sacks/cu. yd.		6.28	6.28	5.75	5.75	6.28	6.28	7.5	7.5	7.69	7.0
Cement lbs./cu. yd.		590	590	540	540	590	590	705	705	723	658
Fly ash lbs./cu. yd.		100	100	100	100	100	100	100	100	100	100
Coarse Agg. lbs./cu. yd.		1900	1750	1900	1800	1750	1650	1955	1780	1260	1260
Fine Agg. lbs./cu. yd.		1060	1195	1200	1250	1310	1360	1190	1215	1313	1350
Water lbs./cu. yd. max.		310	310	269	269	290	290	338	338	370	325
Air Entr. % of Vol.		4 to 6	4 to 6	4 to 6	4 to 6	4 to 6	4 to 6	+	+	6.5 to 8.5	6.5 to 8.5
Water Reducing Admixture oz./sack		-	-	*	*	*	*	*	*	-	*
Crushing Strength psi Minimum	7 Days	2800						4200		2800	
	28 Days	4000						6000		4000	

* Varies with product used

+ Residual air only; add no air entraining admixture

Slump.

(3) The slump of concrete utilized shall be as directed by the Engineer, however, in no case shall the slump exceed 5 inches at point of placement if time limits in Section 9 and water content in Table 1 are not exceeded. Typical slump ranges for various types of construction are shown in Table 2.

TABLE 2-SLUMP LIMITS

Types of Construction	Slumps, Inches	
	Max.	Min.
Reinforced foundation walls and footings	4	2
Unreinforced footings, caissons and substructure walls	3	1
Reinforced slabs, beams walls and columns	4	2
Pavements	4	2
Sidewalks, driveways and slabs on ground	4	2
Heavy mass construction	2	1
Concrete conveyed pneumatically or by pumping	5	3
Tunnel Lining and Sewers	4	2

Cement.

(4) Cement shall be ASTM C150 Type 1 portland cement unless otherwise specified in the Detail Specifications or approved by the Engineer.

Fly Ash.

(5) Fly Ash shall conform to ASTM C-618 Types C, F or N except that carbon content shall not be more than 3% by weight and loss on ignition shall not be more than 6 % by weight. Fly Ash shall be sampled in accordance with ASTM C-311.

Water.

(6) Water used with cement in concrete, mortar, and water used for curing concrete, shall be clean, clear, free from sugar, and shall not contain acid, alkali, salts or organic matter in excess of the following amounts when tested in accordance with AASHTO T 26:

(a) Acidity and Alkalinity

- (1) Acidity-0.1 Normal NaOH 2 ml. Max.*
 - (2) Alkalinity-0.1 Normal HC1 10 ml. Max.*
- * To neutralize 200 ml. sample.

(b) Total Solids

- (1) Organic 0.02% max.
- (2) Inorganic 0.30% max.
- (3) Sulphuric anhydride (SO3) 0.04% max.
- (4) Alkali chloride as sodium chloride (NaCl) 0.10% max.

When standard 1:3 mortar briquettes made with cement, sand and water from the sample are compared with briquettes made with the same cement and sand and distilled water, there shall be no indication of unsoundness, marked change in time of set, or variation of more than 10 per cent in strength.

Water which has been approved by the Illinois Department of Public Health for drinking or ordinary household use may be accepted without being tested. All other sources shall be approved by the Engineer.

The Contractor shall not use water from shallow, muddy, or marshy surfaces. The intake of the pipe line shall be enclosed to exclude silt, mud, grass, and other solid materials, and there shall be a minimum depth of 2 feet of water below the intake at all times.

Admixtures.

(7) All admixtures shall be dispensed volumetrically at the concrete plant. When requested by the Engineer, the Contractor shall furnish the services of a manufacturer's qualified field representative to assure proper use of the admixture.

The maximum water soluble chloride content of the admixture shall be such that, when added to the concrete, the total water soluble chloride content shall not exceed 0.1% by weight of cement.

Air-entraining admixtures shall be MWRD approved and conform to the latest edition of ASTM C-260. The amount of air-entraining admixture used shall be adjusted to accommodate whatever variation there may be in the character of the concrete to provide the required air content.

Chemical admixtures added for the purposes of water reduction, acceleration, retardation or combinations thereof shall conform to the latest edition of ASTM C-494. The Contractor shall submit, when requested by the Engineer, appropriate tests, such as infrared spectrophotometry, pH value and solids content, for establishing the equivalence of the materials to the materials which have passed the District's Admixture Test Program.

The water-reducing admixture shall be used as determined by the manufacturer's recommended quantities per hundred weight of Type 1 cement. No ASTM C-494 Type admixture will be allowed unless it has successfully completed the District's Concrete Admixture Test Program and has been accepted for use by the District. The amount of water-reducing admixture and quantities of other ingredients per cubic yard of concrete are indicated in Table 1, Class of Concrete-Class RA, GB, RAP, S, PA and TA.

No other admixture will be allowed unless otherwise provided for in the Detail Specifications or approved by the Engineer.

Aggregates.

(8) Aggregates shall conform to ASTM C-33, except that the gradations shown in Table 3 shall apply.

TABLE 3
SAND

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8"	100
# 4	94-100
# 16	45- 85
# 50	10- 30
#100	0- 5

3/8-INCH COARSE AGGREGATE

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2"	100
3/8"	85-100
# 4	10- 30
# 8	0- 10
#16	0- 5

1-INCH COARSE AGGREGATE

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2"	100
1"	90-100
1/2"	30- 60
#4	0-10

The fine aggregate shall consist of washed sand. Stone sand will be permitted for portland cement concrete provided it is blended with natural sand in the proportions satisfactory to the Engineer. In no case shall stone sand exceed 60 percent by weight of the total sand.

Coarse aggregate shall be natural crushed stone, gravel or crushed gravel. No blast furnace slag shall be used.

All aggregates shall be chemically compatible with each other and with other components of the concrete mix.

Chert, limonite and shale in the aggregate shall not exceed 2% by weight. Deleterious chert shall be defined as the light weight fraction separated in a 2.35 specific gravity heavy media separation. The aggregate shall have no more than 0.2% of other deleterious materials or substances whose disintegrating is accomplished by an increase in volume which may cause a spalling of the concrete.

If visual inspection indicates that the quality of any load or run of aggregate is outside the limits of the specifications, the Engineer may suspend the use of that load or run of material until laboratory tests verify the quality as acceptable or unacceptable.

Mixing.

(9) Concrete mixed at the jobsite shall be mixed in a batch mixer approved by the Engineer.

The Contractor shall provide a modern and dependable concrete mixing plant of sufficient capacity to produce the maximum output of concrete required to complete the work within the specified time without reducing the minimum mixing time hereafter specified. The mixers shall be of the rotary batch type so made and operated as to insure a uniform distribution throughout the mass, so that the resulting mixture is homogeneous, uniform in color and all coarse aggregate completely covered with mortar. Where cement is delivered in bags, no mixer shall be used that requires less than one bag per batch of concrete.

The mixer shall be equipped with batching equipment to meet the following requirements:

The amounts of cement and of each individual size of aggregate entering into each batch of concrete shall be measured by direct weighing equipment satisfactory to the Engineer. Weighing equipment shall be readily adjustable for compensating for the moisture content of the aggregate or for changing the proportionate batch weights, and shall include a visible dial or equally suitable device which will accurately register the scale load from zero to full capacity. The accuracy of the weighing equipment shall conform to the requirements of the U. S. Bureau of Standards. Cement must be weighed and batched separately from the fine and coarse aggregate and shall be discharged directly from the cement batcher into the charging hopper, conveying car or mixing drum of each unit.

Bulk cement weighing hoppers shall be equipped with vibrators to operate automatically and continuously while the weighing hoppers are being dumped to assure a clean dump of the cement each time into the mixer.

Bulk cement shall not be allowed to contact damp sand at any time for more than one hour, and in the winter time when the sand is hot, for more than 30 minutes before the batch is discharged into the mixer. If winter operations are to continue with heating of the aggregate at the batch plant and the batched material is to be held for long periods of time in the trucks, due either to the length of haul or to occasional breakdowns at the mixer plant, then the Contractor shall use bagged cement entirely instead of using bulk cement until the heating of the aggregate is no longer necessary and there is no longer danger of prehydration of the cement before it is used.

In no case shall the temperature of the concrete be allowed to exceed 90°F.

The amount of water entering each batch of concrete shall be measured either by weight or volume. The equipment shall be capable of measuring the water within a tolerance of one percent plus or minus and shall be equipped with an accurate gauge or dial, reading clearly at all times, either in pounds or gallons.

The water measuring device shall be kept locked and the amounts of water to be used shall be varied only under the direction of the Engineer. During concreting, water shall be admitted to the mixer only through the water measuring device and then only at the time of charging.

Each mixer shall be equipped with a suitable clock or timing device, capable of being locked, for visibly indicating the time of mixing after all the materials, including the water, are in the mixer. The time of mixing shall be dependent upon the results obtained but in no case shall the time, after all materials, including water are in the mixer, be less than 1-1/4 minutes for 1 cubic yard and 15 seconds additional for each additional cubic yard.

The entire contents of the drum shall be discharged before recharging. The volume of mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer.

The use of continuous mixing must be approved by the Engineer. When employed, continuous mixing must be in accordance with ASTM C-685. The mixing equipment specifications and performance data must be submitted to the Engineer for approval. The Engineer may then order such tests as necessary to verify the submitted data.

Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C-94. The ready-mix plant and its facilities must be approved by the Engineer. Plant facilities include the mixing apparatus, proportioning apparatus, storage facilities and provisions for heating and cooling materials. The plant facilities must be of the current state of the art and shall include a printing device to record the actual batch quantities. Also subject to approval by the engineer are the concrete trucks serving the plant. When agitation is accomplished in the truck, the truck must be equipped with a revolution counter. When the truck is equipped with a water reservoir, a water level sight gage must be provided. The mixed concrete shall have an initial air and slump content which will insure that the limits shown in Tables 1 and 2 are met at the point of placement within the following time constraints.

Max. Delivery & Placement Time

Air Temperatures 75 ⁰ F and above	60 min.
Air Temperatures below 75 ⁰ F	90 min.

The above temperatures are the ambient air temperatures at the point at which the concrete is being batched.

The above time limits are the maximum times between concrete batching and concrete placement and shall not be exceeded without the approval of the Engineer. The Engineer may

approve longer time intervals when an MWRD approved retarding admixture is added to the concrete.

The producer of ready-mixed concrete shall furnish a ticket stamped by an approved time clock with the departure time from the plant. This time will be the starting time for the Maximum Delivery and Placement Time shown above. The time tickets shall accompany the truck delivering the concrete and shall be given to the Engineer or his representative upon arrival of the job site.

No truck shall be loaded to excess of its rated capacity.

No materials, including water and admixtures, shall be added to the concrete after leaving the ready-mix plant except with the approval of the Engineer.

Notification of Concrete Pours.

(10) The Contractor shall notify the Project Control office by 12 Noon of the day preceding Saturday or holiday concrete pours and by 3:00 P.M. of the day preceding all other concrete pours. Project Control also must be notified immediately of all concrete pour cancellations or other changes in concrete pour schedules.

Quality Control Laboratory.

(11) A Quality Control Field Laboratory must be provided at each concrete materials yard or concrete batching plant. The laboratory must be heated, air conditioned, lighted and reasonably free from noise. Water and sanitary facilities must be provided. The laboratory shall be equipped with the following:

1. Telephone
2. Desk and chair
3. Complete set of 8" sieves for fine aggregate, sizes 3/8" to #200
4. Motorized shaker for fine aggregate sieves
5. Complete set of large sieves for coarse aggregate, sized 1-1/2 to #4
6. Motorized shaker for large sieves
7. Triple beam balance, 200 gm capacity
8. Sample Splitter
9. Hot plate
10. Platform scale, 100 lb capacity
11. ASTM C-143 slump cone, base, rod
12. Long nose shovel, cleaning brush
13. Assorted pans and pails
14. ASTM C-231 Air Meter

The Contractor shall provide experienced quality control personnel, who are subject to the approval of the Engineer, at the ready mix plant or batch plant.

Placing Concrete.

(12) Concrete shall be deposited as nearly as possible in its final position to avoid rehandling and in the case of walls, in such a manner as to maintain the concrete surface approximately

horizontal. Once started, the placing of concrete in any unit shall be a continuous operation. Should any unavoidable break in the concreting operation occur before the completion of a unit, a construction joint shall be formed at the proper location, either by bulkheading or, in the case of a vertical wall, by leveling off to a horizontal plane. The joint shall be properly keyed and, if required, additional reinforcement bars shall be placed as dowels, as directed by the Engineer, without additional cost to the Water Reclamation District. On resuming work, the procedure hereinafter specified for construction joints shall be followed.

In depositing concrete, care shall be taken to prevent the segregation of concrete materials. If chuting is employed, the chute shall be arranged so as to insure a continuous flow without requiring an increase of water over the amount specified. The point of delivery of the chute, conveyor, tube, or other device, shall not be more than eight feet distant horizontally from the point of final deposit of the concrete.

Concrete placed on sloping surfaces shall be poured from toe of slope to top.

The concrete shall be deposited in approximately equal horizontal layers of 18 to 24 inch and shall not be allowed to drop freely more than 4 ft. or through a cage of reinforcing steel.

Bottom-dump buckets may be used to transport mixed concrete to the desired location. Particular care shall be taken to avoid jarring or bumping which may cause segregation.

Elephant trunks, and/or tremies shall be used in walls and columns to prevent freefall of the concrete and to allow the concrete to be placed through the case of reinforcing steel. They shall be moved at short intervals to prevent stacking of concrete.

Pumping equipment shall be a suitable type with adequate pumping capacity. Loss of slump in pumping shall not exceed 1-1/2 inch.

Concrete conveying equipment shall be designated specifically to place concrete. Conveyor systems shall not impair the strength, slump or air content of the concrete being placed. The placement system must be capable of delivering concrete over the entire placement area without delays or equipment relocation.

Alternate placing equipment shall be immediately available for use in the event that the primary placing equipment fails during a placement. Such equipment shall be able to commence placing operations within 30 minutes notice to avoid cold joints in the structural element being placed. The contractor shall submit the alternate methods or procedure to the Engineer prior to placement of the concrete.

Before commencing operations, all surfaces upon which or against which concrete is to be placed shall be cleaned of all mud and debris. At construction joints special care shall be taken as hereinafter specified. No concrete shall be deposited in water except by permission of the Engineer and then only with such precautions as he may require. In no case shall concrete be

deposited in running water, nor shall water be permitted to flow over freshly deposited concrete.

Sections of walls between joints shall be placed continuously to produce a monolithic unit. At least 48 hours must elapse between casing of adjoining units.

Placing of concrete in beams of slabs, shall not begin until the concrete previously placed in walls or columns has attained initial set.

As soon as possible after placement, all concrete shall be tamped, spaded, or vibrated by the use of internal vibrators until it is thoroughly compacted so as to result in a dense, watertight structure, free from voids and with a smooth surface and so as to work the concrete around reinforcement and inserts and to prevent formation of voids. Forms will contain no pockets which will cause the formation of trapped air.

Where possible, all formed concrete shall be vibrated by the use of internal vibrators. Internal vibrators shall not be allowed to remain in one position in the concrete mix but must be continuously inserted and withdrawn in a brisk manner while adhering to a planned orderly pattern. Each horizontal layer shall be consolidated before another layer is placed. When internal vibrators are used, the vibrator shall extend into the underlying layer to bond the two layers together. To avoid excessive pressure on the forms, the vibrator shall penetrate no more than two feet into the underlying layer. In no case will the internal vibrators be used to move the concrete from one spot to another in lieu of shoveling or other accepted methods of placing concrete. Concrete in walls shall be placed and vibrated in such a way that will not cause an accumulation of water at the top of walls nor drive water ahead of pouring toward an end of a wall. Mechanical high frequency vibrators with a minimum frequency of 7000 revolutions per minute are preferred for consolidation of the concrete within the forms. The concrete shall not be vibrated long enough to cause segregation of the aggregate. The bottom forms for beams, girders and floor slabs shall be covered with a structural grout surface before concrete is placed thereon.

The Contractor shall notify the Engineer in sufficient time before starting the concreting of any unit to permit a thorough inspection of forms and reinforcement steel within three working hours unless otherwise authorized by the Engineer. No concrete shall be poured until such inspection has been made and approval given, and then only in the presence of the Engineer or his representative.

In the construction of sewers and conduits, the Contractor shall concrete the section as soon as it is practicable after the excavation has been made. If, in the opinion of the Engineer, the distance between the face of the heading and the end of the concreted section is excessive or unsafe, the Engineer reserves the right to require the Contractor to stop all tunnel work or open cut excavation and to concrete the section to such an extent as the Engineer may direct. The distance between the face of the heading and the end of the concreted section shall be subject to the approval of the Engineer at all times.

In tunnel construction, concrete shall not be placed by pouring through pipes from the surface of the ground directly into the forms. Pneumatic or mechanical concrete placing equipment shall be used in placing concrete into the forms in tunnel construction.

Bentonite slurry used in conjunction with the jacking method shall be pumped from inside the pipe.

In the use of circular or horse shoe forms in tunnel construction, the concrete shall not be discharged directly over the arch. Each side shall be filled alternately and uniformly before arch concrete is place.

Forms.

(13) The Contractor shall provide suitable forms of either steel, plywood or lumber or other material approved by the Engineer which shall conform to the shapes, lines, and dimensions of the concrete as shown on the plans, provide the desired quality of finished work and give the required degree of safety during construction.

Forms for monolithic concrete sewers and tunnel lining shall be made of steel. The Contractor shall submit the design of all steel forms to the Engineer for approval. The design data shall be scaled and signed by a Structural Engineer licensed in the State of Illinois. However, before approval, the Engineer may direct the Contractor to erect a section of the proposed steel forms either in the shop where fabricated or on the site of the work for inspection. Steel forms shall be neatly and accurately made with all similar parts in each longitudinal section of form interchangeable with other sections. Bent plates required to fit shall be rolled and fabricated to the curves before assembling. Steel forms shall have inspection holes or sizes, types and locations as approved by the Engineer.

Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and width and shall be free from loose knots or other surface defects. Joints in forms shall be horizontal or vertical. Lumber previously used in forms shall be free from warps and defects, shall have all nails withdrawn, and all surfaces to be in contact with concrete shall be smooth and thoroughly cleaned. No lumber shall be allowed to remain in finished concrete.

Forms shall be substantial, unyielding, and sufficiently tight to prevent leakage of mortar. Forms shall be properly braced and tied together so as to maintain position and shape while concrete is being poured. If adequate foundation for shores cannot be secured, trussed supports shall be provided. Form tie holes shall be patched if not used to prevent leakage of concrete.

Bolts and rods shall be used for internal ties, and designed and placed so that when the forms are removed no metal will be within one inch of the surface. All holes left by the ties shall be filled with cement mortar. Wire or band ties will not be used except where their use is permitted by the Engineer. They shall be chipped back, after removal of the forms, to not less than one inch from the surface and the holes filled with cement mortar. Wooden spreaders shall not be used.

Forms shall be set to line and grade and so constructed, fastened, and braced as to produce and maintain true lines. If necessary, measuring devices or reference lines shall be provided by the Contractor. Any bulging of the concrete or distortion from the true lines shall be corrected by the Contractor as the Engineer shall direct without additional cost to the Water Reclamation District.

All lines, grades and dimensions of finished concrete work shall be within the tolerances given in ACI Standard Recommended Practice for Concrete Formwork (ACI 347) except as noted below or otherwise specified.

Tolerances for concrete tunnel lining and cast-in-place conduits:

- a. Departure from established alignment or from established grade at major connecting structures and existing facilities 1/2 in.
- b. Departure from established grade2 in.
- c. Departure from established alignment.....3 in.
- d. Variation from minimum thickness at any point None
- e. Variation from inside dimensions..... 1/2 of 1 per cent

After departure from established alignment and grade, the return shall be at a rate not greater than 3 inches per 100 feet of tunnel or cast-in-place sewer.

The finished surface of topping concrete for bottoms of settling tanks shall not vary more than 1/4 inch from the theoretical surface for circular tanks and not more than 1/8 inch for rectangular tanks.

Suitable mouldings or bevels shall be placed in the angles of forms to round or bevel the corners or edges of the concrete, unless otherwise shown on the plans or directed by the Engineer.

Form surfaces in contact with exposed concrete surfaces shall be smooth and free from any imperfections which would cause objectionable roughness on the finished surface of the concrete. Forms shall be thoroughly cleaned and repaired as necessary before reusing. Before each concrete pour, the inside surface of forms shall be coated with paraffin, non-staining mineral oil, or other approved material, or thoroughly wetted (except in freezing weather). When greasy or oily material is used, it shall be applied in such a way as to avoid contact with the reinforcement steel.

Temporary openings shall be provided in forms where necessary to facilitate cleaning and inspection before placing of concrete.

Temporary openings or portholes in wall or column forms may be used to limit the free-fall of the concrete to less than four feet and shall be so located as to facilitate the placing and consolidation of the concrete. The ports shall be spaced no more than six to eight feet apart to limit the horizontal flow of concrete and to avoid segregation.

In general, forms shall be designed and constructed to fit the requirements of the particular type of work for which they are

intended, and their design and construction as well as their use and reuse shall be subject to the approval of the Engineer at all times.

Forms shall not be disturbed until the concrete has adequately hardened and has developed sufficient strength, as determined by test cylinders made of the same quality concrete and cured under approximately the same conditions of temperature and moisture as the part of the structure in question or in accordance with Section 19. Concrete not subject to appreciable bending or direct stress, not dependent on forms for vertical support, not liable to injury from forms for vertical support, not liable to injury from form removal operations or other construction activities shall have a minimum compressive strength of 500 PSI prior to form removal. Concrete subject to appreciable bending or direct stress and partially dependent on forms for vertical support shall have a minimum compressive strength of 1,000 PSI when subject to dead loads only and 2,000 PSI when subject to dead and live loads prior to form removal. The structural classifications shall in all cases be as determined by the Engineer.

Members subject to additional loads during construction shall be adequately shored to support both the members and construction loads in such a manner as to protect the members from damage by the loads. This shoring shall not be removed until the member has acquired sufficient strength to safely support its weight and any imposed load.

The above is not intended to imply that test cylinders be cast with every pour of concrete. However, a sufficient number of test cylinders shall be made and tested to adequately represent the range of concrete quality under curing conditions prevailing for the work. The Contractor shall be fully responsible for the concrete at all times, and any damage to the work, including any caused by too early removal of forms, shall be repaired or replaced by the Contractor, to the satisfaction of the Engineer without any cost to the Water Reclamation District.

Reinforcement.

(14) Reinforcing bars shall conform to the requirements of ASTM Standard A615. They shall be grade 40 or grade 60, unless otherwise specified. Re-rolled or high carbon steel will not be accepted.

Welded wire fabric shall conform to the "Standard Specifications for Welded Wire Fabric for Concrete Reinforcement," ASTM A185.

All reinforcement shall be inspected and tested at the mill in accordance with the aforesaid specifications.

All reinforcement shall be of clean, new stock, free from defects, rust, grease, dirt, kinks and bends not required by the plans. They shall be straightened and bent prior to placing and only in a manner acceptable to the Engineer and subject to heating only when approved by the Engineer.

Reinforcing bars shall be bent accurately to the lines shown on the plans and in accordance with the requirements of the ACI

Standard Details and Detailing of Concrete Reinforcement (ACI 315). A copy of the latest edition of ACI 315 shall be made available at the job site by the Contractor.

After delivery to the site, the reinforcing bars shall be sorted for size and length and stored in racks or on timbers and covered to protect them from weather in a manner acceptable to the Engineer. When cutting reinforcing steel to length on the job site, heat shall not be used. Reinforcing bars shall not be bent or straightened when partially cast into concrete.

Reinforcing bars shall be placed and fastened in position as shown on the plans and directly by the Engineer, wired together at all contact points with annealed iron 18 gauge wire or fastened with suitable clips, acceptable to the Engineer, sufficiently close together to hold the bars rigidly in position. They shall be supported and accurately held in position by metal bar chairs, spacers or hangers. Bar supports shall be in accordance with the latest version of the CRSI Manual of Standard Practice. A copy of this manual shall be made available at all times on the job site by the Contractor.

Reinforcing bars shall be placed and spaced as specified in ACI 315 latest edition.

Splicing of reinforcement shall be in accordance with ACI 315 latest edition.

The Contractor shall submit for approval of the Engineer, complete bar lists with all bending information, their location and any other information required for their proper placement in the work. The Contractor shall be responsible for the proper fit of all bars within the formwork to suit the concrete outlines shown on the contract plans.

Bars shall not be fabricated until the Engineer has approved all bar lists and bending details.

Construction Joints.

(15) Construction joints shall be made only where shown on the plans or approved by the Engineer. If the Contractor desires to change the location of construction joints or add additional construction joints other than shown on the plans, he shall notify the Engineer sufficiently in advance so that, if the change is approved, the reinforcement steel may be properly detailed. The top and end surface of concrete first poured shall be grooved or stepped as shown on the plans or directed by the Engineer. Before commencing the concreting of an adjoining unit, the surfaces shall be thoroughly cleaned of laitance, dirt and debris. If necessary, in the opinion of the Engineer, the old surface shall be cut back until sound, clean concrete is exposed. On all horizontal or near horizontal joints, a coating of GS or GSA gout shall be spread over the entire joint surface to such a depth as the Engineer may require, not to exceed three inches, before placing the fresh concrete. At vertical joints, special care shall be taken to work the freshly placed concrete to obtain an excess of mortar at the joint. All construction joints shall be thoroughly wetted before placing fresh concrete.

Floor slabs, beams and girders shall be constructed integral with each other and with as few construction joints as practicable. Where construction joints are necessary, they will be permitted only near the middle of the span of slabs, beams or girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be set over a distance equal to twice the width of the beam. The maximum distance between joints in slabs and walls shall be no greater than 50 ft. Adequate provisions shall be made for the shear at joints by the use of inclined reinforcement or stirrups as determined by the Engineer.

All sewer arches shall be placed in one continuous operation and longitudinal construction joints shall not be used in the sewer arch. The invert of the sewer may be poured separately from the arch subject to the approval of the Engineer.

In sewer construction, the construction joint between separate pours shall be formed as a substantial continuous tongue and groove joint around the ring of the sewer, and the full length of all horizontal joints.

Water Stops.

(16) When water stops are required, they shall be extruded from a thermoplastic compound, the basic resin of which shall be polyvinylchloride (PVC), and any additional ingredient materials required to provide a satisfactory water stop. The cross section of the water stop shall be such as to insure anchorage into the concrete by means of enlarged ends and/or fins. All intersections of the water stop consisting of Vertical-L, Vertical-T, and Horizontal-T shall be performed in the factory by the manufacturer of the water stop. Only fusion welded butt-joint splices will be permitted between preformed intersections and straight runs of water stop. All water stops shall be provided with tie holes along the inside of the edge ribs for tying the water stop to the reinforcing steel. In all cases a sample of water stop shall be submitted to the Engineer for approval.

Finished water stops shall comply with U.S. Army Corps of Engineers specification CRD C-572. Finished water stops shall have an ultimate tensile strength of 1950 psi and an ultimate elongation of 350 percent in accordance with A.S.T.M. D412. The material shall have a high resistance to acids and alkalies and exhibit little deterioration under accelerated aging tests. Additional physical properties shall be in compliance with the following requirements:

Stiffness in flexure	-A.S.T.M. D747 750 psi min.
Low Temperature brittleness	-A.S.T.M. 746-35 ⁰ F
Durometer hardness, 15 Sec., Shore A	-A.S.T.M. D2240 70 +5
Specific gravity	-A.S.T.M. D297 1.38 max.
Water absorption (48 hrs.)	-A.S.T.M. D570 0.5%

Synthetic rubber shall be allowed as an alternative to PVC for water/stop material with the approval of the Engineer. When used, synthetic rubber water stops shall be formulated from styrene-butadien synthetic rubber and shall comply with the U.S. Army Corps of Engineers specification CRD-C513.

Parts Set in the Concrete.

(17) The Contractor shall place all reinforcing steel, pipes, castings, manhole steps, necessary pipe sleeves, wall castings, anchor bolts, frames, expansion joints, and other inserts and shall form all openings in walls or floors shown on the plans or that may be required to accommodate piping work or equipment prior to pouring concrete unless otherwise specified. No aluminum shall be embedded in concrete unless coated with a protective coating which has been approved by the Engineer.

When practical, wall castings incorporating orifice or gate assemblies shall be placed as a unit in order to insure proper plumb and alignment.

The sizes and locations of inserts or openings will be the responsibility of the Contractor and shall be as determined by manufacturer's equipment drawings and as required by the work. All inserts will be included for payment under appropriate items of the contract except when otherwise noted.

Surface Finish.

(18) The top surface of all floor slabs, except where otherwise noted, shall be finished with a hard nonslippery surface. To accomplish this, the following procedure is recommended: Screed surfaces thoroughly and accurately; after excess water disappears float with a magnesium or wood float; steel trowel lightly to a smooth even surface; then brush, always in one direction, with a medium stiff long handled hair bristle brush with the proper pressure to give the result desired by the Engineer. The finished surface shall appear with very fine uniform depth hair lines. Any coarse ridging of the surface will not be acceptable.

The tops of walls, beams and walkways shall be accurately screeded, and the remaining surface given a plane, hard, magnesium or wood float finish. The corners of all concrete members shall be chamfered 3/4".

The bottoms of all sewage channels and conduits shall be screeded, floated, and steel trowelled to a smooth hard finish.

Water shall not be allowed to flow over or stand on the invert until 24 hours after placement of concrete.

The finished inverts of all sewers built in open cut or tunnel shall be protected during the entire progress of the work and thoroughly cleaned before final acceptance.

Surfaces for sliding joints to be coated shall be accurately screeded and steel trowelled to a smooth plane surface.

Top surfaces which will not be exposed in the finished work shall be carefully screened to the required grade.

Where expansion joints occur in horizontal surfaces, the concrete shall be neatly edged on both sides of the joint and the cork or other type joint material must be free from any concrete particles.

On all slabs and floors where drainage is indicated on the plans or is required, accurate slopes or pitches shall be produced in the finishing.

The addition of dry cement or a mixture of dry cement and sand to take up excess moisture in finishing will not be permitted. Likewise, sprinkling water over concrete surfaces during finishing operations will not be permitted.

On all faces of concrete, smooth dense surfaces will be required, free from honeycomb, stone pockets or roughness. The edges of all walls and beams shall be neatly beveled or rounded. It is the intention to secure smooth, plane surfaces free from roughness. After the removal of the forms, all fins and protrusions shall be removed flush with the surface.

Where shown on the plans, the bottoms of settling tanks shall be placed in two layers. The lower, or structural layer shall be screeded to the proper grade. Before placing the upper layer all laitance, dirt and other loose and soft particles shall be removed. For circular tanks, the upper layer shall be placed after the settling tank mechanism is erected and adjusted and shall be screeded to shape with the mechanism and steel trowelled to a smooth, hard surface. For rectangular tanks, the upper layer shall be placed after the wearing rails are set and shall be accurately screeded and steel trowelled to a smooth hard finish, with extraordinary care being used to insure a surface finished accurately to grade. The upper layer shall be Class T concrete.

All treads and landings of concrete stairs shall be made non-slippery by applying 0.25 pound of antislip grade silicon carbide size 8-16 grit aggregate on each square foot of surface. After the concrete surface is screeded level, it shall be permitted to stand until firm enough to bear the weight of workman standing on boards and before initial set.

Then, the non-slip aggregate (previously soaked about 10 minutes in water) shall be sprinkled by hand on the concrete surface and immediately floated into the cement finish. Grit shall not be required on stair treads when non-skid nosings are provided or where a separate topping is applied.

Concrete roadways shall be floated and straightedged to a true surface as called for on the plans. If contraction joints are to be sawed into hardened roadway surfaces, the sawing operation shall be accomplished within 24 hours.

Finishing operations shall be such as to require a minimum of manipulation from initial placing to finished surface. The final surface finish may be accomplished by belting brooming or burlap drag as directed by the Engineer.

Curing.

(19) Provision shall be made for maintaining concrete in a moist condition for a period of at least 5 days after placement.

Spray-on type membrane shall conform to specifications for Liquid Membrane-Forming Compounds for curing Concrete (ASTM C-309). Spray-on type shall not be used on construction joints, other surfaces where bond is required nor where surface repairs are to be made. Spray-on membrane shall be pigmented white.

Reusable-blanket type curing membrane shall be Waterproof Curing Paper conforming to specifications for Waterproof Paper for Curing Concrete (ASTM C-171) or Plastic Polyethylene Sheets. The covering shall be held securely in place and shall have vaporproof laps sealed with pressure adhesive tape between adjoining sheets and at edges.

On unformed surfaces, the covering shall be applied immediately after the concrete has set. On formed surfaces, the covering shall be applied immediately after the forms are removed and the surfaces inspected by the Engineer. Where surface repairs are to be made, as hereinafter specified, the surface may be uncovered only for the time necessary to make the repairs.

Whenever necessary in the opinion of the Engineer, all exposed surfaces of concrete shall be constantly kept moist by sprinkling with water at short intervals or by covering with moistened burlap or by such other means as may be approved, until the permanent covering is in place or until, in the opinion of the Engineer, the concrete is sufficiently hardened. No exposed concrete shall be placed during periods of hard rain. Freshly placed concrete shall be protected by canvas during storms, or as directed by the Engineer. Sufficient canvas covering shall be provided and kept ready for this purpose.

The Contractor shall have all necessary equipment for curing in readiness before any concrete is poured and curing provisions shall be applied within one hour from initial set.

Concrete Compression Test Cylinders.

(20) The Water Reclamation District will monitor the quality of the concrete by performing the following tests:

1. ASTM C39 test for compressive strength cylindrical concrete specimens.
2. ASTM C231 test for air content of freshly mixed concrete by the pressure method.
3. ASTM C143 test for slump of portland cement concrete.
4. ASTM C138 test for unit weight and yield of concrete.

District personnel will make four cylindrical test specimens for each concrete pour or for each 150 cubic yards of concrete if

the pour is larger than 150 cubic yards. The test specimens shall be made and cured per ASTM C31. Two specimens of each set of four shall be tested at seven days and the other two at twenty eight days.

All field storage and curing facilities for concrete compressive test specimens shall be provided by the Contractor as the Engineer will direct, and shall be such as will maintain a temperature not less than 60⁰F and a moist air condition at all times.

If test specimens do not acquire the strength as specified in Sections 1 and 2, the Contractor shall make such changes in the materials, proportioning or methods of mixing as may be necessary to attain these strengths.

Grouting Sewers in Tunnels.

(21) The quality of materials shall be as herein before specified. Care shall be used in grouting to prevent damage to utilities or other property near the site of the work. The Contractor shall add at least 10 pounds of fireproof fibrous material per bag of cement to the grout to aid in preventing such damage, if so directed by the Engineer. The pressure used in grouting shall be low enough to prevent distortion of the concrete or masonry.

Whenever grout is not considered sufficient, in the opinion of the Engineer, to properly close up any leak, fill voids or repair other defective work, additional work shall be done by the Contractor to properly correct such defect without additional expense to the Water Reclamation District. Pneumatic or mechanical placing equipment used in placing grout shall be equipped, with adequate pressure gauges.

The Contractor shall stop all leaks through the walls or construction joints of the sewers, manholes or other structures by grouting all voids or by other means approved by the Engineer. All grout mixes for stopping leaks shall be approved by the Engineer and shall be applied by drilling completely through the masonry at the point of leakage and forcing the grout under pressure into all voids in the masonry and between the earth and the masonry until the leaks are completely stopped.

All voids between the concrete and the outside of the excavation in tunnel shall be completely filled with backfill grout (GB) or with concrete or other suitable material as the Engineer may direct.

Grout shall be forced through pipes or holes located in the crown of the sewer every 20 feet, to completely fill all voids between the concrete and the sheeting and between the sheeting and the earth or rock, using such pressure necessary to satisfy the Engineer that the voids have been completely filled, or drilling other grout holes and grouting at additional points.

The requirements for grouting in tunnels shall apply to sewers constructed by the jacking method. Grouting shall be completed immediately after jacking operations are completed.

Defective Work and Patching.

(22) It is an express condition of this contract that if any concrete placed in the work is found defective in quality of materials or in the mixing or the placing of same in the work or due to any other cause, so that it is structurally unsound, or not substantially watertight, as determined by the Engineer, it shall be cut out and removed by the Contractor together with such adjacent sound concrete as the Engineer may determine is necessary in order to obtain a safe, structurally sound and watertight structure. Such concrete so removed shall be replaced with new concrete of the quality herein specified, which shall be deposited and compacted and joined to the remainder of the concrete in a manner acceptable to the Engineer.

Where the Engineer grants permission to patch the defective area, it shall be done in accordance with the following procedure: Permission to patch any such area shall not be considered a waiver of the Engineer's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface.

After removing forms, all concrete surfaces shall be inspected. Any poor joints, voids, stone pockets or other defective areas requiring patching as determined by the Engineer shall be patched. All tie holes shall also be patched. Where necessary, defective areas shall be chipped away to a depth of not less than one inch with the edges perpendicular to the surface. The area to be patched and a space at least six inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts Portland cement and sand, with sufficient water to produce a brushing consistency, shall then be well brushed into the surface, followed immediately by the patching mortar. The patch shall be made of the same material and of approximately the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than one part cement to three parts sand. White portland cement shall be substituted for a part of the gray portland cement to match the color of the surrounding concrete, where directed by the Engineer. The proportion of white and gray cements shall be determined by making a trial patch. The amount of mixing water used shall be as little as possible while being consistent with the requirement of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of one hour during which time it shall be mixed occasionally with a trowel to prevent setting.

The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of one to two hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface. On exposed surfaces where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight-edge spanning the patch and held parallel to the direction of the form marks. All patches shall be cured in accordance with Section 19.

Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall, a plunger type grout gun shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

Where the repair is more extensive and requires concrete, the concrete shall be Class R or Class RA unless otherwise directed by the Engineer.

No payment will be made to the Contractor for the additional work of cutting out or removing defective concrete or correcting defective work as herein specified, or for furnishing and placing new mortar or concrete where the surface of older concrete is removed for the purposes herein specified.

Damaged Work.

(23) Before final acceptance of the work, all defective concrete work and all damaged surfaces, whether such damage has resulted from the action of the elements or from injury from any cause whatsoever, shall be neatly repaired without extra charge therefor to the Water Reclamation District. Any honeycombed surfaces or damaged places where surface repairs are permitted, shall be brought to a smooth, dense, watertight condition to the satisfaction of the Engineer. Broken corners, edges, and tops of walls shall be repaired by first chiseling or bush-hammering to allow a thickness of at least two inches of new material free from thin joining edges, and in such a manner as to anchor and key the

new concrete to the old. The surface of the old material shall then be carefully washed with clean water and cement, suitable forms placed, and specified concrete deposited to conform to the lines of the structure and with the finish required.

Cold Weather Concreting.

(24) Unless the ambient air temperature is at least 40⁰ (4.4⁰C) and rising, water and/or aggregates shall be heated so that the temperature of the concrete, when placed, is not less than 55⁰F (13⁰C). The water shall not be heated above 175⁰F (79.4⁰C) and the sand may be heated to a maximum of only 150⁰F (65.6⁰C). Provisions shall be made for maintaining the concrete at a minimum temperature of not less than 50⁰F (10⁰C) for a period of at least seven days. Form removal shall be governed by the attainment of adequate strength in accordance with Section (13). No concrete shall be placed on or against frozen earth, in frosted forms, or on or against concrete or rock containing frost.

Hot Weather Concreting.

(25) When the ambient temperature is 90⁰F (32⁰C) or above, special precautions shall be taken during mixing, placing, and curing to maintain the quality of the concrete. Aggregate and cement shall be kept cool. A set-retarding admixture may be used in accordance with Section (17).

When necessary to cool the mixing water, the use of nitrogen, refrigeration, or replacing part of the water with shaved or crushed ice will be allowed.

Curing of the concrete shall be started as soon as finishing has been completed and/or the water sheen has disappeared.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO**GENERAL SPECIFICATIONS: ELECTRICAL (GSE)****INDEX**

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GENERAL SPECIFICATIONS ELECTRICAL (GSE)

PART 1 GENERAL

1.01 REQUIREMENTS

- A. These specifications govern the execution of the electrical portions of the contract. The Contractor is responsible for the complete installation of the work.
- B. These specifications are written in the imperative form, are directed to the Contractor, and are the requirements of the Contractor, unless noted otherwise.
- C. The Contractor shall bring any conflict between the Plans, Detail Specifications, or General Specifications to the attention of the Engineer. The Engineer is the sole arbiter of any conflict. The Contractor shall proceed as determined by the Engineer, at no extra cost to the District.
- D. All work is covered by the price specified in the proposal.

1.02 SUMMARY OF WORK

- A. Provide labor, material, and services to install electrical items and ancillary systems.
- B. Install new equipment or relocate existing equipment; provide the necessary power and control wiring and other parts to complete the connections and the installation.
- C. The District may require the Contractor to make minor changes (as determined by the Engineer) in order to install the new work, fit or clear existing work, or accommodate variation in dimensions of structures on site, at no extra cost to the District.
- D. Tests to verify that all work is completely operational and meets specifications and professional standards.
- E. Unless specifically directed otherwise, provide all ancillary work (such as electrical and piping connections) even if not shown or described elsewhere, to ensure proper operation of equipment.

1.03 COORDINATION OF WORK

Coordinate work with all trades working on or near the site.

1.04 SUBMITTALS

- A. Related Work Specified Elsewhere: *General Specifications.*

B. Data for motors smaller than ½ horsepower:

1. Manufacturer.
2. Type of motor and frame number.
3. Horsepower rating and speed.
4. Full-load current at stated voltage.
5. Efficiency at ½, ¾, and full load at maximum rated speed.
6. Motor bearings: Manufacturer, type lubrication requirements, and catalog number.

C. Data for motors ½ horsepower and larger:

1. Same data as for motors smaller than ½ horsepower.
2. Power factor at ½, ¾, and full load.
3. Locked rotor current.
4. Starting torque in foot-pounds.
5. Pull-out torque in foot-pounds.
6. Full-load torque in foot-pounds.
7. Temperature rise in degrees Celsius.
8. Insulation class.
9. Position of grease fittings for lubricated bearings.

1.05 GOVERNING CODES AND STANDARDS

The latest versions of the codes, standards, and recommended practices of the organizations specified in *General Specifications*, govern the design, construction, installation, and testing of all work and materials.

PART 2 EXECUTION

2.01 GENERAL

- A. Install work in accordance with manufacturers' and suppliers' approved product installation procedures.
- B. Where redundant equipment has been provided as a backup to assure operation in the event of shut-down or failure of one component, install primary and redundant equipment with completely independent electrical and process systems.
- C. Noise: Install equipment in compliance with federal, state, and local regulations on noise.
- D. Safety: Provide all permanent structures, equipment, and systems needed for protection of personnel. Safety features shall meet the standards of the American National Standards Institute, the National Safety Council, and the State, District, and local and federal agencies that have jurisdiction for safety standards at the facility site(s).

2.02 CONDUIT BOXES

- A. Related Section: Part 3, Products, Table 2, *Conduit Boxes and Outlet Boxes*.
- B. General Installation:
 - 1. Size boxes for easy pulling, handling, training, and splicing of maximum allowable sizes of cables.
 - 2. Wires and cables installed: Radius of bend to be not less than six times diameter of wire or cable.
- C. Flush-mounted boxes: Provide with trims to cover irregularities on mounting surface (brick, concrete, or plastered walls of slabs).
- D. Surface-mounted boxes:
 - 1. Mount with clearance of at least ½ inch between the box and the adjacent surface.
 - 2. Provide the required clearance using a ½-inch bar spacer: 1" x ½" x 1/8" bar channel or equal as approved by the Engineer.
 - 3. Wood spacers: Not permitted.

2.03 600-VOLT WIRE AND CABLE SYSTEM

- A. Related Section: Part 3, Products, Table 4, *Wire Types and Terminal Lugs*.
- B. General Wire and Cable System:
 - 1. Insulated copper electrical wire, cable, and connections to apparatus, equipment, and material.
 - 2. Conductors: Copper.

2.04 WIRING IDENTIFICATION

- A. Color Coding: Designate by color the wires for ground, main feeders, motor leads, control, and instrumentation in accordance with governing codes and industry standard.
- B. Wire makers:
 - 1. Attach to each end of cable and in pull boxes, where spliced.

- 2. Submit schematics with the number of each wire, and label in the field.
- 3. Verify designations with Engineer.

2.05 WIRING METHODS

- A. Control-Wire Connections between apparatus:
 - 1. One continuous length, unless otherwise approved by the Engineer.
 - 2. Make terminations at terminal blocks.
 - 3. Partial lengths:
 - a. Connect with terminal blocks in junction boxes, unless otherwise approved by the Engineer.
 - b. Indicate wire numbers on terminal block marker strips.
- B. Splicing:
 - 1. Permitted only within junction boxes, manholes, and handholds.
 - 2. Attach markers on each side of splice to designate the use of the wire.
- C. Training wires through conduits:
 - 1. Use approved lubricant for pulling wires or cables.
 - 2. Allow slack so wires can expand and contract.
 - 3. Leave service loop of wire in each junction box or pull box for future use if terminated or spliced.

2.06 INSULATION REQUIREMENTS FOR ABOVE 600 VOLTS

Use next highest standard insulation rating above the voltage used.

2.07 GROUNDING

- A. Ground all electrical equipment and enclosures according to local, state, and national codes.
- B. Bus Bars:
 - 1. Related Section: Part 3, Products, Section 3.02.
 - 2. Installation:

- a. Fastening to steel work and concrete: Insert a non-conductive 1/4"-spacer between bus bars and building steel work and concrete.
 - b. Ground buses that cross expansion joints: Provide expansion connections.
- C. Connecting grounds: Secure connections to electrical material and apparatus with bolts made of copper-silicon alloy, stainless steel, or equal.
- D. Ground Rods:
- 1. Copper-clad steel:
 - a. Minimum diameter: 1 in.
 - b. Minimum length: 10 ft.
 - 2. Installation: Drive down to permanent moisture level to ensure good grounding connection.
 - 3. Spacing:
 - a. Between top of rod and grade: 2 ft min.
 - b. Rods connected in multiple: 10 ft min.
 - 4. Rod Grounding System:
 - a. Link together rods and connecting grounding cable:
 - 1. Connect rods to each other using 4/0 copper grounding cable.
 - 2. Fasten with exothermic weld as provided by Cadweld, Thermoweld, or equal.
 - 3. Do not use bolted clamps.
 - b. Connect rod grounding system to main ground bus: Securely bolt connecting cable, which shall be installed in rigid galvanized conduit, to main ground bus.
 - c. Pack rods and cable with uniform earth.
- E. Motor Frames (above 100 volts):
- 1. Grounding Conductor: Copper terminals.
 - 2. Fasten one end to motors by bolts:
 - a. Tap into motor frame at a location approved by the Engineer.
 - b. Do not use soldered terminals.
 - c. Use washers between bolt heads and terminal lugs.
 - d. Do not attach under head of motor foot bolts.
 - 3. Ground wire: Install in same conduit as feeder cable.

F. Junction Boxes grounded to the nearest station ground bus:

- 1. Junction, pull, or splice boxes containing conductors rated greater than 600 volts.
- 2. Junction boxes for 480-volt systems.

2.08 SWITCHBOARDS AND CONTROL PANELS

A. Related Section: Part 3, Products, Table 4, *Wire Types and Terminal Lugs*.

B. Includes instrumentation panels, lighting panels, and motor control centers.

C. Panel construction: Minimum thickness of 14-gauge Cold Rolled Steel and maximum of 1/4" Hot Rolled Steel.

D. Installation and Wiring:

- 1. Group in small bundles with all conductors parallel.
- 2. Tie bundles at appropriately spaced intervals with insulated cradle clips.
- 3. Install panel wire in horizontal and vertical runs with minimum number of bends, offsets, and cross-overs.
- 4. Support system as directed by the Engineer.
- 5. Run wires continuously from terminal to terminal.
- 6. No T-taping or splicing of wires.
- 7. Provide extra-flexible stranded panel wires for connections between cabinet doors and panels:
 - a. Cable and support wires in two sets of grommet plates.
 - b. Connect to two sets of terminal blocks.
 - c. Install wires on hinged side of cabinet door and on sides of cabinet.
 - d. Provide slack in the wires to open the door through an arc of 180° without tension on the wires.

2.09 INSULATION OF MOTOR CONTROL CENTERS

A. Comply with the instructions of the insulation manufacturer.

B. Horizontal and vertical buses (except at stab locations):

1. Insulate along entire length.
2. Isolate buses from starter compartments: Use plates or baffles.

C. Vertical sections:

1. Vertical wiring trough with hinged door.
2. Isolate from starter compartments.

D. Compartments: Insulate to withstand short circuit capacity of equipment without damaging equipment on adjacent compartments.

2.10 LABELING AND NAMEPLATES

A. Circuit Breaker Panels:

1. Label all power and lighting circuits.
2. Provide a typed directory with protective cover inside door that identifies all circuits.
3. Nomenclature for circuits: Specified by the Engineer.

B. Boxes:

1. Identify with nameplate indicating contract number:
 - a. Inside of box: Mount identification so it is easily visible when the cover is removed.
 - b. Outside on cover: Ground mounting screws or bolts of identification flush with inside of cover.

C. Conduit:

1. Above the conduit entrance, inside each box, identify the designated number of each installed conduit where shown on the Plans:
 - a. Stencil.
 - b. Permanent ink marker covered with a coat of lacquer.
 - c. As approved by Engineer.
2. Identify after conduit installation and before wires are pulled through.

D. Nameplates:

1. Affix to all electrical centers and apparatus: Motor control centers, power centers, substations, cabinet doors and panels, switchboard panels,

apparatus cases, junction boxes 6" x 6" and over, and all electrical apparatus.

2. Affix to control and instrumentation devices: Flow meters, recording meters, probes, trip valves, vent valves, electrically operated valves, supervisory valves.
3. Affix to control switches.
4. Drill and fasten with rust-proof mounting bolts or screws.
5. Finish bolts or screws to match nameplate.
6. Fasten to explosion-proof equipment and enclosures with suitable adhesive rather than with bolts or screws.
7. Sizes
 - a. Minimum thickness of plate: 3/32 in.
 - b. Front edges of plate 1/32-in. bevel.
 - c. Lettering: Minimum height of 1/26 in.
8. Fabrication:
 - a. Material: Laminated phenolic.
 - b. Inner layer: Black
 - c. Outer layer: White
 - d. Polished surfaces on both sides.
 - e. Engraved inscription: Black on white background.
9. Inscription: The Engineer will furnish all details, including size of letters, numerals, and punctuation, after station tests of all material and apparatus have been completed.

2.11 EXPLOSION-PROOF EQUIPMENT

A. Products and equipment for hazardous areas:

1. Explosion-proof lighting fixtures, plug receptacles, and electric cabinets.
2. Designed as intrinsically safe.
3. Explosion-proof fittings:
 - a. Use at expansion joints.
 - b. Use for going through walls, floors, and ceilings between non-hazardous and hazardous areas.
 - c. Where required by applicable code.

B. Motor Control Centers in hazardous areas:

1. Isolate centers from hazardous areas with firewall or other NEC-approved means.

2. Protect other electrical equipment from hazards when explosion-proof enclosures are not practical.

2.12 TESTING

- A. Related Work Specified Elsewhere: *General Specifications*.
- B. Complete Verification Tests for electrical work, material, and apparatus in presence of the Engineer:
 1. Switching and Control Devices: Set, adjust, and check for proper operation isolators, isolating switches, disconnecting devices, contactors, motor starters, control switches, relays, thermostats, push-button stations, circuit breakers, motor starting switches, electrodes, and all other switching and control devices.
 2. Buses, wires, cables, transformers, and motors: Verify proper rotation, phase sequences, connections, and insulation.
 3. Rotating electrical apparatus:
 - a. Check air gaps and clearances between revolving and stationary parts.
 - b. Verify that lubricating devices are in satisfactory operation.
 4. Measure resistance of contact surfaces of bus joints and connections to and on all material and apparatus during factory testing.
 5. Calibrate instruments in the field.
- C. Insulation Resistance Tests for all wires, buses, connections, splices, material, and apparatus:
 1. After installation; before final connections.
 2. Use 1000-volt megohmmeter to test insulation resistance of control and metering wires.
 3. Feeder cables rated above 600 volts:
 - a. Meet latest standards for Hi-Pot Testing of high voltage cable.
 - b. Apply 0.8 times the maximum DC Factory Test Voltage recommended.

PART 3 PRODUCTS

3.01 GENERAL

Related Sections:

1. Part 1: *General, 1.02 Summary of Work.*

2. Part 2: *Execution*

3.02 BUS BARS

- A. Copper only.
- B. Current density: 1000 minimum amperes per square inch of cross-sectional area.

3.03 ELECTRIC MOTORS

- A. Motor Types, Sizes, and Ratings:

1. Type: Energy efficient.
2. Sufficient torque with rated voltage and frequency applied at the motor terminals to provide for proper starting from rest and acceleration to full-load speed of the driven equipment.
3. Furnish and install overload protection for the actual motor nameplate full-load current.
4. Smaller than ½ horsepower:
 - a. Split capacitor type with 115 volts, single phase, 60 Hz rating.
 - b. Operating conditions that demand higher starting torque: Substitute as the Engineer directs.
5. ½ horsepower and larger:
 - a. Squirrel cage induction for full voltage starting.
 - b. 480 volts, 3 phase, 60 Hz operation.
 - c. Totally enclosed; non-ventilated.
6. Manufacturer's nameplate rating 25 horsepower and greater: Furnish with junction box one size larger than required by NEMA.

- B. Motor Starters:

1. Starter units for 3 phase, 60 Hz:
 - a. NEMA size one or greater.
 - b. 3 pole, 3 overloads, combination starter with motor circuit protector.
 - c. Minimum of 4 auxiliary contacts.
 - d. Provide external overload reset.
2. Starter units for single-phase: Manual starter with overload.

3. Control transformers:
 - a. Rating of 100 volt amps in excess of normal load requirements for operating the starter.
 - b. Indicate ratings on shop drawings.

C. Lubrication:

1. Furnish motors with standard Zurk-type fittings.
2. Extend fittings with pipe or tubing to locations approved by Engineer.
3. Lifetime motors $\frac{1}{2}$ horsepower and larger: Provide with grease-lubricated ball bearings except when lubrication is sealed in.

- D. Insulation: Class B insulation for continuous time rating motors.

3.04 *PRODUCT TABLES*

- A. Provide and install the products as specified in Tables 1 through 4.
- B. Substitute products of equal value as noted in Part 2, *Execution*, and approved by the Engineer.

Table 1

CONDUIT

Provide conduit hangers; pull, junction, terminal expansion, and outlet boxes; and appurtenances necessary to complete the installation.

TYPE	INSTALLATION LOCATION	SIZE LIMITS	INSTALLATION REQUIREMENTS (d)
Rigid Galvanized Steel: Hot-dipped process or by applying a metalized zinc coating (a)	<ol style="list-style-type: none"> 1. Exposed or concealed 2. Concrete encasement (b) 3. Direct burial (b) 	Min dia: 3/4" (c)	<ol style="list-style-type: none"> 1. Straight as possible. 2. No more than three 90° bends. 3. No running threads. 4. Water collected: Drains to nearest pullbox.
Rigid Galvanized Steel with PVC Coating	Corrosive areas	Min dia: 3/4" (c)	<ol style="list-style-type: none"> 5. Where conduit enters a new structure below grade: Cast entrance seal in concrete wall.
Electrical Metallic Tubing (Thinwall) (a)	<ol style="list-style-type: none"> 1. Office buildings only, and only when shown on Plans. 2. Never encase in concrete 	Min dia: 3/4" (c)	<ol style="list-style-type: none"> 6. Where conduit enters existing concrete structures below grade: Install entrance seals on the outside and inside surfaces of walls.
PVC Schedule 40	Underground only: <ol style="list-style-type: none"> 3. Concrete encasement (b) 4. Direct burial (b) 	Min dia: 3/4"	<ol style="list-style-type: none"> 7. Interior free from abrasions, projections, and debris. 8. Conduit Fittings: Cast metal with cast-metal gasketed covers, lock-nuts, metal bushings, and caps.
Flexible	<ol style="list-style-type: none"> 1. For connections to motors and other devices where vibration is encountered; watertight. 2. For connections to recessed lighting fixtures when concealed above ceiling. 	Min dia: 3/4" Max length: 6'	<ol style="list-style-type: none"> 9. Bushings: Galvanized or plastic. 10. Couplings, elbows, nipples, and offsets for conduit: Same material and service rating of conduit system in which they are installed.

- (a) Hangers: Galvanized structural steel fastened to mounting surface with galvanized bolts.
- (b) Installed a minimum of 36" below grade, unless otherwise approved by the Engineer.
- (c) For lighting fixture drops: 1/2" diameter minimum.
- (d) Conduit shall not be installed within slab unless specifically shown on Plans or approved by the Engineer.

Table 2
CONDUIT BOXES AND OUTLET BOXES

*All boxes installed outdoors or below grade shall be NEMA 4;
All other boxes shall be NEMA 12.*

SIZES	MATERIAL (minimum thickness)	REQUIREMENTS	COVER REQUIREMENTS
24" x 24" x 6" and smaller	<ol style="list-style-type: none"> 1. No. 16 gauge sheet steel for NEMA 12 only 2. Cast metal for NEMA 4 	<ol style="list-style-type: none"> 1. Watertight conduit entrances. 2. Extension rings: Installation not permitted. 	<ol style="list-style-type: none"> 1. Easily removed for maintenance and inspection. 2. Sheet steel: No. 14 gauge minimum thickness.
Larger than 24" x 24" x 6" to 36" x 24" x 6"	No. 14 gauge sheet steel	<ol style="list-style-type: none"> 3. Provide with removable covers for access to box for pulling, training, and splicing of wires. 	<ol style="list-style-type: none"> 3. Will not bulge or warp. 4. Fasten with copper silicon or stainless steel bolts or screws.
Larger than 36" x 24" x 6" to 36" x 36" x 12"	No. 12 gauge sheet steel	<ol style="list-style-type: none"> 4. Drainage: Provide drain openings in bottoms and sides of boxes if conduits are installed to drain into boxes. 5. Framework: Use structural steel members to provide rigid frame for boxes 36" x 36" x 18" and larger. 	<ol style="list-style-type: none"> 5. 12" x 12" x 4" and larger: Fasten with non-corroding captive screws. 6. Covers weighing more than 20 lbs: Provide with two cast or pressed steel handles.
Larger than 36" x 36" x 12"	No. 10 gauge sheet steel	<ol style="list-style-type: none"> 6. Explosion-proof boxes: Cast metal. 7. Minimum depth of 2.5" for all boxes. 	

Table 3

**SPACING OF SUPPORTS:
EXPOSED RIGID CONDUIT (a)**

NOMINAL SIZE OF CONDUIT (Inches)	NUMBER OF CONDUITS	MAXIMUM SPACING OF SUPPORT (Feet)	
		Horizontal	Vertical
¾	1 or 2	7	7
	3 or more	5	
1 and 1 ¼	1 or 2	10	8
	3 or more	6	
1 ½ and larger	1 or 2	10	10
	3 or more	6	

- (a) Conduits installed along wall or ceilings:
1. Clearance: Not less than ½" between conduit and mounting surface.
 2. Spacer: 1" x ½" x 1/8" bar channel; or ½" Unistrut, Kindorf, or equal.

Table 4

WIRE TYPES AND TERMINAL LUGS

TYPE	SIZE	REQUIREMENTS
Power Wire	No. 6 AWG and smaller	Stranded type THHN/THWN
	No. 4 AWG and larger	Stranded type XHHW
Control Wire	No. 14 AWG or larger	Stranded type THHN/THWN
Lighting Wire	No. 12 AWG	Solid single conductor type THHN/THWN
Panel Wire	No. 14 AWG/7 strand type	SIS switchboard wire, 90 degrees C, 600 volts
Terminal Lugs (b)	Ends of wires smaller than No. 4 AWG	One-hole, solderless, pressure type, copper
	Ends of wires larger than No. 4 AWG	One-hole, compression type, copper, insulation sealing collars

- (b)
1. Open-spade type not permitted.
 2. Not required for equipment with screw compression terminations, such as molded-case air circuit breakers.
 3. Insulate for dielectric strength 2.5 times normal potential of the circuit when the spacing between studs on apparatus is small enough that lugs can touch each other if they turn.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

GENERAL SPECIFICATIONS - LANDSCAPING (GSL)

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PART 1 INTRODUCTION

1.01 INTENT OF SPECIFICATIONS

It is the intent of the Metropolitan Water Reclamation District of Greater Chicago (District) to have high quality plant materials furnished, planted and maintained in accordance with the best and latest industry codes, standards and recommended practices, as defined by:

- A. United States Department of Labor Occupational Safety and Health Administration (OSHA)
- B. American Association of Nurserymen
- C. American Standard for Nursery Stock
- D. American National Standards Institute Inc. (ANSI)
- E. American Society for Testing and Materials (ASTM)
- F. American Society of Landscape Architects (ASLA)

The Contractor shall furnish and establish plant materials and provide landscape maintenance services in accordance with the following “General Specifications Landscaping” for any landscaping work in the Contract. The General Specifications Landscaping are designed to complement the Detail Specifications and Contract Drawings.

1.02 COORDINATION OF WORK

The Contractor shall coordinate all trades in the establishment of the plant materials and, if directed by the Engineer, prepare coordination drawings for approval of the Engineer.

On-site landscape work shall not be initiated until the final grades have been established with subsoil and topsoil as specified and the site has been approved by the Engineer.

PART 2 WOODY PLANT MATERIALS

2.01 GENERAL

- A. This work includes, but is not limited to, the following:
 - 1. Digging and preparing plant holes.
 - 2. Furnishing, transporting, temporary storage and planting any replacement plant materials.
 - 3. Planting and establishing all plant materials.
 - 4. Mulching and wrapping of plant materials.

- 5. Caring of all plant materials
- 6. Replacing of Unsatisfactory plant materials.
- 7. General site clean-up.

- B. Related work specified elsewhere within “General Specifications Landscaping” includes:

- 1. Perennial Materials (See part 3).
- 2. Restoration and New Seeding (See Part 4).
- 3. Woody Plant Materials Transplanting (See Part 5).
- 4. Protection of Existing Plant Materials (See Part 6).
- 5. Protection, Restoration and Clean-up (See Part 7).
- 6. Hillmass Construction and Final Grades (See Part 8).
- 7. Woody Plant Materials Transplanting for Purchase Requisition (See Part 9).

2.02 QUALITY ASSURANCE

Reference Standards: All nursery stock shall conform with the current “American Standards for Nursery Stock” ANSI Z60.1 adopted by the American Association of Nurserymen in every respect including:

- 1. Height
- 2. Caliper.
- 3. Branching.
- 4. Size.
- 5. Grade.
- 6. Root spread.
- 7. Ball depth and width.

2.03 SUBMITTALS

- A. Samples: Submit the following to the Engineer for approval:
 - 1. One cubic foot of mulch material.
 - 2. One 3’ length of tree wrapping material.
 - 3. One 3’ length of tie cord for tree wrapping.
 - 4. One cubic foot of plant soil mixture.
- B. Certificates: Submit the following to the Engineer.:

1. A state inspection certificate from the supplying nursery for all plant materials.
2. Certification that all plant materials conform to the American national Standards Institute published by the American Association of Nurserymen.
3. Certification as to the nursery where the plant materials were growing prior to being dug for delivery.
4. Certification by invoice number as to the date all plant materials in each shipment were dug.
5. Certification that the equipment used was of the proper type, size, capacity or condition to do the work.
6. Invoices of each shipment of plant materials.
7. Invoice showing the quality and kind of mulch materials delivered to the site.

2.04 JOB CONDITIONS

- A. Environment: Planting shall be performed only when weather and soil conditions are favorable for such operations. Operations will be suspended or postponed whenever conditions are unfavorable for such work, as determined by the Engineer.
- B. Equipment: Equipment of a type, size, capacity or condition unsuited for obtaining first-class work and expedition of the job shall be replaced with proper equipment as determined by the Engineer. Limits of the operation shall be restricted to areas designated by the Engineer.

2.05 PRODUCTS

1. PLANT MATERIALS LIST

Plant Materials: All plant materials shall be furnished in the sizes and quantities specified on the list and installed at locations shown on the Plans or at other locations as directed by the Engineer.

(SAMPLE LIST) SHADE TREES (All Balled and Burlapped)	
<u>BOTANICAL NAME</u>	<u>2"-3"</u> <u>COMMON NAME</u>
Acer Platanoides "Emerald Queen"	Emerald Queen Norway Maple
Acer Platanoides "Schwedleri"	Schwedler Norway Maple
Acer Rukbkrum "Armstrong"	Armstrong Red Maple
Acer Rubrum "Red Sunset"	Red Sunset Red Maple
Acer Rubrum X. Acer Saccharinum "Autumn Blaze"	Autumn Blaze Red Maple
Acer Saccharinum	Silver Maple
Acer Saccharum	Sugar Maple
Aesculus Glabra	Ohio Buckeye
Alnus Glutinossa	European Black Alder
Betula Nigra	River Birch
Celtis Occidentalis	Common Hackberry
Fraxinus Americana	White Ash
Fraxinus American "Autumn Purple"	Autumn Purple Ash
Fraxinus Pennsylvanica Lanceolata	Green Ash
Fraxinus Pennsylvanica Lanceolata "Marshall's Seedless"	Marshall's Seedless Green Ash
Fraxinus Pennsylvanica Lanceolata "Summit"	Summit Ash
Gleditsia Tria. In. "Shademaster"	Shademaster Honeylocust
Gleditsia Tria. In. "Skyline"	Skyline Honeylocust
Gleditsia Tria. In. "Green Glory"	Green Glory Honeylocust
Gymnocladus Diocus	Kentucky Coffeetree
Pyrus Callleryana "Bradford"	Bradford Pear
Quercus Palustris	Pin Oak
Tilia Americana	American Linden
Tilia Cordata "Greenspire"	Greenspire Linden
Tilia Euchora "Redmond"	Redmond Linden

(SAMPLE LIST)	
ORNAMENTAL TREES	
(All Balled and Burlapped)	
5'-6'	
<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>
Acer Ginnala	Amur Maple
Acer Campestre	Hedge Maple
Amelanchier Arborea	Down Serviceberry
Amelanchier Canadensis	Shodblow Serviceberry
Amelanchier Grandiflora	Grandiflora Serviceberry
Cercis Canadensis	Eastern Redbud
Cornus Alternifolia	Pagoda Dogwood
Crataegus Crusgalli	Cockspur Hawthorn
Crataegus Viridis "Winter King"	Winter King Hawthorn
Magnolia Soulangeana	Saucer Magnolia
Malus Atrosanguinea	Carmine Flowering Crabapple
Malus "Beverly"	Beverly Flowering Crabapple
Malus "Coralburst"	Coralburst Flowering Crab
Malus "Donald Wyman"	Donald Wyman Flowering Crab
Malus "Dobloons"	Dobloons Flowering Crab
Malus Floribunda	Japanese Flowering Crabapple
Malus "Indian Magic"	Indian Magic Flowering Crab
Malus "Liset"	Liset Flowering Crab
Malus "Prairie Fire"	Prairie Fire Flowering Crab
Malus "Profusion"	Profusion Flowering Crabapple
Malus "Red Jewel"	Red Jewel Flowering Crabapple
Malus "Red Splendor"	Red Splendor Flowering Crabap.
Malus Sargentii	Sargent Flowering Crabapple
Malus "Selkirk"	Selkirk Flowering Crabapple
Malus "Snowdrift"	Snowdrift Flowering Crab
Malus Zumi Calocarpa	Redbud Flowering Crabapple
Prunus Americana	Common American Plum
Prunus Virginiana "Shubert"	Shubert Chokecherry
Syringa Reticulata	Japanese Tree Lilac

(SAMPLE LIST)	
SHRUBS	
(All Balled and Burlapped)	
18"-24"	
<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>
Berberis Thunbergii	Japanese Barberry
Berberis Thunbergii Atropurpurea	Redleaf Japanese Barberry
Cotoneaster Apiculata	Cranberry Cotoneaster
Lonicera Xylosteum "Claveyi"	Clavey's Dwarf Honeysuckle
Lonicera Xylosteum "Emerald Mound"	Emerald Mound Honeysuckle
Myrica Pennsylvanica	Northern Bayberry
Potentilla Fruticosa "Gold Drop"	Gold Drop Potentilla
Potentilla Fruticosa "Gold Finger"	Gold Finger Potentilla
Potentilla Fruticosa "Jackmanni"	Jackman's Potentilla
Potentilla Fruticosa "Katherine Dykes"	Katherine Dykes Potentilla
Prunus Glandulolsa "Rosea"	Pink Dwarf Flowering Almond
Rhus Aromatica "Gro-Low"	Low Growing Sumac

(SAMPLE LIST)
SHRUBS
(All Balled and Burlapped)

18"-24"

BOTANICAL NAME

Rosa Rugosa
 Spirea Bulmalda "Anthony Waterer"
 Spirea Bulmalda "Froebeli"
 Spirea Japonica "Alpine"
 Spirea Japonica "Shirobana"
 Spirea Nipponica "Snowmound"
 Stephanandra Incisa "Crispa"
 Symphoricarpos Orbiculatus
 Syringa Meyeri "Palibin"
 Syringa Patula "Miss Kim"

COMMON NAME

Rugosa Rose
 Anthony Waterer Spirea
 Froebel Spirea
 Alpine Japanese Spirea
 Shirobana Japanese Spirea
 Snowmound Spirea
 Cutleaf Stephanandra
 Indian Currant
 Dwarf Korean Lilac
 Miss Kim Lilac

24"-30"

BOTANICAL NAME

Aronia Melanocarpa
 Berberis Thunbergii
 Berberis Thunbergii Atropurpurea
 Chaenomeles Japonica "Texas Scarlet"

COMMON NAME

Black Chokeberry
 Japanese Barberry
 Redleaf Japanese Barberry
 Texas Scarlett Flowering
 Quince
 Cranberry Cotoneaster
 Annabelle Hydrangea
 Peegee Hydrangea
 Tardiva Hydrangea
 Kalm St. Johnswort
 Common Winterberry
 Clavey's Dwarf Honeysuckle
 Emerald Mound Honeysuckle
 Northern Bayberry
 Pink Dwarf Flowering Almond
 Fragrant Sumac
 Meadow Rose
 Rugosa Rose
 Prairie Rose
 Anthony Waterer Spirea
 Froebel Spirea
 Alpine Japanese Spiera
 Shirobana Japanese Spirea
 Snowmound Spirea
 Vanhouttee Spirea
 Indian Currant
 Miss Kim Lilac
 Burkwood Vibumum
 Koreanspice Vibumum
 Doublefile Vibumum

Cotoneaster Apiculata
 Hydrangea Arborescens "Annabelle"
 Hydrangea Paniculata "Grandiflora"
 Hydrangea Paniculata Tardivum
 Hypericum Kalmianum
 Ilex Verticillata
 Lonicera Xylosteum "Claveyi"
 Lonicera Xylosteum "Emerald Mound"
 Myrica Pennsylvanica
 Prunus Glandulosa "Rosea"
 Rhus Aromatica
 Rosa Blanda
 Rosea Rugosa
 Rosa Setigera
 Spirea Bulmalda "Anthony Waterer"
 Spiera Bulmalda "Froebeli"
 Spirea Japonica "Alpine"
 Spirea Japonica "Shirobana"
 Spirea Nipponica "Snowmound"
 Spirea Vanhouttei
 Symphoricarpos Orbicullatus
 Syringa Patula "Miss Kim"
 Viburnum Burkwoodii
 Vibumum Carlesii
 Vibumum Plicatum Tomentosum

2'-3'

BOTANICAL NAME

Aronia Melanocarpa
 Chaenomeles Japonica "Texas Scarlet"
 Cotoneaster Multiflora
 Euonymus Alatus
 Euonymus Alatus "Compacta"

COMMON NAME

Black Chokeberry
 Texas Scarlet Flowering Quince
 Many Flowered Cotoneaster
 Winged Euonymus
 Dwarf Winged Euonymus

(SAMPLE LIST)		
SHRUBS		
(All Balled and Burlapped)		
<u>2'-3'</u>		
<u>BOTANICAL NAME</u>		<u>COMMON NAME</u>
Forsythia Intermedia (Meadowlark)		Meadowlark Forsythia
Forsythia Intermedia (Spring Glory)		Spring Glory Forsythia
Hamelis Vernnalis		Vernal Witchhazel
Hydrangea Paniculata "Grandiflora"		Peegee Hydrangea
Hydrangea Paniculata "Tardivum"		Tardiva Hydrangea
Hydpericum Kalmiamnum		Kalm St. Johnswort
Ilex Verticillata		Common Winterberry
Lonicera Xylosteum "Claveyi"		Clavey's Dwarf Honeysuckle
Lonicera Xylosteum "Emeral Mound"		Emerald Mound Honeysuckle
Myrica Pennsylvanica		Northern Bayberry
Prunus Glanddddullosa "Rosea"		Pink Dwarf Flowering Almond
Prunus Cistena		Purpleleaf Cistina Plum
Prunus Trilola		Flowering Plum
Rhus Aromatica		Fragrant Sumac
Rhus Tykphina		Staghorn Sumac
Rose Blanda		Meadow Rose
Rosa Rugosa		Rugosa Rose
Rosa Setigera		Prairie Rose
Spirea Vanhouttei		Vanhoutee Spirea
Symphoricarpos Orbiculatus		Indian Currant
Syringa Chinennsis		Chinese Lilac
Syringa Prestoniae "James MacFarllane"		James MacFarlane Lilac
Syringa Vulgaris		French Lilac
Vibumum Burkwoodii		Burkwood Vibumum
Vibumum Carlesii		Koreaspice Vibumum
Vibumum Dentatum		Arrowwood Vibumum
Vibumum Lantana		Wayfaring Vibumum
Vibumum Lentago		Nannyberry Vibumum
Vibumum Opulus		European Cranberrybush
Vibumum Plicatum Tomentosum		Doublefile Vibumum
Vibumum Prunifolium		Blackhaw Vibumum
Vibumum Siebildi		Siebold Vibumum
Vibumum Trilobum		American Cranberrybush
Weigela Florida "Pink Princess"		Pink Princess Weigela
Weigela Florida "Vanicek"		Vanicek Wwigela
(SAMPLE LIST)		
EVERGREENS		
(All Balled and Burlapped)		
<u>3'-4'</u>		
<u>BOTANICAL NAME</u>		<u>COMMON NAME</u>
Thuja Occidentalis "Wareana"		Siberian Arborvitae
Thuja Occidentalis "Woodwardii"		Woodward Arborvitae
<u>4'-5'</u>		
<u>BOTANICAL NAME</u>		<u>COMMON NAME</u>
Thuja Occidentalis "Techny"		Mission Arborvitae
Pinus Mugho "Mugho Pine"		Mugho Pine
Pinus Sylvestris "Scotch Pine"		Scotch Pine

(SAMPLE LIST) EVERGREENS (All Balled and Burlapped)	
<u>5'-6'</u>	
<u>BOTANICAL NAME</u> Juniperus Chinensis "Fairview" Picea Glauca Densata "Black Hills Spruce" Picea Punngens "Colorado Blue Spruce" Pinus Nigra "Austrian Pine"	<u>COMMON NAME</u> Fairview Juniper Black Hills Spruce Colorado Blue Spruce Austrain Pine
(SAMPLE LIST) GROUND COVER	
	(1-Gallon Container)
<u>BOTANICAL NAME</u> Euonymus Fortunei "Coloratus"	<u>COMMON NAME</u> Purpleleaf Wintercreeper
(SAMPLE LIST) FLOWERS	
	<u>(2' Plus)</u>
<u>BOTANICAL NAME</u> Achillea Filipendulina "Coronations Gold" Achillea Millefolium "Rosea" Aegopodium Podagraria "Variegatum" Astilbe Fannal Astilbe Pulmila Chkrysanthemum X Xuperbum Chrysanthemum Leuchatemum Coreopsis "Baby Sun" Gaillardia X Grandiflora "Goblin" Hosta "Royal Standard" Sedum Telephium "Indian Chief" Stachys Byzantina	<u>COMMON NAME</u> Yarrow Rosy Yarrow Bishop's Weed Red Astilbe Creeping Purple Astilbe Shasta Daisy Oxeye Daisy Coreopsis Dwarf Fiesta Daisy Royal Standard Hosta Live Forever Sedum Lamb's Ears
(SAMPLE LIST) BULBS	
	<u>(Large Size DN II)</u>
<u>BOTANICAL NAME</u> Daffodil "Dutch Master"	<u>COMMON NAME</u> Trumpet Daffodil

2. COST OF NEW AND REPLACEMENT PLANT MATERIALS

The Contractor and the District agree that the cost of new and replacement plant materials not planted shall be deducted from the Contractor's payment, all as determined by the Engineer, based on the latest average wholesale prices from acceptable nurseries at the time plant materials are being installed, all in accordance with these specifications, including installation costs. The costs are assumed to include the following:

1. Providing new and replacement plant materials.
2. Transportation of new and replacement plant materials to the site.
3. Site preparation for planting.
4. Planting operations in accordance with these specifications.
5. Removing any unacceptable plant materials and disposing them off site.

3. NURSERY STOCK REQUIREMENTS

- A. General: Plants shall be nursery grown, good landscape quality and have a shape and habit of growth that is normal for the species. All plants shall be grown under climatic and soil conditions similar to the planting site. Any woody plant materials grown in predominantly sandy soils shall be unacceptable as Balled and Burlapped stock. All nursery stock shall be measured before pruning, with branches in normal position. All plants shall have broad, dense heads of foliage when in leaf, and be densely branched specimens characteristic to the species, diseases, sun scald, knots, stubs or other object able disfigurement. Thin, weal plants shall not be accepted. Plants must shown appearance of normal health and vigor in strict accordance with these specifications.
- B. Shade Trees: Shade trees shall be free of branches (under-trimmed) not higher from the ground line than one-half the total height of the tree; shall have single leaders; be well-branched and with reasonably straight stems. This requirement shall cover general species, but some varieties, which have other characteristics of growth will be accepted.
- C. Ornamental Trees and Shrubs: all ornamental trees and shrubs shall be branched and foliated to the ground.
- D. Nomenclature: Plants shall be true to their name as specified.
- E. Source: The southernmost limits for the source of plant materials shall be one sub-zone south of the site of the work. Plant Hardiness Zones shall be as designated in the current Miscellaneous Publication No. 1475, Agricultural Research Service, USDA.

4. SIZES AND MEASUREMENTS

- A. Diameter: Shade Trees up to 4-inch diameter size shall be measured for diameter 6 inches above the ground line and 12 inches above the ground for larger tree sizes.
- B. Root System: The root system of all plants shall be sufficient to ensure plant growth.
- C. Balled and Burlapped Plants: Balled and Burlapped plants shall be dug with a sufficient quantity of earth taken equally on all sides and bottoms of the plants to include the necessary roots to ensure growth. The balls shall be prepared in a workmanlike manner and firmly bound. Where infrequent root pruning or transplanting in the nurseries have caused roots greater than 1/2" in thickness to extend beyond the recommended ball diameter, the ball diameter must be increased so that no roots greater than 1/2" in thickness, except tap roots, are cut.
- D. Bare Root Trees: All bare root trees shall have a heavy fibrous root system that has been developed by proper root pruning and transplanting. All trees shall have been transplanted not less than two (2) times; no callipered lining out stock shall be accepted.
- E. Bare Root Shrubs: All bare root shrubs shall be of (Balled and Burlapped) quality with a fully branched top and have a mature fibrous root system.
- F. Container Grown Plants: Container grown plants shall be well-rooted and established in the container in which they are growing. They shall be grown in the container for a sufficient length of time for the root system to hold the earth when taken from the container but not long enough to become pot bound. The size of the containers shall be not less than 75 percent of the ball sizes for comparable Balled and Burlapped plant materials. Containers shall be stable and not deteriorated to a degree which will cause breaking up of the root ball during the planting operations.
- G. Collected Stock: when collected plants are specified, the spread of roots, bare root, shall be one-third greater than the spread of roots, bare root nursery grown. If collected material is moved as Balled and burlapped, the minimum ball sizes shall be equal to those specified for the next larger size nursery grown stock, Balled and Burlapped.
- H. Oversized Plants: Plants larger than specified in the plant list may be used, if approved by the Engineer, but use of such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots and root ball shall be increased in proportion to the size of the plant.
- I. Size Range: Where a size range is specified, stock furnished shall be interpreted to mean that no less than 50% shall be of the maximum size specified within each range.

- J. Substitutions: When plants of kinds or sizes specified are not available for planting, substitutions may be made upon written request by the Contractor for approval by the Engineer. Plant substitutions must be the same genus and hardiness as specified, and of equal cost.

5. **INSPECTION AND APPROVAL OF NURSERY STOCK**

- A. Inspection: Inspection of the trees and shrubs to be furnished will be made at the nursery by the Engineer and must be in the field of then nursery supplying the planting materials. All stock furnished shall be inspected and tagged with District numbered tags by the Engineer in the growing nurseries prior to digging.
- B. Tagging: It is the Contractor's responsibility to locate all plant materials prior tagging by the Engineer for the first time. If re-tagging is required upon request by the Contractor, the Engineer shall determine the cost expended for time and distance traveled, which will be deducted from the Contractor's payments. Selecting and tagging for the Fall Planting Season shall be done no sooner than August 15th and no later than November 20th. Selecting and tagging for the Spring planting season shall be done no sooner than February 15th and no later than may 20th. The Contractor shall notify the Engineer in writing no less than two weeks before, for scheduling the selection and tagging.
- C. Approval: Plants shall be subject to inspection and approval at the place of growth and upon delivery for conformity to specification requirements as to quality, size and variety. Such approval shall not impair the right of inspection upon delivery at the site or during the progress of the work or right of rejection due to damage suffered in handling or transportation.
- D. Final Acceptance: Approval of plant material shall not be construed as an acceptance of it. Final acceptance will not be made until the plant material is determined to be in a healthy growing condition at the end of the establishment period.
- E. Inspection Certificate: All plant material, including collected stock, shall comply with the State and Federal laws with respect to inspection for plant diseases and insect infestation. An inspection certificate required by law to this effect shall accompany each shipment and on arrival, the certificate shall be filed with the Engineer.

6. **MISCELLANEOUS PLANTING MATERIALS**

- A. Planting Soil: The planting soil shall be 8 parts by volume of topsoil (2 parts by volume of blended mushroom compost as processed by GSO America, Crystal Lake, IL 60014, or an approved equal) and 5 lbs. of bone meal/cy of mix. Certification by the supplier is required.
 - 1. Topsoil: Topsoil shall be natural, fertile, friable soil possessing the characteristics of rich productive

soils in the Chicago area. Topsoil shall be without admixture of subsoil and shall be clean, free from clay lumps, weed seeds, roots, stones, stumps, or similar substances, debris or other objects which are a hindrance to planting or care operations.

- 2. Mushroom Compost: Compost shall be a mixture of horse manure, straw, peatmoss and fertilizer. It shall have been composted, used for mushroom growing, sterilized, and then aged as a finished organic compost. It shall be free of foreign matter and harmful chemicals.
 - 3. Bone Meal: Bone meal shall be finely ground and steamed.
- B. Tree Wrapping Materials:
- 1. Wrapping Paper: The tree wrapping material shall be burlap, heavy crepe paper or commercially available tree wrapping paper. Wrapping paper shall be first quality, not less than 4" nor more than 8" in width. Burlap shall be at least eight-ounce burlap.
 - 2. Wrapping Cord: Cord shall be jute twine not less than two-ply. All ties or fasteners shall be of natural and decomposable material.
- C. Mulch Material: The mulch material for planting shall be approved by the Engineer. It shall be uniformly graded and have the ability to completely block sunlight from reaching the surface of the soil. Mulch shall be from hard wood (tree back nuggets); minimum chip size shall be 1/2"; maximum chip size shall be 1 1/2"; or shall be hardwood shredded bark, double processed. All mulch shall be clean with no "debris" or "fines" (as processed by GSO America, Crystal Lake,, IL 60014, or an approved equal). Certification by the supplier is required.
- D. Soil Amendments: At planting time, the roots of all trees and shrubs shall be treated with "Roots TM Dry Formula" as manufactured by Roots TM Inc., a Division of Las Products Corp., New Haven, CT 06511, or an approved equal. The rates of application shall be as follows: shade and ornamental trees – 1 lb./cal. inch of tree; shrubs – 1/2 lb./shrub.
- E. Bracing: Tree guying and staking will only be required when necessary to ensure the proper upright position of the tree. It shall be appropriate to the plant and site conditions. Bracing materials shall be approved by the Engineer prior to installation.

2.06 **EXECUTION**

1. **PLANTING TIME**

- A. Plant Conditions: Regardless of calendar date, plants must be dormant at the time of digging and when they arrive at the site of the work or storage site.

- B. Weather Conditions: Planting operations shall be conducted under favorable weather conditions during the planting seasons which are normal for such work as determined by accepted practice in the Chicago area.
- C. Spring Operations: The Spring planting operations will start as soon as weather conditions are such that the plants can be dug and moved, and shall extend to May 30.
- D. Fall Operations: The Fall planting season will begin about September 30 and extend to November 30, but after the plant has become dormant and before the soil is frozen. Evergreens may be planted August 15 through October 1.
- E. Bare Root Planting: All bare root plant material shall be planted in the spring. It shall be planted only when the temperature exceeds 35°F. Planting shall terminate on May 15. Fall bare root planting shall be allowed only with written approval of the Engineer.
- F. Restrictions: Planting shall not be made in frozen ground; holes shall not be dug in frozen ground and frozen backfill material shall not be used.
- G. Extensions: The Contractor may request in writing an extension of the planting season. Extensions, if allowed will contain additional conditions and must be requested in writing at least two weeks prior to the close of the planting season.

2. DIGGING PLANTS

- A. Notifications: The Contractor shall notify the Engineer not less than seventy-two hours in advance of the digging of any plant material in the nursery.
- B. Digging Time: Plants shall not be dug until the Contractor is ready to transport them from their original locations to the site of the work or approved storage.
- C. Digging Care: All stock shall be dug with care, avoiding injury to the plants or loss of damage to the roots, particular attention being given to the fibrous roots. Immediately after digging, roots shall be protected against drying out and freezing.
- D. Balled and Burlapped: Balled and burlapped plants shall be dug with compact, natural balls of soil firmly wrapped with burlap and securely tied with twine or rope, or secured by other approved means. Synthetic twine or cord will not be accepted. Each ball shall be of sufficient width and depth to encompass the fibrous and feeding roots necessary to ensure full recovery and development of the plant. Earth balls shall be watered and protected against drying out or freezing.
- E. Bare Root: Bare root plants shall be dug only when air temperatures exceed 35 degrees F.

- F. Container Grown: Container grown plants shall be well rooted and established in the container in which they are growing. They shall have grown in the container for a sufficient length of time for the root system to hold the earth when taken from the container, but not long enough to become pot bound. The size of the container shall be not less than 75% of the ball sizes for comparable balled and burlapped plant material. Containers shall be stable and not deteriorated to a degree which will cause breaking up of the root ball during the planting operation.

3. SHIPPING

- A. Handling: Each species or variety shall be handled and packed in the manner approved for that plant, having regard for the soil and climatic conditions at the time and place of digging and of delivery, and to the time that will be consumed while in transit or delivery. All precautions that are customary in good trade practice shall be taken to ensure the arrival of the plants in good condition.
- B. Packing: Plants shall be packed or covered in such a manner as to ensure adequate protection against damage while in transit. The roots of bare root plants shall be carefully protected with wet straw or other suitable material to ensure the arrival of the plants at their destination with roots in a moist condition.
- C. Tagging: All stock furnished must be legibly tagged with the botanic and common name.
- D. Transportation Care: During transportation, the Contractor or those transporting the plants for the Contractor shall exercise care to prevent injury and drying out of the plants. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, ball of earth broken or loosened, or areas of bark torn, the Engineer may reject the injured plant. When a plant has been so rejected, the Contractor shall at once remove it from the area of work and replace it.
- E. Unacceptable Material: Any plant material not acceptable upon delivery shall be removed from the site and acceptable material shall be brought in to replace it within five days any within acceptable planting periods. Any replacement that may be required shall be selected and tagged by the Engineer.

4. TEMPORARY STORAGE

- A. Storage Time: No plant shall remain in temporary storage over the Summer or Winter.
- B. Storage of Balled and Burlapped Material: The earth balls of Balled and Burlapped planting materials shall be kept moist and their solidity carefully preserved. Plants may remain on the site of the work only 72 hours prior to being planted or placed in storage. To prevent drying out or freezing, they shall be stored either in a cool, moist storage building or placed in a compact group with a suitable mulch ma-

terial placed around and between the balls so that they are completely covered.

- C. Storage of Bare Root Material: Bar root plants may remain on the site of the work only 24 hours prior to being planted or placed in storage. During this 24 hour period, the Contractor shall continue to exercise care to prevent injury and drying out of the plants. The roots of plants to be placed in storage shall first be puddle in a paste solution of planting soil and water. The plants shall then be protected and kept moist by "heeling-in" the roots or by placing the plant in a cool moist storage building the roots shall be covered with a suitable moist mulch.
- D. Storage of Container Grown Material: The roots and rooting material of container grown planting material will be kept moist. To prevent freezing, they shall be stored either in a cool, moist storage building or placed in a compact group with a suitable mulch material placed around and between the balls so that they are completely covered
- E. Duration of Storage: The duration of storage for balled and burlapped and container grown deciduous plant materials will terminate in the Spring when the plants, under field conditions, break dormancy and in the Fall when the ground freezes and cannot be satisfactorily worked. The mulch materials used for temporary storage of the plant materials shall meet with the approval of the Engineer.
- F. Unplanted Materials: Plant materials not planted by the end of the storage periods shall be removed from the site and not returned to the site for use. The engineer shall note the District tag numbers, plant types and size to ensure this regulation.

5. **SITE PREPARATION**

- A. Surface Preparation: The area to be planted will be finished to line and grade before site preparation work is begun. The immediate planting areas for trees, shrubs and ground covers, etc., shall be treated prior to planting. An area extending a minimum of 3 (three feet) in all directions from where any plant is to be planted and the entire plant beds where the spacing of the plant is 6 feet or less shall be treated. Treatment shall be by either mechanical or chemical means. If a mechanical method is used, the area shall be cultivated to a depth of not less than 2 inches with equipment approved by the Engineer until the surface is at final grade, smooth and free of debris, gullies, clods, stones, grass, weeds and any other living vegetation. If chemical control is used, the treated area does not have to be disturbed prior to planting provided the surface is smooth and free of debris, gullies, clods, and stones. All planting areas shall be in a weed-free condition prior to planting.
- B. Layout of Planting Area: The Contractor shall furnish and place all stakes for locating the plantings. The specific location of each shade and ornamental tree shall be staked by the Contractor. Stakes shall be marked to indicate the tree species, variety, and size.

Mass planting area for shrubs, vines and ground covers shall be outlined by the Contractor and marked to indicate the shrub species, variety, size, quantity and typical spacing. The spacing and location of species shall be as directed by the Engineer at the pre-construction meeting to be held at a mutually agreed time and date prior to the commencement of the planting operation.

- C. Intent: It is the intent of the District to develop a natural woody, irregularly shaped planting area. Field adjustments necessary to obtain this effect, as well as to facilitate planting will be made subject to the approval of the Engineer.

6. **EXCAVATION OF PLANT HOLES**

- A. General: All plant pits shall be excavated with vertical sides, horizontal bottom, and shall be circular in shape. An approved mechanical tree planting machine may be used. On slopes, the depth of excavation shall be measured at the center of the hole. All plant pits shall be approved by the Engineer prior to planting operations.
- B. Excess Material: All excess material excavated from the holes shall be removed from the site.
- C. Holes for Balled and Burlapped and Container Grown: Excavation of holes for planting Balled and Burlapped or container grown material shall be dug at the locations indicated by the stakes or on the Contract Drawings. They shall be excavated 1 foot greater in diameter than the earthen balls or containers. Depth of the holes shall be sufficient to accommodate ball when plant is set at the finished grade. Plants shall not be set lower than their original grade at the nursery, including allowance for final settlement.
- D. Holes for Bare Root: Plant holes for bare root material shall be wide enough and deep enough to accommodate the spread out roots of the plants. The holes will be deep enough to allow the plant to be planted at the grade it grew in the nursery.
- E. Drainage: When planting holes or planting beds are deemed by the Engineer to be poorly or insufficiently drained for the plant species to be planted, additional drainage shall be provided by the Contractor. The location and means of surface and subsurface drainage shall be proposed by the Contractor and approved by the Engineer before installation by the Contractor at no additional cost to the District. If the Contractor proceeds to install plant materials in such areas without the written approval by the Engineer and those plant materials fail to meet the requirements as herein called for in Section 2.07, Inspection for Acceptance of Plant Materials, the Contractor shall make all replacements as determined by the Engineer.
- F. Obstructions: In the event that rock or underground construction work or obstructions are encountered in any plant hole excavation work, alternate locations shall be selected by the Engineer at no additional cost to the District.

7. **PLANTING PROCEDURES**

- A. General: when planting trees, shrubs and ground-covers, etc., all stones, debris and all living herbaceous and woody material within the area to be mulched shall be killed or removed. All plants shall be planted in the plumb position. Plants will be set at the same depth as they grew in the nursery.
- B. Mixing the Planting Soil: The Contractor shall notify the Engineer as to site location, time and equipment necessary for mixing the planting soil a minimum of one week before processing. The method of mixing the components of the planting soil shall meet the approval of the Engineer. The planting soil shall be in a loose friable condition at the time of planting.
- C. Backfilling: Prepared planting soil shall be placed around the balls of Balled and Burlapped plants, around the container or mass of soil and roots of container grown plants or around the roots of bare root plants being planted in excavated holes. APPROVED WATERING EQUIPMENT SHALL BE AT THE SITE OF THE WORK AND IN OPERATING CONDITION PRIOR TO STARTING THE PLANTING OPERATION. Carefully tamp the planting soil during placement and thoroughly water after the backfilling has been completed. This watering shall completely saturate the backfill and be performed during the same day as the planting.

After ground settles, as a result of watering, the voids shall be filled to the proper level with more planting soil. When backfilling plant holes, sufficient planting soil shall be placed on the bottom of the plant holes or beds so that the plants will be at the proper grade when placed in the holes. All plants shall be set plumb and straight at the time of planting.
- D. Saucers: Backfilled soil shall be "saucered" around the plant at the outer edge of the hole to aid in irrigation during the period of establishment. Watering saucers shall be constructed around all single plants. The saucers shall be a minimum of 4 feet in diameter and a minimum of 4 inches deep.
- E. Balled and Burlapped: Remove all cords, wires and burlaped from the trunk of the plant during or at the end of the backfilling operation.
- F. Container Grown: Prior to placing the container grown plant in the excavated hole, the container shall be removed with care so as to not disturb the soil in which the root system is growing. Care shall be taken during the backfilling operations not to destroy the solidity of the mass of soil. Containers of material that decompose within one growing season after planting need not be removed.
- G. Bare Root: At planting time, the roots of all trees and shrubs shall be dipped in a prepared solution of "TerraSorb GB" as manufactured by Industrial Services International Inc. of Bradenton, Florida, or an approved equal. When planting in excavated holes, the roots shall be carefully spread in a natural position and

prepared backfill material shall be worked in around the roots to eliminate air pockets. The plant shall be gently raised and lowered to assure contact of the roots with the soil. When planting in a slot made with a tree planting machine or a planting bar (a special planting spade manufactured for planting seedlings), The slot shall be of a adequate depth to allow the roots to be fully extended vertically when seedlings is placed in the slot at the proper depth. Care shall be taken when planting to prevent the end of the roots from being turned upward. After placing the seedling in the slot at the proper depth, the slot shall be completely closed to eliminate all air pockets.

8. **PRUNING**

- A. General: Pruning shall be the responsibility of the Contractor. It may be done at the nursery or at the planting site in such a manner as to preserve the natural growth habit of the plant material.

All pruning shall completed within two days following planting operations of each plant, meet the approval of the Engineer and be done with sharp tools in accordance with good horticultural practices.
- B. Deciduous Trees: Pruning shall consist of removing twigs and branches as directed by the growth habit of the trees being pruned. Unless otherwise directed by the Engineer, branches shall not be removed from a height exceeding one-third the total height of the shade tree; neither shall the leader or terminal buds of the leader be removed. Clump form trees, ornamental trees and shrubs shall not be stemmed up. All cuts over 1 inch in diameter shall be painted with an approved tree paint; paint shall cover all exposed cambium, as well as other exposed living tissue.
- C. Deciduous Shrubs: Multi-stemmed shrubs shall have one-third of their height removed while maintaining their natural form and shape. Single stemmed shrubs shall be pruned in the same manner as ornamental trees.

9. **MULCH COVER**

- A. General: Within 5 days after planting, a mulch cover shall be placed around all plants to control the growth of competing vegetation. A mulching material shall be applied to a minimum depth of 3 ½ inches. Depth of mulching material should not exceed 4 inches.
- B. Individual Trees: Each individual shade and ornamental tree shall be mulched in a 4'(four foot) diameter around each plant.
- C. Individual Shrubs: Each individual shrub shall be mulched in a 3' (three foot) diameter around each plant.
- D. Planting Beds: The entire area of irregularly shaped planting beds shall be mulched to a minimum distance extending 3' (three feet) beyond the dripline of the plants.

10. **WRAPPING**

General: Trees shall be inspected for injury to trunks, insect infestation and improper pruning before wrapping. Within seven days after planting, all deciduous trees shall be wrapped from the ground line to the height of the first branch. The tree wrapping paper shall be secured with ties of stout cord (jute twine not less than 2 ply) that will stretch with the growth of the tree. Remove cord after one growing season from fast growing species.

11. BRACING

General: Tree guying and staking will only be required when necessary to ensure the proper upright position of the tree as determined by the Engineer. Bracing materials shall be approved by the Engineer prior to installation.

12. ESTABLISHMENT AND CARE

A. Time: The period of establishment shall extend from the date of planting/replanting through September of the following year at which time the plant materials will be inspected for acceptance.

B. General: During the period of establishment, the Contractor shall be responsible for properly caring for plants to assure maximum possible survival and vigorous healthy growth. Care of all plant material shall begin immediately after each plant is planted and shall continue through the establishment period.

Care shall consist of watering, weeding, spraying, cultivating, pruning and removal of dead materials, replenishing mulch to its original condition as specified, resetting of plants to proper grade, fertilizing and other necessary operations required or as ordered by the Engineer to maintain a neat appearance and healthful vigor of the plants. All requirements for proper care shall be considered as incidental to the cost of the Contract and shall be performed on a regular basis or within five days following notification by the Engineer.

C. Requirements: The minimum care requirements for proper care are:

1. Watering: Performed at least once every ten days during the months of May through October. The schedule for watering shall be determined by the Engineer. Should excessive moisture conditions prevail, the Engineer may delete any or all of the watering cycles or any part of said cycles. The water shall be applied to individual plants in such a manner that the plant hole will be saturated without allowing the water to overflow beyond the earthen saucer. Watering of plants in beds shall be applied in such a manner that all plants are uniformly saturated without allowing the water to flow beyond the periphery of the bed. The plants to be watered and the method of application shall be approved by the Engineer. The contractor shall not be re-

lieved in any way from the responsibility for unsatisfactory plants due to the amount of watering.

2. Replenishing Mulch: Mulch disturbed by the weeding operations or other operations shall be replaced to its original condition as specified. Mulch shall be replenished to maintain a 3 ½" uniform cover, till final acceptance of the Contract.

3. Restoring Saucers: All saucers shall be restored to their specified condition when disturbed by the Contractor's operations.

4. Hand Weeding: Performed once each month during the months of May through September. Weeds and grass growth shall be removed from within the earthen saucer of individual plants and from within the entire area of the planting beds. The weeding schedule shall be determined by the Engineer. The weeding may be performed in any manner approved by the Engineer provided the weed and grass growth, including their roots and stems, are removed from the area specified therein. All debris that results from this operation must be removed at the end of each day. The plants weeded shall be determined by the Engineer. The Contractor shall not be relieved in any way from the responsibility for unsatisfactory plants due to the extent of weeding.

5. Tree Spraying: One preventative spray at the beginning of the season to protect susceptible shade and ornamental trees from recurring diseases and insect infestation.

6. Wrap Repair: All tree wrapping and ties shall be repaired and inspected monthly.

7. Fertilization: All trees and shrubs shall be fertilized at the end of the established period. Nitrogen nutrients shall be uniformly applied to the surfaces of all areas where plant material was installed. The rate shall be 10 pounds of nutrients per 1000 square feet of organic mulch.

8. Weed Control: Pre-emergent Herbicide chemicals shall be applied while plant materials are still dormant, once each year to control wild grasses.

9. General Clean-up: The overall work area shall be cleaned once each week. Weeds, debris, dead branches, etc., shall be removed from the site.

2.07 INSPECTION FOR ACCEPTANCE OF PLANT MATERIALS

A. Notification for Inspection: Prior to the September of the following year of the planting operations, the Contractor must request in writing an inspection for acceptance of the planted areas. At the end of the estab-

ishment period in September, of the following year, the Engineer will determine the number and species of missing, dead diseased or unhealthy plants and will inform the Contractor in writing which plants are rejected. The total number of each type and size of plants will be counted.

B. Minimum Requirements:

1. Acceptable Plants: To be considered a healthy and vigorously growing plant, the following conditions must be met:
 - a. Visual evidence of new terminal growth.
 - b. A good supply of mature foliage covering a minimum of 75% of the plant.
 - c. Plant is in a vertical position, plant at the proper grade level.
 - d. Growing plant meets specified contract size and intent.
2. Unacceptable Plants: A plant will be rejected when any of the following conditions are evident.
 - a. Nutritional Deficiency (yellowing, undersized, or malformed leaves).
 - b. Weather Damage (frost, cold, sun, scald, windburn, heat, drought).
 - c. Mechanical Injury (damage from equipment).
 - d. Chemical Injury (spills from gasoline, oil or herbicides).
 - e. Improper Installation (planted too deep or too high, poor drainage, over-fertilized, over-pruned, dead branches).
 - f. Pests and Diseases (including insects, root rot, borers, girdling and galls).
 - g. Non-conformance with specified plant list, approved substitution list or approved locations.

2.08 FINAL ACCEPTANCE

To meet the requirements for final acceptance, the following procedures will be used.

- A. Replacements: All rejected plants will be replaced. Replacements shall be the same species unless otherwise agreed on to before replacement. Replacement planting procedures shall conform to these specifications; it is entirely including new planting soil mix, etc., and shall only be accomplished in the presence of the Engineer. All rejected plants shall be removed from the site.
- B. The Contractor must also:
 1. Complete replacement of all dead, missing and defective plant material.
 2. Mulch and weed planting beds and plant saucers. If a chemical was used originally for site prepara-

tion, then a second application shall be done at this time.

3. See to it that any required tree wrapping and all saucers are in good condition.
4. Complete remedial measures directed by the Engineer to ensure plant survival.
5. Repair any and all damage caused while making plant replacements.
6. Submit all certificates as specified.

**PART 3
PERENNIAL MATERIALS**

3.01 PERENNIAL PLANTS, FLOWERING BULBS, GROUND COVERS AND VINES

All material and handling criteria shall be the same as for Part 2 (Woody Plant Materials). The entire planting bed area shall be prepared and filled with "Planting Soil Mix" as detailed in this specification. Depth of planting bed shall be uniform and no less than 8 inches. Individual perennial plugs shall be placed at a slightly irregular spaced grid within the bedding area at approximately a 14-inch to 16-inch spacing in either direction.

The handling and planting of flower plugs, bulbs, ground cover and vines shall conform to Part 2 (WOODY PLANT MATERIALS), Sizes and measurements, "F", Container Grown Plants. Planting depths shall be appropriate to each specie of perennial or bulb.

**PART 4
RESTORATION AND NEW SEEDING**

4.01 DESCRIPTION

This work includes seedling all new areas and areas disturbed by the Contractor's operations as determined by the Engineer.

4.02 QUALITY ASSURANCE

- A. Reference: All seed shall conform with the current seed laws of the State of Illinois.
- B. Requirements:
 1. Provide seed in tagged and labeled bags indicating the percentage of purity and germination.
 2. The seed shall have been tested within six months prior to the date of seeing.
 3. Seed shall have a minimum of 80% pure live seed.

4.03 SUBMITTALS

Certifications: Submit the following to the Engineer:

1. Certification as to the amount of each seed variety in a seed mix.
2. Certification as to the amount of each compound in a dry or liquid fertilizer.
3. Weight tickets for each load of mulch material.
4. Weight tickets for each load of topsoil.

4.04 JOB CONDITIONS

- A. Environment: Seeding shall be performed only when weather and seedbed conditions are favorable for such operations. Operations will be suspended or delayed whenever conditions are unfavorable for such work.
- B. Equipment: Equipment of a type, size, capacity or condition unsuited for obtaining first class work and expedition of the job shall be replaced with proper equipment. Limits of operation shall be restricted to areas designated by the Engineer.

Seed Variety	Permanent Seeding pounds/acre	Dormant Seeding pounds/acre
1. General Seed Mix		
Kentucky 31 or Alta Fescue	70	105
Dawson Red Fescue	20	30
Perennial Rye Grass	20	30
2. Low Maintenance Seed Mix		
Reed Canary Grass	15	23
Tall Fescue	15	23
Birdsfoot Trefoil	15	23
3. High Maintenance Seed Mix		
Tall Fescue (Turf Type)	150	225
Kentucky Bluegrass	44	66
Perennial Rye Grass	20	30

4.05 PRODUCTS

1. SEED MIXTURES AND RATES

The seed mixtures shown herein and rates per acre shall be seeded where indicated on the Contract Drawings and as directed by the Engineer. Birdsfoot Trefoil shall be inoculated within 12 hours of sowing with an inoculants specific to Birdsfoot Trefoil.

2. MISCELLANEOUS MATERIALS

- A. Topsoil: Topsoil shall be a natural, fertile, friable soil possessing the characteristics of rich productive soils in the Chicago area. Topsoil shall be without admixture of subsoil and shall be clean and free from clay lumps, weed seeds, roots, stones, stumps, or similar substances, debris or other objects which are a hindrance to planting or care operations.
- B. Fertilizer: The fertilizer shall be regular commercial fertilizer (including liquid from) meeting the requirements of the applicable State Laws, and shall be in such physical condition to ensure uniform application over the area to be fertilized. Rate of application per acre shall be as follows:

Nitrogen	(N)	120 pounds
Phosphorus	(P)	180 pounds
Potassium	(K)	180 pounds

C. Mulch: All mulch material shall be non-toxic to vegetation and to the germination of seed, and shall be free from noxious weeds and weed seeds in the group

classified as primary noxious weed seed in the existing Illinois Seed Law, and shall be approved by the Engineer.

1. Wood Fiber Mulch: Wood Fiber mulch shall be manufactured from whole wood chips; paper mulch is not acceptable.
2. Straw Mulch: Straw mulch shall be stalks of wheat, rye, oats, or other approved straw, and shall be air-dried.

4.06 EXECUTION

1. SEEDING TIME

Seeding Time and Restrictions: Seeding may be done at any season of the year except during certain limited periods of adverse weather conditions during which the Engineer may not permit seeding. No seeding shall be done during high winds or when the ground is wet, frozen or in an otherwise untellable conditions

2. SEEDBED PREPARATION

- A. Surface Preparation: All gullies and washes shall be filled to conform to the desired shape and the entire area to be seeded shall be reasonably smooth before actual seedbed preparation is begun. Stones larger than one inch in diameter, sticks, stumps and other debris which would interfere with seeding operations, growth or maintenance of the vegetative cover shall be removed.
- B. Fertilizer: At this stage of the operation, the required fertilizer shall be applied uniformly.

- C. Seedbed: The seedbed shall be prepared with suitable tillage equipment to a three-inch minimum depth immediately after the fertilizer is applied. The area to be seeded shall be worked until all soil particles are reduced to a size not larger than one inch in the largest dimension. The prepared surface shall be free from all weeds clods, stones, roots, sticks, rivulets, gullies, crusting and caking.
- D. Inaccessible Areas: On areas inaccessible to machinery, a suitable seedbed shall be prepared to a minimum depth of one inch, using hand tillage tools such as a rake or other suitable tillage tools.
- E. Restrictions: The Contractor shall suspend operations when the soil is too wet, too dry, frozen or otherwise untilable.
- F. Approval: Seeding may be done immediately after, preparation, or at a later date provided the seedbed has remained in a good, friable condition and has not become muddy or hard. If it has become hard, it shall be tilled to a friable condition again. No seeds shall be sown until the seedbed has been approved by the Engineer.

3. SOWING THE SEED

- A. General: The seeding operation shall be performed immediately after preparation of the seedbed and approval by the Engineer. The seed shall be drilled or broadcast with equipment that will ensure uniform distribution of the seed, using one of the following methods:
 - 1. The seed will be drilled approximately ¼ to ½ inch deep and cultipacked or rolled once over with a corrugated roller on all areas where equipment can be operated safely. Seeding operations will be at right angles to the run-off.
 - 2. The seed will be broadcast and covered with a light harrow cultipacker or other suitable equipment.
 - 3. The seed will be seeded with a hydraulic seeder using no less than 1000 gallons of water per acre. The water shall contain the proper quantity of seed to meet the specified seeding rate per acre. On other areas too steep or otherwise inaccessible to equipment, the seed shall be covered with a light harrow or other suitable equipment.
- B. Seed Covering: Seed covering and firming operations will be across the slope. In areas inaccessible to equipment, seed will be covered using hand tools. Skipped areas, wider than four inches, shall be reseeded.
- C. Inoculants: The recommended amount of inoculant will be tripled when legumes are hydroseeded.

4. MULCH COVER

- A. General seeded areas shall be mulched with either a wood fiber mulch or a straw mulch within 24 hours of seeding. The Contractor's method of applying the mulch shall be subject to the approval of the Engineer before work is started.
- B. Wood Fiber Mulch: Wood fiber mulch, seed and fertilizer may be applied evenly over the area to be seeded in a one-step operation in accordance with manufacturer's recommendations. On slopes of 3:1 or steeper, the wood fiber mulch shall be applied at a rate of 2,000 pounds per acre. On flat surfaces and slopes less than 3:1, the wood fiber mulch shall be applied at a rate of 1,500 pound per acre.
- C. Straw Mulch: Straw mulch shall be applied uniformly over the area by hand, blower or other suitable equipment at a rate of two tons of air-dried material per acre. When applied, the mulch shall be free of thick layers or clumps. Mulch shall be anchored with an anchoring tool that crimps the mulch into the ground to a depth of approximately one inch.

5. CARE AND PROTECTION OF SEEDED AREAS

- A. General: The Contractor shall care for all seeded areas, including watering, grading, or re-seeding for a minimum period of ninety days or until a healthy growth of grass exists over the entire seeded area. The ninety-day acceptance period shall be entirely within the growing season between April 1 and October 31. Any areas which are bare or fail to show a uniform stand, for any reason whatsoever, shall be reseeded with the original mixture, and if required, such seeding shall be repeated until final acceptance. The Contractor shall properly water, weed and otherwise care for all seeded areas until final acceptance of the entire job. Damage resulting from erosion, traffic, or any other cases shall be repaired by filling with topsoil, tamping, and seeding by the Contactor if such damage occurs prior to final acceptance.
- B. Mowing: Seeded areas shall be maintained at a height of not more than four inches until final acceptance. On areas seeded in the Fall, the grass shall not be mowed until the following Spring. Mowing equipment or mowing operations which the Engineer may consider dangerous or injurious to the completed work shall not be used.

6. FINAL ACCEPTANCE OF SEEDED AREAS

General: At the completion of the contract work, the Contractor shall request the Engineer, in writing, to accept the work. For the purpose of establishing an acceptable standard, scattered bare spots, none larger than one square foot, will be allowed up to a maximum of three percent of any seeded area.

PART 5
WOODY PLANT MATERIAL TRANSPLANTING

5.01 GENERAL

All plant materials being transplanted or plant materials being furnished for replacement shall conform to these general specifications. ALL PLANT MATERIALS MUST BE PRUNED BY THE CONTRACTOR IN ACCORDANCE WITH THESE GENERAL SPECIFICATIONS AND APPROVED BY THE ENGINEER, PRIOR TO BEING TRANSPLANTED. The Contractor and the District agree that the District has the right to add or subtract plant materials to be transplanted as determined by the Engineer. The transplanting cost as determined by the Engineer shall apply for all subtractions or additions.

5.02 DESCRIPTION

This work includes, but is not limited to, the following:

1. Digging plant materials utilizing the tree spade method and preparing plant holes.
2. Furnishing, transporting, temporary storage and plant any replacement plant materials.
3. Pruning, mulching and wrapping of transplanted or replacement plant materials.
4. Restoration seeding, (See part 4).
5. Protection of existing woody plant materials, (See Part 6).
6. Protection, restoration and clean-up (See Part 7).

5.03 QUALITY ASSURANCE FOR ANY REPLACEMENT PLANT MATERIALS

Reference Standards: All nursery stock for any replacement plant materials shall conform with the current "American Standards for Nursery Stock" ANSI Z60.1 (adopted by the American Association of Nurserymen in every respect including.)

1. Height
2. Caliper.
3. Branching.
4. Size.
5. Grade.
6. Root spread.
7. Ball depth and width.

5.04 SUBMITTALS FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. Samples: Submit the following to the Engineer for approval:
 1. One cubic foot of mulch material.
 2. One 3' length of tree wrapping material.
 3. One 3' length of tie cord for the tree wrapping.
 4. One cubic foot of planting soil mixture.

5. If the planting soil mix is prepared off site, the Contractor shall provide a certificate showing that the quantities and types of materials required have been provided.

- B. Certificates for any replacement plant materials: Submit the following to the Engineer:
 1. A state inspection certificate from the supplying nursery for all replacement plant materials.
 2. Certification that all replacement plant materials conform to the American National Standards Institute published by the American Association of Nurserymen.
 3. Certification as to the nursery where the replacement plant materials were growing prior to being dug for delivery.
 4. Certification by invoice number as to the date all replacement plant materials in each shipment were dug.
 5. Certification that the equipment used was of the proper type, size, capacity or condition to do the work.
 6. Invoices of each shipment of replacement plant materials.
 7. Invoice showing the quantity and kind of mulch material delivered to the site.

5.05 JOB CONDITIONS

Environment: Digging and transplanting or planting of any replacement plant materials shall be performed only when weather and soil conditions are favorable for such operations. Operations will be suspended or postponed whenever conditions are unfavorable for such work, as determined by the Engineer.

5.06 PRODUCTS

1. LIST OF PLANT MATERIALS TO BE TRANSPLANTED (REQUIRING REPLACEMENT GUARANTEE)

- A. Plant Materials: All plant materials shall be transplanted from existing on-site locations to various on-site or off-site locations as directed by the Engineer.
- B. Equipment: Equipment to be utilized for transplanting operations shall be of a type and size as herein specified. All trees requiring a (90") diameter ball shall be "root pruned and/or transplanted" by utilizing a "Big John "90AA" or approved equal. All (80") by utilizing a "Big John 80A" or approved equal. All (65") by utilizing a "Big John 65A" or approved equal. All (55") by utilizing a "Big John 55A" or approved equal. Limits of the operation shall be restricted to areas designated by the Engineer.

C. Shade and Ornamental Trees: Shade and ornamental trees shall be transplanted to locations as directed by the Engineer. The Contractor shall stake proposed locations for approval by the Engineer prior to the initiation of transplanting procedures.

D. Shrubs: Shrubs shall be transplanted as individual plants within existing planting beds and/or to newly created irregularly shaped planting beds as directed by the Engineer.

2. (LIST OF PLANT MATERIALS TO BE TRANSPLANTED (REQUIRING REPLACEMENT GUARANTEE))

(SAMPLE LIST) SHADE TREES			
<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Green Ash	5 ½'-6"	(7)	(90")
Green Ash	4 ½"-5"	(5)	(80")
Green Ash	3 ½"-4"	(6)	(65")
Autumn Purple Ash	6"	(1)	(90")
Autumn Purple Ash	3 ½"-4"	(3)	(65")
Honey Locust	6"	(7)	(90")
Honey Locust	4"-4 ½"	(3)	(65")
Honey Locust	3 ½"	(2)	(65")
Hackberry	7"	(2)	(90")
Hackberry	5 ½"-6"	(4)	(90")
Hackberry	4-4 ½"	(8)	(65")
Hackberry	5"	(4)	(55")
		80 Total Shade Trees	
(SAMPLE LIST) ORNAMENTAL TREES			
<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Amur Maple	8'-10'	(1)	(65")
Dotted Hawthorn	12'-14'	(1)	(80")
Dotted Hawthorn	8"-10"	(2)	(65")
Cockspur Hawthorn	10'-12'	(5)	(65")
Cockspur Hawthorn	6'-7'	(5)	(55")
Cockspur Hawthorn	4 ½"-5"	(3)	(42")

(SAMPLE LIST- CONTINUE)
ORNAMENTAL TREES

<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Cockspur Hawthorn	2"-2 1/2"	(2)	(42")
Cockspur Hawthorn	4"-4 1/2"	(7)	(55")
Thornless Hawthorn	6'-7'	(1)	(55")
Thornless Hawthorn	2 1/2"-3"	(5)	(42")
Winterking Hawthorn	12'-14'	(4)	(80")
Winterking Hawthorn	10'12'	(7)	(65")
Winterking Hawthorn	8'-10'	(3)	(65")
Winterking Hawthorn	3 1/2"	(3)	(55")
Winterking Hawthorn	2 1/2"-3"	(3)	(42")
Floribunda Crab	3"-3 1/2"	(9)	(55")
Royalty Crab	3"-3 1/2"	(2)	(55")
Royalty Crab	2 1/2"-3"	(3)	(42")
Sargeant Crab	6'-7'	(1)	(55")
Sargeant Crab	2 1/2"-3"	(3)	(42")
Flowering Crab	5 1/2"	(2)	(80")
Flowering Crab	4"-5"	(8)	(65")
Flowering Crab	8'-10'	(2)	(65")
Flowering Crab	3 1/2"-4"	(3)	(65")
Flowering Crab	3"-3 1/2"	(22)	(55")
Flowering Crab	2"	(2)	(42")
Plum Leaf Hawthorn	10'-12'	(5)	(65")
Plum Leaf Hawthorn	2 1/2"	(4)	(42")
Newport Plum	5"-6"	(1)	(80")
Newport Plum	4 1/2"- 5"	(3)	(65")
Newport Plum	3 1/2"-4"	(27)	(65")
Newport Plum	3"-3 1/2"	(15)	(55")

**(SAMPLE LIST- CONTINUE)
ORNAMENTAL TREES**

<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Newport Plum	2 ½"	(1)	(42")
American Plum	10'-12'	(4)	(65")
American Plum	8'-10'	(4)	(65")
Shubert Plum	4 ½"	(3)	(65")
Shubert Plum	3 ½"	(3)	(55")
Shubert Plum	2 ½"-3"	(5)	(42")
		<u>(184 Total)</u>	
		Ornamental Trees	

**(SAMPLE LIST)
SHRUBS**

<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Persian Lilac	3'-4'	(10)	(32")
Persian Lilac	4'-5'	(25)	(32")
Persian Lilac	5'-6'	(9)	(42")
Persian Lilac	6'-8'	(6)	(42")
Purple Leaf Plum	6'-7'	(10)	(55")
Vibumum Lentago	5'-6'	(8)	(42")
Vibumum Lentago	4'-5'	(19)	(32")
Vibumum Lantana	5'-6'	(7)	(42")
Vibumum Lantana	4'-5'	(10)	(32")
Vibumum Dentatum	3'-4'	(8)	(32")
Vibumum Dentatum	4'-5'	(330)	(32")
Winged Euonymus	4'-5'	(12)	(32")
Upright Flowering Quince	3'-4'	(22)	(32")
Upright Flowering Quince	4'-5'	(49)	(32")
Japanese Tree Lilac	3'-4'	(21)	(32")
Japanese Tree Lilac	4'-5'	(2)	(32")
Aronia (Black Chokeberry)	2'-3'	(15)	(32")
Aronia (Black Chokeberry)	3'-4'	(18)	(32")
Rosa Sitegera	3'-4'	(8)	(32")
		<u>(292 Total)</u>	
		Shrubs	

2. LIST OF PLANT MATERIALS TO BE TRANSPLANTED (NOT REQUIRING REPLACEMENT GUARANTEE)

(SAMPLE LIST) SHADE TREES			
<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
*Green Ash	10"-12"	(14)	(90")
*Honey Locust	12"-14"	(9)	(90")
*Honey Locust	10"-12"	(5)	(90")
*Black Locust	10"12"	(1)	(90")
*Honey Locust	8"-10"	(4)	(90")
Norway Maple (Top Prune Only)	8"-10"	(3)	(90")
*Little Leaf Linden	10"-12"	(5)	(90")
*Little Leaf Linden	8"-10"	(1)	(90")
American Linden (Top Prune Only)	8"-10"	(1)	(90")
American Linden (Top Prune Only)	6"-7"	(1)	(90")
Hackberry	8"-10"	(2)	(90")
		(46 Total)	
		Ornamental Trees	

Note: All of these shade trees() must be top pruned first and root pruned with the respective tree spade size as designed herein, (2 times in place) and (2 sides each time) at intervals as directed by the Engineer. An application of Roots™ liquid form, shall be used at each root pruning interval. These trees will be transplanted after they are dormant as directed by the Engineer. Of these trees, only those trees as determined by the Engineer will be transplanted. Any of those not selected by the Engineer for transplanting shall be deducted from Contract payment at the cost determined by the Engineer.

(SAMPLE LIST) ORNAMENTAL TREES			
<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Cockspur Hawthorn	15'-16'	(8)	(90")
Flowering Crab	15'-16'	(3)	(90")
Sargent Crab	8"	(1)	(90")
Newport Plum	15'-16'	(6)	(90")
Amur Maple	12'-14'	(3)	(90")
		(21 Total)	
		Ornamental Trees	

3. CONVERSION TABLE OF SIZES FOR PLANT MATERIALS

Clump	To	Caliper Inch
3'-0"	1"
4'-0"	1 ½"
5'-0"	1 ¾"
6'-0"	2"
7'-0"	2 ½"
8'-0"	3"
10'-0"	4"
12'-0"	5"
14'-0"	6"
16'-0"	7"
18'-0"	8"

4. TRANSPLANTING COST OF EXISTING PLANT MATERIALS

The Contractor and the District agree that the transplanting cost of existing plant materials shall be as determined by the Engineer. The transplanting cost of any plant materials not transplanted by May 30 of the Spring planting season, or by November 30 of the Fall planting season shall be deducted from the Contractor's payment

5. COST OF EXISTING REPLACEMENT PLANT MATERIALS

The Contractor and the District agree that the cost of all guaranteed plant materials which may be unacceptable upon inspection time and not replaced by November 30 of the Fall planting season shall be deducted from the Contractor's payment, all as determined by the Engineer, based on the latest average wholesale prices from acceptable nurseries at the time plant materials are being installed, all in accordance with these specifications, including installation costs. The costs include the following:

- A. Removing the unacceptable plant materials and disposing them off site as directed by the Engineer.
- B. Site preparation for planting.
- C. Providing the replacement plant materials.
- D. Transportation of replacement plant materials to the site.

- E. Planting operations in accordance with these specifications

6. REQUIREMENTS FOR REPLACEMENT OF GUARANTEED PLANT MATERIALS

- A. Plant materials to be replaced under the contract guarantee shall be of the same type and size as those identified to be transplanted.
- B. All replacement plant materials shall be Balled and Burlapped.

7. ESTABLISHMENT AND CARE OF TRANSPLANTED PLANT MATERIALS

- A. Time: The period of establishment shall extend from the date of transplanting to replanting of replacement plant materials the following year.
- B. General: During the period of establishment, the Contractor shall be responsible for properly caring for plants to assure maximum possible survival and vigorous healthy growth. Care of all plant material shall begin immediately after each plant is planted and shall continue through the establishment period.

Care shall consist of watering, weeding, spraying, cultivating, pruning and removal of dead materials, replenishing mulch to its original condition as specified, resetting of plants to proper grade, fertilizing and other necessary operations required or as ordered by the Engineer to maintain a neat appearance and healthful vigor of the plants. All requirements for proper care shall be considered as incidental to the cost of the contract and shall be performed on a regular basis or within five days following notification by the Engineer.

- C. Requirements: The minimum care requirements for proper care are:
 - 1. Watering: Performed at least once every ten days during the months of May through October. The schedule for watering shall be determined by the Engineer. Should excessive moisture conditions prevail, the Engineer may delete any or all of the watering cycles or any part of said cycles. The water shall be applied to individual plants in such a manner that the plant hole will be saturated without allowing the water to overflow beyond the earthen saucer. Watering of plants in beds shall be applied in such a manner that all plants are uniformly saturated without allowing the water to flow beyond the periphery of the bed. The plants to be watered and the method of application shall be approved by the Engineer. The Contractor shall not be relieved in any way from the responsibility for unsatisfactory plants due to the amount of watering.

2. Replenishing Mulch: Mulch disturbed by the weeding operations or other operations shall be replaced to its original condition as specified. Mulch shall be replenished to maintain a 3 ½" uniform cover, till final acceptance of the Contract.
3. Restoring Saucers: All saucers shall be restored to their specified condition when disturbed by the Contractor's operations.
4. Hand Weeding: Performed once each month during the months of May through September. Weeds and grass growth shall be removed from within the earthen saucer of individual plants and from within the entire area of the planting beds. The weeding schedule shall be determined by the Engineer. The weeding may be performed in any manner approved by the Engineer provided the weed and grass growth, including their roots and stems, are removed from the area specified therein. All debris that results from this operation must be removed at the end of each day. The plants weeded shall be determined by the Engineer. The Contractor shall not be relieved in any way from the responsibility for unsatisfactory plants due to the extent of weeding.
5. Tree Spraying: One preventative spray at the beginning of the season to protect susceptible shade and ornamental trees from recurring diseases and insect infestation.
6. Wrap Repair: All tree wrapping and ties shall be repaired and inspected monthly.
7. Fertilization: All trees and shrubs shall be fertilized at the end of the establishment period. Nitrogen nutrients shall be uniformly applied to the surfaces of all areas where plant material was installed. The rate shall be 10 pounds of nutrients per 1000 square feet of organic mulch.
8. Weed Control: Pre-emergent Herbicide chemicals shall be applied while plant materials are dormant, once each year to control wild grasses.
9. General Clean-up: The overall work area shall be cleaned once every week. Weeds, debris, dead branches, etc., shall be removed from the site.

8. NURSERY STOCK REQUIREMENTS FOR REPLACEMENT PLANT MATERIALS

- A. General: Plants provided for replacement shall be nursery grown, good landscape quality and have a shape and habit of growth that is normal for the species. All plants shall be grown under climatic and soil conditions similar to the planting site. Any woody plant materials grown in predominantly sandy soils shall be unacceptable as balled and burlapped stock. All nursery stock shall be measured before pruning with branches in normal position.

All plants shall have broad, dense heads of foliage when in leaf, and be densely branched specimens characteristic to the species, free from cracks and splits. Plants shall be free from insects, diseases, sun scald knots, stubs or other objectionable disfigurements. Thin, weak plants shall not be accepted. Plants must show appearance of normal health and vigor in strict accordance with these specifications.

- B. Shade Trees: Shade trees shall be free of branches (under trimmed) not high from the ground line than one-half the total height of the tree, shall have single leaders, be well-branched and with reasonable straight stems. This requirement shall all cover general species, but some varieties which have other characteristics of growth will be accepted.
- C. Ornamental Trees and Shrubs: All ornamental trees and shrubs shall be branched and foliated to the ground.
- D. Nomenclature: Plants shall be true to their name as specified.
- E. Source: The southernmost limits for the source of plant materials shall be one sub-zone south of the site of the work. Plant hardiness zones shall be as designed in the current Agricultural Research Service, USDA, and Miscellaneous Publication No. 1475.

9. METHODOLOGY FOR DETERMINING SIZES AND MEASUREMENTS OF REPLACEMENT PLANT MATERIALS

- A. Diameter: Shade trees up to 4" diameter size shall be measured for diameter 6" above the ground line and 12" above the ground for larger tree sizes.
- B. Root System: The root system of all plants shall be sufficient to ensure plant growth.
- C. Balled and Burlapped Plants: Balled and burlapped plants shall be dug with a sufficient quantity of earth taken equally on all sides and bottoms of the plants to include the necessary roots to ensure growth.

The thickness of depth of the balls shall be sufficient to include the depth of the roots according to species. The balls shall be prepared in a workman-like manner and firmly bound. When infrequent root pruning or transplanting in the nurseries have caused roots greater than ½" in thickness to extend beyond the recommended ball diameter, the ball diameter must be increase so that no roots greater than ½" in thickness, except tap roots, are cut.

- D. Oversized Plants: Plants larger than those being replaced may be used if approved by the Engineer, but use of such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots and root ball shall be increased in proportion to the size of the plant.
- E. Size Range: Where a size range is specified, stock furnished shall be interpreted to mean that no less than 50% shall be of the maximum size specified within each range.

- F. Substitutions: When plants of kinds or sizes of those being replaced are not available for planting time or within the same climate zone or similar soil conditions, substitutions may be made upon written request by the Contractor and approval by the Engineer. Plant substitutions must be the same genus and hardiness as specified, and of equal cost.

10. INSPECTION AND APPROVAL OF NURSERY STOCK FOR REPLACEMENT PLANT MATERIALS (ALL BALLED AND BURLAPPED)

- A. Inspection: Inspection of the trees and shrubs to be furnished as replacements will be made in the field of the growing nursery by the Engineer. All stock furnished shall be inspected and tagged with District numbered tags by the Engineer in the growing nurseries prior to digging.
- B. Tagging: It is the Contractor's responsibility to locate all plant materials prior to tagging by the Engineer for the first time. If re-tagging is required upon request by the Contractor, the Engineer shall determine the cost expended for time and distance traveled, which will be deducted from the Contractor's payments. The Contractor shall give the Engineer at least two weeks notice prior to any proposed tagging date. The notification shall be in writing and should suggest dates that can be mutually agreed upon.
- C. Approval: Plants shall be subject to inspection and approval at the place of growth and upon delivery for conformity to specification requirements as to quality, size and variety. Such approval shall not impair the right of inspection upon delivery at the site or during the progress of the work or right of rejection due to damage suffered in handling or transportation.
- D. Inspection Certificate: All plant material shall comply with the State and Federal law with respect to inspection for plant diseases and insect infestation. An inspection certificate required by law to this effect shall accompany each shipment and on arrival, the certificate shall be filed with the Engineer.

11. MISCELLANEOUS PLANTING MATERIALS FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. Planting Soil: The planting soil shall be 8 parts by volume of topsoil, (2 parts by volume of blended mushroom compost as process by GSO America, Crystal Lake, Il 60014, or an approved equal) and 5 lbs of bone meal/cy of mix. Certification by the supplier is required. Planting soil mix shall be utilized to fill in pockets and/or voids for tree spade transplanted plant materials.

- 1. Top soil: Topsoil shall be a natural, fertile, friable soil possessing the characteristics of rich productive soils in the Chicago area. Topsoil shall be without admixture of subsoil and shall be clean and free from clay lumps, weed seeds, roots, stones, stumps or similar substance, debris or other objects which might be a hindrance to planting or care operations.
- 2. Mushroom Compost: Compost shall be a mixture of horse manure, straw, peat moss and fertilizer. It shall have been composted, used for mushroom growing, sterilized and then aged as finished organic compost. It shall be free of foreign matter and harmful chemicals.
- 3. Bone Meal: Bone meal shall be finely ground and streamed.

B. Tree Wrapping Materials:

- 1. Wrapping Paper: the tree wrapping materials shall be burlap, heavy crepe paper or commercially available tree wrapping paper. Wrapping paper shall be first quality, not less than 4" nor more than 8" in width. Burlap shall be least 8 ounce burlap.
 - 2. Wrapping Cord: Cord shall be jute twine not less than 2 ply. All ties or fasteners shall be of natural and decomposable material.
- C. Mulch Material: The mulch material for planting must be approved by the Engineer. It shall be uniformly graded and have the ability to completely block sunlight from reaching the surface of the soil. Mulch shall be from hard wood (tree bark nuggets); minimum chip size shall be ½"; maximum chip size shall be 1 ½"; or shall be hardwood shredded bark, double processed. All mulch shall be clean with no "debris" or "Fines" (as processed by GSO America, Crystal Lake, IL 60014, or an approved equal). Certification by the supplier is required.
 - D. Soil Amendments: At planting time, the roots of all trees and shrubs, shall be treated with "Roots™ Dry Formula" as manufactured by Roots™ Inc., a Division of Lisa Products Corp., New Haven, CT 06511, or an approved equal. The rates of application shall be as follows: shade and ornamental trees – 1 lb./cal. Inch of tree; shrubs – ½ lb. shrub.

5.07 EXECUTION

1. PLANTING TIME FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. The Contractor shall complete the work required in this Contract on the following schedule:

PHASE I – TRANSPLANTING: All plant materials to be relocated under the Contract shall be transplanted by no later than May 30 of the Spring planting season or November 30 of the Fall planting season.

The transplanting cost of any existing shade trees, ornamental trees and/or shrubs not transplanted shall be deducted from the Phase I Contract payment, all as called for in Section 5.06, Transplanting Cost of Existing Plant Materials.

PHASE II – GUARANTEE & REPLACEMENT:

The Contractor shall guarantee all transplanted plant materials. During the month of September of the following year, the Engineer will inspect the plant materials and identify those plant materials which do not meet the requirements of Section 5.08, Inspection For Acceptance of Transplanted Plant Materials.

The Contractor shall replace all unacceptable plant materials during the Fall planting season and no later than November 30. The cost of any unacceptable plant material not replaced by November 30 shall be deducted from the Phase II Contract payment, all as called for in Section 5.06, Cost of Replacement Plant Materials.

- B. Plant Conditions: Regardless of calendar date, plants must be dormant at the time they are dug and planted.
- C. Weather Conditions: Transplanting operations shall be conducted under favorable weather conditions. See Part 2, Woody Plant Materials, Section 2.06 Execution, Planting Time.
- D. Restrictions: Plantings shall not be made in frozen ground; holes shall not be dug in frozen ground and frozen backfill material shall not be used.

2. DIGGING PLANTS FOR REPLACEMENT PLANT MATERIALS (ALL BALLED AND BURLAPPED)

- A. Notification: The Contractor shall notify the Engineer not less than 72 hours in advance of the digging of any plant materials in the nursery.
- B. Digging Time: Plants shall not be dug until the Contractor is ready to transport them from their original locations to installation on the site of the work or approved storage. The maximum time lapse between digging and being properly loaded for delivery to the site of work or being placed in approved storage shall be three days.
- C. Digging Care: All stock shall be dug with care, avoiding injury to the plants or loss of or damage to the roots, particular attention being given to the fibrous roots. Immediately after digging, roots shall be protected against drying out and freezing.
- D. Balled and Burlapped: All replacement plant materials shall be Balled and Burlapped and shall be dug with compact, natural balls of soil firmly wrapped with burlap and securely tied with twine or rope or secured by other approved means. Synthetic twine or cord will not be accepted.

Each ball shall be of sufficient width and depth to encompass the fibrous and feeding roots necessary to ensure full recovery and development of the plant. Earth balls shall be watered and protected against drying out.

3. SHIPPING METHODOLOGY FOR REPLACEMENT PLANT MATERIALS

- A. Handling: Each species or variety shall be handled and packed in the manner approved for that plant, having regard for the soil and climatic conditions at the time and place of digging and of delivery and to the time that will be consumed while in transit or delivery.

All precautions that are customary in good trade practice shall be taken to ensure the arrival of the plants in good condition.
- B. Packing: Plants shall be covered in such a manner as to ensure adequate protection against damage while in transit.
- C. Tagging: All replacement stock furnished must be legibly tagged with the botanic and common name.
- D. Transportation Care: During transportation, the Contractor or those transporting the plants for the Contractor shall exercise care to prevent injury and drying out of the plants. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, ball of earth broken or loosened, or areas of bark torn, the Engineer may reject the injured plant. When a plant has been so rejected, the Contractor shall at once remove it from the area of the work and replace it.
- E. Unacceptable Material: Any plant material not acceptable upon delivery shall be removed from the site and acceptable material shall be brought in to replace it within 5 days and within acceptable planting periods. Any replacements that may be required shall be selected and tagged by the Engineer.

4. TEMPORARY STORAGE FOR REPLACEMENT PLANT MATERIALS.

- A. Storage Time: No plant shall remain in temporary storage beyond May 30 of the Spring planting season or November 30 of the Fall planting season.
- B. Storage of Balled and Burlapped Material: The earth balls of Balled and Burlapped planting materials shall be kept moist and their solidity carefully preserved. Plants may remain on the site of the work only 72 hours prior to being planted or placed in storage. To prevent drying out or freezing, they shall be stored either in a cool moist storage building or placed in a compact group with a suitable mulch material placed around and between the balls so that they are completely covered. The mulch materials shall meet with the approval of the Engineer.
- C. Unplanted Materials: Replacement plant materials not planted by November 30 shall be removed from the site. The Engineer shall note the MWRD tag numbers,

plant types and determine their dollar cost which will be deducted from the final payment to the Contractor.

5. EXCAVATION OF PLANT HOLES FOR REPLACEMENT PLANT MATERIALS

- A. General: All plant pits shall be excavated with vertical sides, horizontal bottom, and shall be circular in shape. An approved mechanical tree planting machine may be used. On slopes, the depth of excavation shall be measured at the center of the hole. All plant pits shall be approved by the Engineer prior to planting operations.
- B. Excess Material: All excess material excavated from the holes shall be removed from the site.
- C. Holes for Balled and Burlapped and Container Grown: Excavation of holes for planting Balled and Burlapped or container grown material shall be dug at the locations indicated by the stakes or on the Contract Drawings. They shall be excavated 1 foot greater in diameter than the earthen balls or containers. Depth of the holes shall be sufficient to accommodate ball when plant is set at the finished grade. Plants shall not be set lower than their original grade at the nursery, including allowance for final settlement.
- D. Drainage: When planting holes or planting beds are deemed by the Engineer to be poorly or insufficiently drained for the plant species to be planted, additional drainage shall be provided by the Contractor. The location and means of surface and subsurface drainage shall be proposed by the Contractor and approved by the Engineer before installation by the Contractor at no additional cost to the District. If the Contractor proceeds to install plant materials in such areas without the written approval by the Engineer and those plant materials fail to meet the requirements as herein called for Section 5.08, Inspection for Acceptance of Transplanted Plant Materials, the Contractor shall make all replacements as determined by the Engineer.
- E. Obstructions: In the event that rock or underground construction work or obstructions are encountered in any plant hole excavation work, alternate locations shall be selected by the Engineer at no additional cost to the District.

6. PLANTING PROCEDURES FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. General: All plants shall be planted in the plumb position. Transplanted plants will be set at the same depth as they grew before transplanting. Replacement plants will be set at the same depth as they grew in the nursery.
- B. Layout of Planting Area: The Contractor shall furnish and place all stakes for locating the plantings. The specific location of each shade and ornamental

tree shall be staked by the Contractor. Stakes shall be marked to indicate the tree species, variety and size. Mass planting areas for shrubs, vines and groundcovers shall be outlined by the Contractor and marked to indicate the shrub specie, variety, size and quantity, and typical spacing. The spacing and location of species shall be as directed by the Engineer at the pre-construction meeting to be held at a mutually agreed time and date prior to the commencement of the planting operations.

- C. Mixing the Planting Soil: The Contractor shall notify the Engineer as to site location, time and equipment necessary for missing the planting soil a minimum of one week before processing. The method of mixing the components of the planting soil shall meet the approval of the Engineer. The planting soil shall be in a loose, friable condition at the time of planting.
- D. Backfilling: Prepared planting soil mix shall be utilized immediately to fill in pockets and/or voids for tree spade transplanted plant materials, as well as placed around the balls of Balled and Burlapped plants being planted in excavated holes. APPROVED WATERING EQUIPMENT SHALL BE AT THE SITE OF THE WORK AND IN OPERATING CONDITION PRIOR TO STARTING THE PLANTING OPERATION. Carefully tamp the planting soil during placement and thoroughly water after the backfilling has been completed. This watering shall completely saturate the backfill and be performed during the same day as the planting.

After ground settles as a result of watering, the voids shall be filled to the proper level with the planting soil. All plants shall be set plumb and straight at the time of planting.

- E. Saucers: Soil shall be backfilled with a saucer shape around the plant at the outer edge of the hole to aid in irrigation. Watering saucers shall be constructed around all single plants. The saucers shall be a minimum of 4" deep and sized to surround the entire hole.
- F. Balled and Burlapped Stock: Remove all cords, wires and burlap from the trunk of the plant during or at the end of the backfilling operation.
- G. Planting Beds: The entire area of planting beds shall be prepared to a depth of no less than 8" by tilling and/or disking prior to digging planting holes.

7. PRUNING FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. General: Pruning shall be the responsibility of the Contractor. It may be done at the nursery or at the planting site in such a manner as to preserve the natural growth habit of the plant material. All pruning shall be completed within 2 days following planting operations of each plant, meet approval of

the Engineer and be done with sharp tools in accordance with good horticultural practices.

- B. Deciduous Trees: Pruning shall consist of removing twigs and branches as directed by the growth habit of the trees being pruned. Unless otherwise directed by the Engineer, branches shall not be removed from a height exceeding one-third the total height of the shade tree; neither shall the leader or terminal buds of the leader be removed. Clump form trees, ornamental trees and shrubs shall not be stemmed up. All cuts over 1" in diameter shall be painted with an approved tree paint; paint shall cover all exposed cambium, as well as other exposed living tissue.
- C. Deciduous Shrubs: Multi-stemmed shrubs shall have one-third of their height removed while maintaining their natural form and shape. Single stemmed shrubs shall be pruned in the same manner as ornamental trees.

8. MULCH COVER FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

- A. General: Within 5 days after planting, a mulch cover shall be placed around all plants to control the growth of competing vegetation. All mulching material shall be applied to a minimum depth of 3 ½". Depth of mulching material should not exceed 4".
- B. Individual Trees: Each individual shade and ornamental tree shall be mulched around each plant to cover the entire hole size.
- C. Individual Shrubs: Each individual shrub shall be mulched around each plant to cover the entire hole size.
- D. Planting Beds: the entire area of irregularly shaped planting beds shall be mulched to a minimum distance extending 3' (three feet) beyond the dripline of the plants.

9. WRAPPING FOR TRANSPLANTED OR REPLACEMENT PLANT MATERIALS

General: Trees shall be inspected for injury to trunks, insect infestation and improper pruning before wrapping. Within 7 days after planting, all deciduous trees shall be wrapped from the ground line to the height of the first branch.

The tree wrapping paper shall be wrapped tightly around the trunk from the bottom to the top with a minimum of 1" overlap. At the top and bottom and at two intermediate intervals not greater than 18", the wrapping paper shall be secured with ties of stout cord (jute twine not less than 2 ply) that will stretch with the growth of the tree. Remove cord after one growing season from fast growing species.

10. BRACING FOR TRANSPLANTED OR REPLACEMENT TREES

General: Tree guying and staking will only be required when necessary to ensure the proper upright position of the tree as determined by the Engineer. Bracing materials shall be approved by the Engineer prior to installation.

5.08 INSPECTION FOR ACCEPTANCE OF TRANSPLANTED PLANT MATERIALS

- A. Inspection: The Engineer during the month of September will inspect all the plant materials to determine the number and species of plants that are acceptable and will inform the Contractor in writing which plants are rejected. The total number of each type and size of plants will be counted.
- B. Minimum Requirements:
 - 1. Acceptable Plants: To be considered a healthy and vigorously growing plant, the following conditions must be met:
 - a. Visual evidence of new terminal growth.
 - b. A good supply of mature foliage covering a minimum of 75% of the plant.
 - c. Plant is in a vertical position, planted at the proper grade level.
 - 2. Unacceptable Plants: A plant will be rejected when any of the following conditions are evident:
 - a. Nutritional Deficiency (yellowing, undersized, or malformed leaves).
 - b. Weather Damage (frost, cold, sun, scald, wind burn, drought).
 - c. Mechanical Injury during installation (damage from equipment and improper handling).
 - d. Improper Installation (planted too deep or too high, poor drainage, over-pruned, dead branches).
 - e. Pests and Diseases (including insects, root rot, borers, girdling and galls).
 - f. Non-conformance with specified plant list, approved substitution list or approved locations.
- C. Replacements: The Engineer, following the September inspection of the transplanted plant materials, will provide a list of unacceptable plant materials to be replaced during the Fall planting season and no later than November 30th. All rejected plants shall be removed from the site.

Replacement shall be the same species and sizes as those that were transplanted unless otherwise agreed to before replacement. Replacement planting procedures shall conform to these specifications in their entirety, including new planting

soil mix, etc., and shall only be accomplished in the presence of the Engineer. All unacceptable transplanted materials will be replaced no later than November 30th.

PART 6
PROTECTION OF EXISTING PLANT MATERIALS

6.01 DESCRIPTION

The Contractor shall provide the proper protection of all trees and shrubs not designated to be removed for permanent construction as shown on the Contract Drawings and as determined by the Engineer.

6.02 MATERIALS

General: Materials for the purpose of protecting existing plant materials may be new or used, adequate for the required purpose and must not violate applicable codes and regulations.

6.03 EXECUTION

- A. General: All trees on the property to be preserved and all trees adjacent to the property shall be protected against damage during the construction operations by fencing or armoring. The tree protection shall be placed before any excavation or grading is begun and shall be maintained in repair for the duration of the construction work unless otherwise directed. No material shall be stored or construction work carried on within 40' of any tree designated to be saved. Tree protection shall remain until the planting work is started and then be removed.
- B. Armoring: Individual trees near heavy construction traffic shall be wrapped with burlap and 2"x4" planks wired vertically as armor around trunks and spaced not more than 2" apart to a height of 5' above the ground.
- C. Fencing: All trees in groups near construction traffic shall be protected by fencing in the following manner. Fences shall have posts equivalent to 4"x4" set 3' in the ground and extending 5' above the ground, set at intervals not to exceed 8'. Two wales shall be provided, equivalent to 2"x6", and vertical 1"x6" boards applied not over 6" apart.
- D. Snow Fencing: The Contractor shall install snow fencing held in place by metal posts along the Contract Limit Lines to protect the trees and forest floor outside these limits.

6.04 DAMAGES

General: Any damage to existing tree crowns or root systems shall be repaired immediately by an approved tree surgeon. Roots exposed and/or

damaged during operations shall immediately be cut off cleanly inside the exposed or damaged area, cut surfaces painted with approved tree paint, and topsoil spread over the exposed root area. If any trees to be saved are severely injured by mechanical equipment, the Contractor agrees to pay for each tree 3" in caliper the sum of \$600.00 for each tree up to 6" in caliper the sum of \$1,200.00, and for each 6" and over in caliper the sum of \$1,800.00 for each 4' in height the sum of \$1,200.00, and for each shrub 8' and over in height the sum of \$300.00 as fixed and agreed liquidated damages.

PART 7
PROTECTION, RESTORATION AND CLEAN-UP

7.01 DESCRIPTION

This section of the specifications pertains to protection of private and public property. Restoration of any areas or devices damaged. Clean-up of any soil, other material or debris spilled on paved roads, walks or other areas by the Contractor.

- A. Protection: The Contractor shall be responsible for the protection of private and public property in the course of performing his work. Entry to the site shall be only made at the locations indicated on the drawings or as directed by the Engineer. Public streets shall not be used for parking of construction vehicles or of workers' vehicles. Street surfaces, if deposited with dirt or other debris related to the Contractor's work shall be cleaned in a manner and to the extent satisfactory to the Engineer. Existing fencing and gates shall be repaired or replaced to the satisfaction of the Engineer if damaged or destroyed by the Contractor.
- B. Restoration: Restoration of any areas or devices damaged by the Contractor shall be performed to the satisfaction of the Engineer. The greatest potential for damage will be to existing trees, shrubs, Part 6, Section 6.04, damages to ground cover, flowers and to the grass surfaces over which the Contractor's work will proceed. When grass areas have been damaged by construction activity to the extent that they will not return to their previous condition of their own course in time as determined by the Engineer, the damage shall be repaired at the Contractor's expense. Damage shall include, but not be limited to rutting or tearing of grass by wheeled vehicles or killing of grass caused by traffic, stockpiling of materials or construction equipment, etc.
- C. Clean-up: Any soil and other material or debris spilled on paved areas, walks and drives shall be removed promptly, keeping these areas clear at all times. Large stones, excess planting soil and debris shall be removed from the site upon the completion of all work. The Contractor shall re-

move all excess soil, dead plant materials, packing materials, burlap, brush, limbs and other trimmings or debris, from the site. All disturbed areas shall be smoothed, reseeded or resodded, if required. All clean-up work will be considered incidental to construction work, and no extra compensation will be allowed.

**PART 8
HILLMASS CONSTRUCTION AND FINAL GRADES**

8.01 DESCRIPTION

This section of the specifications pertains to the hillmass construction shown on the Contract Plans. The subject hillmass development specifications are as follows:

- A. Intent: The Contractor shall construct a hillmass as shown on the Contract Plans. The subject hillmass is to be constructed from suitable fill material. Any additional topsoil that may be required shall be provided by the Contractor at his expense from an out side source and comply with "Topsoil" as described herein.
- B. Debris Removal: The Contractor shall remove all debris. Removed debris shall be properly disposed of by the Contractor in accordance with all State, County, and local laws and regulations in effect and preceding the contract period. Debris shall be removed at the direction of the Engineer. Debris under 18 inches in nominal size may be disposed of in the embankment of the hillmass at the direction of the Engineer. Debris disposed of in the hillmass must be buried a minimum of five feet (5') below the final surface contour as shown on the Contract Plans. All organic debris, regardless of size, shall be removed.
- C. Topsoil Removal: Existing topsoil from the hillmass work zone shall be removed and stored outside the hillmass work zone at the direction of the Engineer. The top six inches (6") or more of topsoil as determined by the Engineer, containing plants, roots and foreign debris shall be removed separately and stored outside the work zone at the direction of the Engineer.
- D. Grading: The Contractor shall perform the grading work necessary to establish the contours as shown on the Contract Plans. All grading shall establish proper drainage so as to eliminate the potential for ponding of water. All grading work shall be performed by the Contractor at the direction of the Engineer. The Engineer shall approve all rough grading prior to the application of clay and topsoil.
- E. Placement of Fill Material: The Contractor shall provide and place all fill material to develop and complete the contours of the hillmass as shown on the Contract Plans. The Contractor shall place and compact such fill material at the direction of the Engineer to 75% maximum density (ASTM D-1557).

- F. Seeded Areas: A six inch (6") thick layer of clean topsoil shall be provided.
- G. Planting Areas: The top shall be five feet (5') thick, (shall be composed of four feet (4') thick clay loam and one foot (1") thick topsoil). The woody planting areas and seeded areas shall be smoothly blended together to establish a uniform grading.
- H. Topsoil Definition: Topsoil shall be a natural, fertile, friable soil possessing the characteristics of rich productive soils in the Chicago area. Topsoil shall be without admixture of subsoil and shall be clean, free from clay lumps, weed seeds, roots, stones, stumps, or similar substances, debris or other objects which are a hindrance to planting or care operations.

The Contractor shall re-adjust the contour and landscaping of the hillmass required because of more or less excavated suitable fill material as directed by the Engineer with no additional cost to the District.

**PART 9
WOODY PLANT MATERIALS TRANSPLANTING
(FOR PURCHASE REQUISITIONS)**

9.01 GENERAL

All plant materials being transplanted shall conform to these general specifications. ALL PLANT MATERIALS MUST BE PRUNED BY THE CONTRACTOR IN ACCORDANCE WITH THESE (GSL) AND APPROVED BY THE ENGINEER, PRIOR TO BEING TRANSPLANTED. The Contractor and the District agree that the District has the right to add or subtract plant materials to be transplanted as determined by the Engineer shall apply for all subtractions or additional.

9.02 DESCRIPTION

- This work includes, but is not limited to the following:
- 1. Digging plant materials utilizing the tree space methods and preparing plant holes.
 - 2. Furnishing, transporting, temporary storage and planting any replacement plant materials.
 - 3. Pruning, mulching and wrapping of transplanted plant materials.
 - 4. Restoration seeding, (See Part 4).
 - 5. Protection of existing woody plant materials, (See Part 6).
 - 6. Protection, restoration, and clean-up (See Part 7).

9.03 SUBMITTALS FOR TRANSPLANTED PLANT MATERIALS

Samples: Submit the following to the Engineer for approval:

1. One cubic foot of mulch material.
2. One 3' length of tree wrapping material.
3. One 3' length of tie cord for the tree wrapping.
4. One cubic foot of planting soil mixture.
5. If the planting soil mix is prepared off site, the Contractor shall provide a certificate showing that the quantities and types of materials required have been provided.

9.04 JOB CONDITIONS

Environment: Digging and transplanting of any plant materials shall be performed only when weather and soil conditions are favorable for such operations. Operations will be suspended or postponed whenever conditions are unfavorable for such work, as determined by the Engineer.

9.05 PRODUCTS

1. **LIST OF PLANT MATERIALS TO BE TRANSPLANTED (NOT REQUIRING REPLACEMENT GUARANTEE), NOTE: FOR PLANT MATERIALS REQUIRING GUARANTEE, (SEE PART 5).**
 - A. Plant materials: All plant materials shall be transplanted from existing on site locations to various new on-site or off-site locations as directed by the Engineer.
 - B. Equipment: Equipment to be utilized for transplanting operations shall be of a type and size as herein specified.
 - C. Shade and Ornamental Trees: Shade and ornamental trees shall be transplanted to locations as directed by the Engineer. The Contractor shall stake proposed locations for approval by the Engineer prior to the initiation of transplanting procedures.

(SAMPLE LIST) SHADE TREES			
<u>Plant Name</u> Red Maple	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Red Maples	8"	(1)	(90")
Red Maple	9"	(1)	(90")
Sugar Maple	9"	(1)	(90")
Silver Maple	10"	(1)	(90")
Honey Locust	9"	(2)	(90")
Honey Locust	10"	(1)	(90")
Honey Locust	12"	(2)	(90")
		(9 Total) Shade Trees	

<u>Plant Name</u>	<u>SIZE</u>	<u>Total</u>	<u>Min. Tree Spade Size or B&B</u>
Flowering Crab	10"	(2)	(90")
Flowering Crag	9"	(1)	(90")
Flowering Crab	6"	(1)	(65")
Flowering Crab	4"	(1)	(55")
		(5 Total)	
		Ornamental Trees	

- D. Shrubs: Shrubs shall be transplanted as individual plants within existing planting beds and/or to newly created irregularly shaped planting beds as directed by the Engineer.
- E. Shrubs: Shrubs shall be transplanted as individual plants within existing planting beds and/or to newly created irregularly shaped planting beds as directed by the Engineer.

2. *TRANSPLANTING COST OF EXISTING PLANT MATERIALS*

The Contractor and the District agree that the transplanting cost of existing plant materials shall be as determined by the Engineer. The transplanting cost of any plant materials not transplanted by May 30 of the Spring plant season or November 30 of the Fall planting season shall be deducted from the Contractor's payment.

3. *MISCELLANEOUS PLANTING MATERIALS FOR TRANSPLANTED PLANT MATERIALS*

- A. Planting Soil: The planting soil shall be 8 parts by volume of topsoil, 2 parts by volume of blended mushroom compost as process by GSO America, Crystal Lake, Il 60014, or an approved equal and 5 lbs. of bone meal/c. yd. of mix.. Certification by the supplier is required. Planting soil mix shall be utilized to fill in pockets and/or voids for tree spade transplanted plant materials.
- 1. Topsoil: Topsoil shall be a natural, fertile, friable soil possessing the characteristics of rich productive soils in the Chicago area. Topsoil shall be without admixture of subsoil and shall be clean and free from clay lumps, weed seeds, roots, stones, stumps or similar substances, debris or other objects which are a hindrance to planting or care operations.

- 2. Mushroom Compost: Compost shall be a mixture of horse manure, straw, peat moss and fertilizer. It shall have been composted, used for mushroom growing, sterilized and then aged as a finished organic compost. It shall be free of foreign matter and harmful chemicals.
- 3. Bone Meal: Bone meal shall be finely ground and steamed.

B. Tree Wrapping Materials:

- 1. Wrapping Paper: The tree wrapping material shall be burlap, heavy crepe paper or commercially available tree wrapping paper. Wrapping paper shall be first quality, not less than 4" nor more than 8" in width. Burlap shall be at least 8 ounce burlap.
- 2. Wrapping Cord: Cord shall be jute twine not less than 2 ply. All ties or fasteners shall be of natural and decomposable material.

- C. Mulch Material: The mulch material for planting must be approved by the Engineer. It shall be uniformly graded and have the ability to completely block sunlight from reaching the surface of the soil. Mulch shall be from hard wood (tree bark nuggets); minimum chip size shall be 1/2"; maximum chip size shall be 1 1/2"; or shall be hardwood shredded bark, double processed. All mulch shall be clean with no "debris" or fines" (as processed by GSO America, Crystal Lake, Il 60014, or an approved equal). Certification by the supplier is required.

- D. Soil Amendments: At planting time, the roots of all trees and shrubs shall be treated with "Roots™ Dry Formula" as manufactured by Roots TM Inc., a Division of Lisa Products Corp., New Haven, CT 06511, or an approved equal. The rates of application shall be as follows: shade and ornamental trees – 1 lb. /cal. inch of tree; and shrubs – 1/2 lb./shrub.

9.06 EXECUTION

1. PLANTING TIME FOR TRANSPLANTED PLANT MATERIALS

The Contractor shall complete the work required in this Contract in accordance with the following:

- A. Transplanting: All plant materials to be relocated under this Contract shall be transplanted by no later than May 30 of the Spring planting season or November 30 of the Fall planting season..
- B. Plant Conditions: Regardless of calendar date, plants must be dormant at the time they are dug and planted.
- C. Weather Conditions: Transplanting operations shall be conducted under favorable weather conditions
- D. Restrictions: Planting shall not be made in frozen ground; holes shall not be dug in frozen ground and frozen backfill material shall not be used.

2. PLANTING PROCEDURES FOR TRANSPLANTED PLANT MATERIALS

- A. General: all plants shall be planted in the plumb position. Transplanted plants will be set at the same depth as they grew before transplanting.
- B. Layout of Planting Area: The Contractor shall furnish and place all stakes for locating the plantings. The specific location of each shade and ornamental tree shall be staked by the Contractor. Stakes shall be marked to indicate the tree species, variety, and size. Mass planting areas for shrubs, vines and ground covers shall be outlined by the Contractor and marked to indicate the shrub specie, variety, size and quantity, and typical spacing. The spacing and location of species shall be as directed by the Engineer at the preconstruction meeting to be held at a mutually agreed time and date prior to the commencement of the planting operations.
- C. Mixing the Planting Soil: The Contractor shall notify the Engineer as to site location, time and equipment necessary for mixing the planting soil a minimum of one week before processing. The method of mixing the components of the planting soil shall meet the approval of the Engineer. The plant soil shall be in a loose, friable condition at the time of planting.
- D. Backfilling: Prepared planting soil mix shall be utilized immediately to fill in pockets and/or voids for tree spade transplanted plant materials. APPROVED WATERING EQUIPMENT SHALL BE AT THE SITE OF THE WORK AND IN

OPERATING CONDITION PRIOR TO STARTING THE PLANTING OPERATION. Carefully tamp the plant soil during placement and thoroughly water after the backfilling has been completed. This watering shall completely saturate the backfill and be performed during the same day as the planting.

- E. After ground settles as a result of watering, the voids shall be filled to the proper level with the planting soil. All plants shall be set plumb and straight at the time of planting.
- F. Saucers: Soil shall be backfilled with a saucer shape around the plant at the outer edge of the hole to aid in irrigation. Watering saucers shall be constructed around all single plants. The saucers shall be a minimum of 4" deep and sized to surround the entire hole.
- G. Planting Beds: The entire area of planting beds shall be prepared to a depth of not less than 8" by tilling and/or disking prior to digging planting holes.

3. PRUNING FOR TRANSPLANTED PLANT MATERIALS

- A. General: Pruning shall be the responsibility of the Contractor. It shall be done immediately prior to transplanting in such a manner as to preserve the natural growth habit of the plant material.
- B. Deciduous Trees: Pruning shall consist of removing twigs and branches as directed by the growth habit of the trees being pruned. Unless otherwise directed by the Engineer, branches shall not be removed from a height exceeding one-third the total height of the shade tree; neither shall the leader or terminal buds be removed. Clump form trees, ornamental trees and shrubs shall not be stemmed up. All cuts over 1" in diameter shall be painted with an approved tree paint; paint shall cover all exposed cambium, as well as other exposed living tissue.
- C. Deciduous Shrubs: Multi-stemmed shrubs shall have one-third of their height removed while maintaining their natural form and shape. Single stemmed shrubs shall be pruned in the same manner as ornamental trees.

4. MULCH COVER FOR TRANSPLANTED PLANT MATERIALS

- A. General: Within 5 days after planting, a mulch cover shall be placed around all plants to control the growth of competing vegetation. All mulching material shall be applied to a minimum depth

of 3 ½". Depth of mulching material should not exceed 4".

- B. Individual Trees: Each individual shade and ornamental tree shall be mulched around each plant to cover the entire hole size.
- C. Individual Shrubs: Each Individual shrub shall be mulched around each plant to cover the entire hole size.
- D. Planting Beds: The entire area of irregularly shaped planting beds shall be mulched to a minimum distance extending 3' (three feet) beyond the dripline of the plants.

5. WRAPPING FOR TRANSPLANTED PLANT TREES

General: Trees shall be inspected for injury to trunks, insect infestation and improper pruning before wrapping. Within 7 days after planting, all deciduous trees shall be wrapped from the ground line to the height of the first branch.

The tree wrapping paper shall be wrapped tightly around the trunk from the bottom to the top with a minimum of 1" overlap. At the top and bottom and at two intermediate intervals not greater than 18", the wrapping paper shall be secured with ties of stout cord (jute twine not less than 2 ply) that will stretch with the growth of the tree. Remove cord after one growing season from fast growing species.

6. BRACING FOR TRANSPLANT TREES

General: Tree guying and staking will only be required when necessary to ensure the proper upright position of the tree as determined by the Engineer. Bracing materials shall be approved by the Engineer prior to installation.

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GENERAL REQUIREMENTS

(1) LIMITS OF WORK

In order to prevent interference between contractors on adjoining sections, it is hereby agreed that the occupation of the space and the performance of work within a distance of fifty (50) feet on either end of the limits herein specified or shown on the plans, shall be such as the Engineer may direct. The Contractor shall perform any work ordered by the Engineer in writing, that is included within a distance of fifty (50) feet beyond either end of said limits, and such work shall become a part of this contract, and the Contractor shall be paid for said work performed by him at the unit prices herein specified for each class of work performed. In the event that the Contractor is ordered by the Engineer, in writing, to delete any work within a distance of fifty (50) feet in either direction, from either of the end limits of this contract, and the Contractor shall not be paid for any work or for any anticipated profits on work deleted, and the work deleted may be performed by the Water Reclamation District or by any other of its Contractors. In any event, the Water Reclamation District shall not be liable to the Contractor for any damages or extra expenses for any decrease in the work to be performed hereunder, or for any expense that may result from any increase of the quantities of work, or from the performance of any work by the Contractor within a distance of fifty (50) feet beyond either end limit of this contract, in excess of the unit prices herein specified for work actually performed, nor shall the Water Reclamation District be liable for damage on account of the occupation by another contractor of the space within a distance of fifty (50) feet inside of the end limits of this contract.

(2) WATER MAINS

Wherever, in the performance of the work specified under this contract, it shall be necessary to remove, alter or repair water mains in the streets, public alleys and highways of the municipalities, the Contractor will arrange for the removal, alteration or repair of such water mains, without additional expense to the Water Reclamation District, and in accordance with the rules, regulations and ordinances of the municipalities under which this work is performed, subject to the approval of the proper municipal officials.

Wherever, in the performance of the work specified under this contract, it shall be necessary to remove, cut off or damage water service pipes in any way, the Contractor shall alter, repair or replace such water pipes and connect

the same to the water mains and shall in the meantime install and maintain temporary service in place of that interrupted, without extra charge to the Water Reclamation District. The Contractor shall perform all work on water service pipes in accordance with the rules regulations and ordinances of the respective municipalities.

Wherever it is necessary to alter, repair or replace water mains or service pipes, the Contractor shall take adequate measures to disinfect the new section in accordance with AWWA standards. All work performed by the Contractor shall have the approval for standards and quality of the local public health agency having jurisdiction and shall be approved by them before placing the section in service.

(3) PUMPING, BAILING AND CLEANING

The Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and properly dispose of all water or sewage entering the tunnel, trenches, or other parts of the work, and keep said excavations as dry as possible until the structures to be built therein are completed. All water pumped or drained from the work shall be disposed of in a suitable manner without damage to adjacent property, or to sewers, pavements, electrical conduits, or other work or properties. Until the acceptance of the work, the Contractor shall, if so ordered by the Engineer, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work shall clean the entire length of such finished part of the work, to the satisfaction of the Engineer.

The Contractor shall make provisions to dispose of all accumulated surface water at the site. The Water Reclamation District does not and will not provide an outlet for or handle the disposal of any such accumulated surface water.

The Contractor shall place and maintain any temporary dams, flumes, bulkheads or other structures, necessary to prevent water, from entering the work under this Contract, from adjacent sections of the sewer or adjacent structures, and shall completely remove the same when ordered by the Engineer where emergency by-passing of sewage is required into either a receiving ditch, waterway or storm sewer. The Contractor shall chlorinate such flows as approved by the Engineer.

All expense incident to or caused by said water conditions or by such interruption of the work shall be included in the unit or lump sum prices herein specified.

(4) PROTECTION OF STREETS AND TRAFFIC

The Contractor shall make safe provisions; so far as is practicable, at all cross street and private driveways for the free passage of vehicles and pedestrians. Where such provisions are impracticable or unnecessary, in the opinion of the Engineer, the Contractor shall make arrangements, satisfactory to the Engineer and the proper authorities, for the diversion of the traffic and shall provide all material and signs and perform all work necessary for the construction and maintenance of roadways and bridges for the diversion of traffic. Where openings are made in or adjacent to any street, alley or public place, the Contractor shall at his own expense, furnish such material and equipment, provide such watchmen, and take such other precautionary measures as are necessary for the protection of persons or property. All material excavated and the materials or plant used in the construction of the work shall be so placed as to safeguard the work and allow free access to all fire hydrants, water valves, gas valves, manholes or electric, telegraph and telephone conduits, and fire alarm and police call boxes in the vicinity. After completion of the work, the Contractor shall remove all equipment, and material that were created by his operations, and shall leave the work area and adjacent premises in a clean and orderly condition.

The Contractor shall comply with the provisions of "State of Illinois, Manual of Uniform Traffic Control Devices" and any regulations for all traffic control devices erected on Water Reclamation District construction projects.

(5) REPAIRING OF PAVED STREETS AND SIDEWALKS

Roads or pavements, storm ditches, culverts, gutters, curbs, crosswalks and sidewalks destroyed or damaged by the Contractor, in activities under this contract, shall be repaired or replaced by the Contractor without extra charge.

If the destruction or damage is due to settlement caused by work in the tunnel, the ground surface shall be brought to its original elevation and the damaged pavement, storm ditches, culverts, gutter, curb, crosswalk or sidewalk shall be replaced immediately with new material by the Contractor.

If the destruction or damage is due to work in open cut, then immediately after the trench or pits have been backfilled, the pavement, storm ditches, culverts, curb, crosswalk or sidewalk shall be temporarily restored and maintained by the Contractor, in as near the original condition as possible, using old materials at hand or such new materials as necessary to keep the street safe for traffic until it is permanently repaved or the curbs, gutters, crosswalks or sidewalks are permanently reconstructed.

(6) NEW PAVEMENTS, GUTTERS, CURBS AND WALKS

The Contractor shall obtain the consent of the Engineer and the appropriate Municipal, County or State authority having jurisdiction thereover, before constructing the permanent pavements, gutters, curbs, crosswalks and sidewalks in place of those destroyed or damaged. The Contractor shall construct the new pavements, gutters, curbs, crosswalks and sidewalks in a careful and thorough manner of like character to that destroyed or damaged, or of such other material as the Engineer shall order, provided the use of such other materials will involve no additional expense to the Contractor.

The use of old material removed from the work shall be subject to the inspection of the Engineer, and any rejected material shall be replaced with new material. Any deficiency shall be corrected with new material of approved quality. The materials used and the manner in which pavements, gutters, curbs, crosswalks and sidewalks are restored shall conform to the requirements and specifications of the municipality or governmental agency under whose jurisdiction the work is done, and shall be subject to the approval of the Engineer.

(7) TESTS

An infiltration test shall be made by the Contractor in the presence of the Engineer after the first one thousand linear feet or less of sewer is completed, as ordered by the Engineer. Additional tests of the type ordered by the Engineer will be required for each succeeding one thousand linear feet or less, as ordered by the Engineer. A final test of the type ordered by the Engineer will be required prior to final acceptance of this contract. All tests shall be conducted in a manner as to minimize interference with the Contractor's work or progress. No additional pipe shall be laid until the infiltration test on the section tested is satisfactory.

Where the depth of the ground water is not sufficient to completely submerge the section to be tested, an exfiltration test shall be used in place of an infiltration test when ordered by the Engineer. The Contractor shall be allowed additional payment for exfiltration tests in addition to the prices bid for sewer items. The additional payment shall be the actual cost of the work to the Contractor and shall be determined on a time and material basis for labor, material and equipment.

No additional payment for infiltration tests in addition to the prices bid for Sewer Items to be tested as called for in the Detail Specifications will be allowed.

Personnel for reading measuring devices will be furnished by the Engineer, but all other labor, equipment, materials and water, including gauges and meters, will be furnished by the Contractor.

Infiltration tests will be made by measuring the infiltrated flow of water over a measuring weir set up in the invert of the sewer at a known distance from a limiting point of infiltration. Exfiltration tests will be made by bulkheading the section to be tested and admitting water to the lower end allowing gas to escape at the upper end until the sewer is filled. The bulkheads must be watertight and water will be added until a level of water four feet above the crown of the sewer in the manhole at the upper end of the section is attained. The rate of flow required to keep this required head will be the exfiltration. All tests will be carried on for a length of time and at intervals as ordered by the Engineer.

The infiltration or exfiltration shall not exceed 32 gallons per day, per inch of sewer perimeter per mile of sewer, and no individual leak will be permitted that in the opinion of the Engineer might endanger the pipeline or the backfill around it. If the leakage exceeds the maximum permitted, the Contractor shall immediately make all repairs and replacements that in the opinion of the Engineer are necessary to secure the required water-tightness.

After all repairs are made to the satisfaction of the Engineer, the Contractor shall again make an infiltration or exfiltration test and this procedure will be repeated until a satisfactory test is made, if and when ordered by the Engineer. The cost of any additional testing, as specified by the Engineer, will be at the Contractor's expense and at no additional cost to the Water Reclamation District.

The Water Reclamation District shall not be responsible for any damage to the pipelines or otherwise due to testing.

(8) FLUMING AND BYPASSING

Full carrying capacity must be maintained in all sewers at all locations where connecting structures are to be constructed. The existing sewers may flow full or under pressure, therefore, the Contractor shall familiarize himself with the flow conditions to be encountered at all locations where connections to live sewers are required under this contract. Flumes and bypasses shall be designed for full capacity of the existing sewer. Plans and procedures shall be submitted to the Engineer for approval before proceeding with the work.

(9) TELEVISION INSPECTION

Prior to acceptance, the inspection of sewers of 42-inch dia. or smaller shall be conducted by a television with the recording on video tape of the entire length of sewer installed. The Contractor shall furnish all labor, electronic equipment and technicians to perform the closed circuit television inspection of the sewers. Operation of the equipment is to be controlled from above ground with a skilled technician at the control panel in the mobile television studio, controlling the movement of the television camera.

The technician shall have the capability to adjust the brilliance of the built-in lighting system by remote control.

The view seen by the television camera shall be transmitted to a monitor located inside a mobile TV studio. The mobile TV studio shall have the capabilities to produce a video tape.

The Contractor's mobile studio shall be large enough to accommodate up to five people for the purpose of viewing the monitor while the inspection is in progress.

The television inspection procedure shall be as follows:

- (a) After cleaning, sewer sections between the manholes shall be visually inspected by means of closed-circuit television. The inspection will be done one manhole section at a time.
- (b) The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video systems shall be capable of producing pictures of good quality.
- (c) The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater 30 feet per minute. Manual winches, powered winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
- (d) When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.
- (e) The importance of accurate distance measurements is emphasized. Measurements for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter roll-a-tape, or other suitable device.
- (f) Videotape Recordings: The purpose of the recording shall be to supply visual and audio records of the constructed sewer line, that may be replayed. The videotape shall include a brief and informal verbal description of the sewer line. Videotape recording playback shall be at the

- (g) speed it was recorded. It shall have slow-motion or stop-motion playback features. The Contractor shall have necessary playback equipment readily accessible for review by the Engineer during the Contract. The Contractor shall provide two copies of the videotape to the Engineer as a part of "As-Built" record set.
- (h) Inspection Report: A written report is to be submitted describing the procedures used and summarizing the results shown on the video tape with corrective action taken if required. This report is also to be part of the "As-Built" record set.

(10) DISPOSAL OF EXCAVATED MATERIAL

All excavated material, except that required for backfilling in open cut or elsewhere on this work, and, except as stated in Section 29, HISTORICAL AND SCIENTIFIC SPECIMENS, of the General Specifications, shall be removed from the site of the work as soon as excavated and shall be disposed of by the Contractor in a lawful manner without additional expense to the Water Reclamation District.

TUNNEL CONSTRUCTION

(11) WORK INCLUDED

Tunneling includes all of the equipment, materials and labor required to construct the underground construction procedures together with all the work at the ground surface and the construction of adits or shafts required to support and provide access to the work.

The applicable requirements of Tunnel Construction shall apply to all operations in which men and equipment are engaged in underground construction including tunneling through earth or rock, using hand or machine excavation, drilling and blasting in rock, placing temporary and permanent tunnel liners, jacking tunnel liner in place, grouting, pumping and all other required tunneling procedures approved by the Engineer and called for in the Contract Documents. The Contractor shall be responsible for all damage including damage to existing pavements, utilities or structures caused by his operations. All damage caused by the construction shall be repaired or replaced at Contractor's expense.

(12) LIGHTING AND VENTILATION

All tunnel work shall be lighted with a sufficient number of electric lights to insure proper work and inspection. A supply of fresh air by mechanical ventilation sufficient for the health, safety and efficiency of the workmen and engineers shall be provided at all times throughout the length of the tunnel and especially at the headings. Additional lights and ventilation shall be provided wherever the Engineer may direct to insure health or safety.

(13) TEMPORARY SHAFTS AND EXCAVATIONS

The Contractor shall make all arrangements necessary for the locations, construction and operation of the temporary shafts, drifts and tail tunnels required for construction of the specified work. Plans and calculations shall be prepared and stamped by a structural engineer registered in the State of Illinois and submitted for the Engineer's approval prior to start of construction.

All shafts and/or excavations shall be covered or backfilled whenever work ceases for the day.

The structures shall be constructed of proper size and shape and shall be suitably equipped to allow work to be carried on expeditiously.

Adequate provisions shall be made for safe access and egress of personnel to and from the work at all times.

Upon the completion of the work, the Contractor shall remove and completely backfill all shafts, drifts and tunnels not part of the finished work in a manner which will restore the subsurface and grade to a conditions equal to that which existed prior to construction.

Backfilling of earth excavations shall be done as specified herein under Sections 37 and 38 of the General Specifications-Sewers. Backfilling in deep rock excavations shall be accomplished in a manner which will prevent the possibility of migration of ground waters between existing underground aquifers. Contractor's procedure for backfilling shall be included in his plans and calculations for construction of the temporary shafts and excavations.

(14) EXCAVATION

The tunnel shall be excavated and trimmed to such size and shape as will allow the placing of the full masonry section of the sewer to the specified tolerances of line and grade as shown on the plans.

If steel bracing is used, the full masonry sections shown on the plans shall be placed inside any indentations in the body of the plates used to support the earth. Flanges or shapes may extend into the body of the masonry a distance not to exceed two (2) inches. If wooden bracing is used, no part hereof shall extend into the sewer section shown on the plans. No additional payment or allowance of any nature will be made for the use of the steel plates or shapes for supporting the earth.

If permission is given the Contractor to excavate the tunnel for a specified distance without immediately placing the concrete lining, the proposed method of bracing the tunnel and the extra bracing necessary shall be submitted for approval to the Engineer.

Should any movement of the earth over or adjacent to the work occur, the Engineer may order any or all work under this contract stopped except that which is necessary to secure the work and to preventing further movement of the ground over or adjacent to the work. The Contractor shall resume tunneling at the place at which movement of the earth over or adjacent to the work has occurred only when, in the opinion of the Engineer, he has taken all necessary precautions to prevent further movement.

The Contractor, will keep a record of the elevation of all sewer, water and utility lines to detect any settlement of or damage to such utilities. The Contractor shall immediately restore, at his own expense, any utilities damaged by his operations and will insure against further settlement.

(15) SHEETING, BRACING AND LINING

All excavations in earth for shafts and tunnels shall be adequately sheeted and braced.

A drawing with calculations prepared by the structural engineer registered in the State of Illinois, showing the method and sizes of lining and bracing proposed to be used shall be submitted to and approved by the Engineer before the necessary materials or equipment is ordered by the Contractor.

Special care shall be exercised to insure that full bearing is obtained between the lining and sheeting and the earth.

If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe in the opinion of the Engineer, the Engineer may require and the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety required by the Engineer. The Contractor shall provide such added bracing and support by such method approved by the Engineer as he may elect to use, but the taking of such precautions shall in no way relieve the Contractor of his sole and final responsibility for the safety of lives, work and structures.

(16) BREASTING

The Contractor shall at all times keep available near each heading sufficient breasting and bracing to secure the heading against soil movement.

All such additional bracing and support shall be done at no additional cost to the Water Reclamation District.

(17) UNAUTHORIZED EXCAVATION

Wherever excavation is performed beyond of the specified outside dimensions of the masonry section to allow the placing of the sheeting, bracing or lining or whenever the Contractor is allowed to excavate beyond the lines of the finished work for his convenience, or whenever material beyond of the specified outside dimensions of the

section caves or breaks into the tunnel, then the Contractor, without extra payment therefor, shall completely fill the remaining space with concrete of the quality specified for the sewer section or such other materials as the Engineer shall order.

(18) PLAN FOR TUNNEL CONSTRUCTION

Fireproof materials shall be used in all above ground tunnel plant structures, within 100 feet of the shaft. On all shafts, steel bracing and tight wood lagging will be required. In the tunnel construction, steel ribs and wood lagging will be permitted. The electrical service buildings may be constructed of either wood, steel or other material which, in the opinion of the Engineer, is acceptable.

An adequate reversible mechanical ventilation system shall be provided to properly ventilate all sections of the tunnel in a manner satisfactory to the Engineer.

The Contractor shall have in operation in each heading at all times an audible automatic gas alarm. The alarm shall be Gas Tech Portable Gas Detector, Model GX 3 as manufactured by Gas Tech, Inc., Mountain View, California or Seni Tox 2, Model DC as manufactured by Bacharach Instrument Co., Mountain View, California, or equal as approved by the Engineer, listed by the NIOSH, OSHA or other nationally recognized testing laboratory.

In addition, the Contractor shall have at each work site approved portable testing equipment to measure for carbon monoxide and hydrogen sulfide gases and oxygen deficiency.

Sanitary conveniences for the use of all persons employed on the project shall be constructed and maintained by the Contractor in sufficient number in accordance with the State of Illinois, Health and Safety Rules, and in such manner, and at such places as shall be approved by the Engineer.

Where diesels are operating or blasting is done, a nitrogen dioxide tester shall be available.

Fire hydrants sufficient in number and capacity, for the anticipated fire loading shall be temporarily installed to protect the main shaft, yard and out buildings.

Where a conveyor system, utilizing a vertical belt of combustible materials is used, a fixed detection and extinguishment system shall be installed and maintained.

OPEN CUT CONSTRUCTION

(19) WORK INCLUDED

Installation of sewers in open cut shall include: clearing the site of the work, loosening, loading, removing and disposing in the specified manner all materials, wet or dry; furnishing, placing and maintaining of all sheeting, bracing and timbering; pumping, bailing, fluming; protecting and repairing of existing structures and utilities; installing the sewer section; backfilling; and all incidental and collateral work necessary completing the entire work as specified.

(20) EXCAVATION

The excavation between the lines of sheeting shall be of sufficient width to permit the work to be constructed in the manner and of the size specified without any part of the bracing or sheeting being inside the lines of the completed concrete section of the structure being built. Excavations in paved and traffic areas shall be kept to the minimum dimensions required for construction.

Topsoil shall be stripped off separately and stored for replacement of top surface over the backfill.

(21) SHEETING, BRACING AND TIMBERING

The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, utilities or structures outside of the trench or pit.

Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Plans and as ordered by the Engineer.

All sheeting systems shall be left in place under the following conditions:

1. Sheeting in contact with concrete or masonry.
2. Where specified in the Contract Documents.

Unless otherwise specified, the sheeting left in place shall be cut off as directed by the Engineer.

No additional payment shall be made for sheeting left in place.

If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe in the opinion of the Engineer, the Engineer may require and the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety required by the Engineer. The Contractor shall provide such added bracing and support by such method approved by the Engineer as he may elect to use, but the taking of such added precautions shall in no way relieve the Contractor of his sole final responsibility for the safety of lives, work and structures. The use of such additional bracing and support shall be without additional cost to the Water Reclamation District. The failure of the Engineer to order the aforementioned additional bracing shall in no way relieve the Contractor of his sole and final responsibility.

(22) UNAUTHORIZED EXCAVATION

Whenever excavation in open cut is performed without authority, beyond the lines and grades shown on the Plans or as directed by the Engineer, the Contractor shall backfill without extra payment therefor, all such excavated

space beyond such lines and grades with concrete or other material as the Engineer may direct.

(23) LAYING PIPE

The trench shall be excavated in accordance with the depths and widths shown on the Plans. Trench widths in excess of those shown on the Plans will not be permitted.

Steel or wood sheeting shall be furnished and installed as required and its use shall be determined by the ground conditions encountered, easement agreements as specified or as directed by the Engineer and as shown on the Plans.

Dewatering operations sufficient to maintain the water level at or below the surface of trench bottom or base of the bedding course shall be accomplished prior to placement of pipe or concrete, if not performed prior to excavation and placing of the bedding as called for on the contract Plans. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation.

The pipe shall be laid to the line and grade shown on the Plans.

Where practicable, pipe shall be laid with the bell or groove end at the advancing end of the pipe. Before laying, the joint surfaces shall be clean and free of all dirt and other foreign material. The gasket and the joint surfaces of the pipe to be laid shall be lubricated and the gasket properly placed in the groove on the spigot or tongue end. No petroleum product shall be used for lubrication, see Section 30 of this Specification. The pipe shall then be laid and pulled firmly into position. Care shall be exercised to see that the pipe is straight and level as the spigot enters the bell. The position of the gasket shall be checked with a feeler gauge to see that it is properly positioned.

If adjustment in the position of the length of pipe is required after it has been laid or if the gasket is found to be out of place, the length of pipe shall be removed, cleaned and re-jointed as for a newly laid pipe.

Concrete cradle shall be Class R or Class RA. Backfill below a level one foot above the top of pipe may take place after the concrete has achieved a sufficient initial set so that no damage to the concrete will occur when placing the backfill. The concrete shall have a compressive strength of 2,000 pounds per square inch prior to backfilling of the trench over a level one foot above the top of the pipe.

The Contractor shall have the option of adding calcium chloride in amounts not to exceed two (2) percent by weight of the cement to Class R or Class RA concrete that is to be furnished and placed only for un-reinforced pipe cradle or encasement.

The calcium chloride shall comply with the requirements of ASTM Standard D 98 Type S or Type L. Calcium chloride additive will not be permitted when reinforcement bars are to be placed in concrete. All other requirements of General Specifications - Concrete shall apply.

LINE AND GRADE

(24) SETTING LINE AND GRADE

The Contractor is responsible for setting line and grade from the information included in the Plans and Specifications, and in accordance with the General Specifications, Section 8, Lines and Grades. No payment in addition to the price bid for the respective items will be allowed for setting line and grade.

The control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument.

(25) LINE AND GRADE FOR SEWER IN OPEN CUT

The tolerance in line and grade of installed pipe shall comply with the following:

Variance from established line and grade shall not be greater than one thirty-second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (1/2) inch, provided that any such variation does not result in a level or reverse sloping invert; provided also, that variations in the invert elevations between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (1/64) of an inch per inch of pipe diameter, or one-half (1/2) inch maximum.

(26) LINE AND GRADE FOR SEWER IN TUNNEL

The tolerance in line and grade of installed sewer shall comply with the following: Departure from established L grade - 2", Departure from established line - 3".

The return to established line and grade shall be at a rate no greater than 3" per 100'.

Any pipe placed which does not comply with this requirement shall be replaced at the Contractor's expense.

PIPE SEWERS

(27) GASKET SPECIFICATIONS

Gasket stock shall be a synthetic rubber compound in which the elastomer is Neoprene, exclusively. Said compound shall contain not less than 50% by volume of Neoprene and shall contain no factice, reclaimed rubber or any deleterious substances, ASTM Standard C 361. The stock shall be extruded or molded and cured in such a manner that any cross-section will be dense, homogeneous and free from porosity, blisters, pitting and other imperfections.

The stock shall be extruded or molded with smooth surfaces to the required dimension within a tolerance of $\pm 1/32$ " at any cross section. The gasket stock shall meet the following physical requirements when tested in accordance with the appropriate ASTM standards:

Tensile strength ___ 1500 psi minimum ASTM Standard D 412.

Elongation at Break ___ 350% minimum, ASTM Standard D 412.

Shore Durometer Type A ___ 40 ± 5 for pipe diameters less than 90" (60 ± 5 may be used for pipe diameters over 90"), ASTM Standard D 2240.

Durometer Aging ___ Hardness increase after 48 hours at 14 degrees F + 15 points maximum.

Compression set ___ 20% maximum when compressed 22 hours at 158 degrees F, ASTM Standard D 395, Method B.

Accelerated Aging ___ 20% maximum tensile, 40% maximum elongation deterioration, 15 points maximum increase in hardness, all determined after oven aging for 70 hours at 212 degrees F, ASTM Standard D 573.

Liquid Immersion, Oil ___ 80% maximum volume change after immersion in ASTM Oil No. 3 for 70 hours at 212 degrees F, ASTM Standard D 471. Test specimens shall have a height or thickness of $0.08" \pm 0.005"$ the test specimens shall be discs cut from the gaskets. The dimensions and shape of the discs shall be that of the cross-section of the gasket.

Liquid Immersion, Water ___ 15% maximum volume change after immersion in water for 7 days at 158 degrees F, ASTM Standard D 471. Test specimens shall have a height or thickness of $0.08" \pm 0.005"$, ASTM Standard D 471. The test specimens shall be discs cut from the gaskets. The dimensions and shape of the discs shall be that of the cross-section of the gasket.

Ozone Cracking ___ no visible cracking at 2 times magnification of the gasket after 72 hours exposure in 50pphm ozone concentration at 100 degrees F, testing and inspection to be on a gasket loop mounted to give approximately 20 % elongation, ASTM Standard D 1149.

The Contractor shall furnish certified copies of laboratory reports from the gasket supplier indicating conformance with the above requirements for each shipment of gaskets. A minimum of 2 tests for each pipe diameter shall be performed at the Contractor's expense on gaskets selected at random by the Engineer. Tests shall be performed by an independent testing laboratory and shall include all the tests listed above.

Each gasket shall be permanently marked with the manufacturer's trademark or name, date of manufacture, and the initials of the Water Reclamation District. All gaskets shall be stored in a cool place, preferably at 70

degrees F, or less and in no case shall the gasket for joints be exposed to direct rays of the sun for more than 72 hours.

No more than two (2) vulcanized joint will be permitted on any one gasket.

(28) VITRIFIED CLAY SEWER PIPE

The Contractor shall furnish and lay vitrified clay sewer pipe in accordance with the provisions for concrete pipe. See Sections 24, 25, 26, and 27 of the General Specifications-Sewers and as shown on the Plans.

All pipe and specials shall conform to ASTM Standard 700. Joints shall conform to ASTM Standard C 425, Type 3.

(29) REINFORCED CONCRETE SEWER PIPE

All reinforced concrete circular pipe shall be provided with bell and spigot or tongue and groove type joints for use with rubber gaskets as hereinafter specified. Excessive shrinkage cracks in the bell and spigot or tongue and groove ends or excessive bleeding at form ends which expose aggregates or create voids, or other defects or damage to the end of the pipe which would prevent making a satisfactory joint, as determined by the Engineer, shall be deemed reason for rejection of the pipe. The pipe shall have a preformed groove on the tongue or spigot face of each pipe section to properly position and confine the rubber gaskets in the annular space.

All reinforced concrete sewer pipe shall conform to ASTM Standard C 76. The pipe joints shall conform to ASTM Standard C 361. All references to a specific class of pipe and wall thickness shall conform to the requirements of that specified under ASTM Specification C 76. The reinforcement steel in the joint shall be tied to the pipe barrel steel as called for in ASTM Standard C 361.

Cement used under Specification ASTM Standard C 76 shall be limited to ASTM Standard C 150, Type II or Type I with flyash or ASTM Standard C 595 Type IP (MS).

Gaskets for concrete pipe shall conform to Section 28, Gasket Specifications of the General Specifications-Sewers. The gaskets shall be of sufficient cross-sectional area and volume so that when the joint is assembled, the gasket will be compressed to form a water-tight seal. Gaskets shall be extruded or molded and cured in such a manner that any cross-section will be dense, homogenous and free from porosity, blisters, pitting and other imperfections. The gaskets shall be molded or extruded to the tolerance as specified.

Any foreign material which adheres to the pipe and interferes with the proper seating of the gasket shall be removed. No cracked, broken or otherwise defective gaskets shall be used in this work. As the work progresses,

the interior of the pipe shall be cleaned of all dirt and all other superfluous material.

Lubricant for use with the gasket shall be equal to the vegetable oil soap as manufactured by Davis Young Corp., Fort Wayne, Indiana, or a Bentonite Slurry diluted to a paste of consistency satisfactory to the Engineer. No petroleum product shall be used as a lubricant.

The Contractor shall submit to the Engineer for approval, detailed drawings of pipe and pipe joint to be furnished and placed under this contract, including the dimensions of the rubber gasket and the joint in the assembled pipe position.

The supplier of reinforced concrete sewer pipe shall submit for approval the design of pipe sizes not listed in the tables of ASTM Standard C 76. The information submitted shall show wall thickness, concrete strength, and the area, type, placement, and strength of the steel reinforcement and shall meet the D-load strength test requirements as called for in the ASTM tables.

Reinforced concrete sewer pipe delivered to the job site shall be not less than ten (10) days old from date of manufacture and except for closure pieces, shall be not less than 6-feet nor more than 12-feet long unless otherwise approved by the Engineer.

On each reinforced concrete sewer pipe manufactured, the following items shall be clearly marked on the interior surface of the pipe: (1) class and size of pipe; (2) date of manufacture; and (3) name or trademark of the Manufacturer.

No reinforced concrete sewer pipe shall be delivered to the job site without the Water Reclamation District inspector's stamp affixed thereon, and shall be subject to re-inspection upon delivery to the job site.

(30) JACKING PIPE

The precast concrete pipe specified in the contract has been designed to support the maximum anticipated earth loads and superimposed live loads which will be imposed on the pipe when installed in a smooth machine mined bore of specified diameter and grouted in place.

The imposition of additional stresses during jacking operations has not been considered in specifying the pipe and pipe joint. The Contractor, if choosing the option of jacking the precast concrete pipe, shall upgrade the quality and strength of the pipe and pipe joint specified to the extent necessary to withstand the additional stress imposed by the jacking operations. The details shall be submitted to the Engineer for approval. The pipe shall be jacked in place without damaging the pipe joint or barrel.

Circular pipe sewer jacked in place does not require primary lining. The pipe section shall be jacked as excavation progresses in a way which leaves no length of excavated tunnel exposed at any time. Bentonite shall be applied to lubricate the pipe in order to facilitate the jacking operation.

The bentonite shall be displaced from the space between excavation and pipe exterior by cement grout after completion of each jacking operation between shafts.

Pressure and the amount of the grout shall be limited by the Contractor to avoid pipe damage and displacement of the pipe beyond specified tolerance.

Wherever the pipe projects into open excavations such as shafts where the surrounding soil is excavated beyond the limits of the machine mined bore, the Contractor shall redesign the pipe section to suit the changed conditions caused by his construction procedures. Such redesign shall be performed by a registered Structural Engineer in the form of calculations and design details and submitted to the Engineer for review. All such changes shall be duly detailed and noted on the "As-Built" drawings.

Prior to construction, the Contractor shall submit for approval the complete construction procedure and equipment he proposes to use for jacking. The Contractor shall also submit calculations stamped by a Structural Engineer registered in the State of Illinois which will clearly show that maximum bearing stresses imposed upon the concrete by the jacking effort will not exceed .375 of the ultimate strength of the concrete. The calculations shall clearly state the unit hydraulic pressure which is required to develop the maximum allowable jacking effort and that this unit hydraulic pressure should not be exceeded during jacking operations.

The minimum requirements for jacked alternate pipe in excess of the specified requirements of ASTM C 76 for pipe and ASTM 361 for joints are as follows:

1. Minimum 5000 psi concrete compressive strength.
2. Full circular cage reinforcing at inside and outside face of pipe.
3. Cast in place fittings in the pipe wall as required for application of bentonite and grout.
4. Supplemental joint reinforcing.
5. Provide minimum 5/8 in. of suitable cushioning material full circumference in joints.
6. Straight outside wall without bell damage.
7. Variations in laying lengths measured at ¼ points on the circumference of the pipe shall not be more than 1/8 in./ft. of diameter with a maximum of 3/8 in. in any length of pipe. Maintain squareness and proper joint configuration by means of a joint template within an allowable tolerance of 3/16 in. on the spigot shoulder measured at ¼ points on the circumference of the pipe.
8. The pipe shall be poured in a true vertical position with the bell at the bottom.

9. Contractor shall provide jacking frame for uniform distribution of the load around the periphery of the joint to protect bells. Circular pipe sewer jacked in place does not require primary lining.

Any installed pipe found to be damaged shall be replaced by the Contractor. Damaged pipes are not acceptable under this contract. Slight damage as determined by the Engineer may be repaired only with the approval of the Engineer. In the event of unusual circumstances which could not be reasonably anticipated and after every other alternative has been demonstrated to be ineffective and if the interests of the Water Reclamation District are best served the Engineer will accept the repair or total reconstruction of a damaged pipe length. Calculations stamped by a structural engineer registered with the State of Illinois shall be furnished attesting that the repaired pipe or pipe reconstructed in place will be equal to or will exceed in strength and anticipated life of the pipe specified. Final acceptance of each repair or reconstruction will be contingent upon receipt of the Contractor's Structural Engineer's written statement that the work was completed under his direct supervision in the field and that the furnished work is equal to or better than the pipe lining as specified under the contract.

In reference to the Contract Plans, it is required that the "L" dimension exceed the "B" dimension by a minimum of one-eighth inch. During the jacking process, the Contractor shall place an approved compressible cushioning material on the bearing area at the joint to evenly distribute the jacking pressure around the perimeter of the pipe and to prevent localized pressure.

A joint opening (z) in installed pipe which is less than one-eighth an inch shall be clear indication of unseen failure on the outside of the pipe and it will be required that the Contractor replace the entire damaged pipe between joints.

Inability of the Contractor to complete a jacking run without delay to pipe lengths within the run shall be cause for the Engineer to rescind approval for the jacking method and the Contractor shall be required to proceed with alternate tunnel methods, allowed under Contract, at no additional cost to the Water Reclamation District.

IRON CASTINGS AND MISCELLANEOUS METALS

(31) DESCRIPTION

The contractor shall furnish, deliver and place iron castings, including manhole frames and covers, and miscellaneous metal parts, and such other iron castings and metal parts as shown on the plans or as ordered by the Engineer. All pieces shall be plainly marked with the piece mark as called for on the Plans. Painting, if required, shall be performed as called for in the Plans and Specifications.

(32) MATERIAL AND WORKMANSHIP

All castings shall be of tough, close-grained gray iron, free from blowholes, shrinkage cracks and cold shuts. They shall conform to a suitable grade of the "Standard Specifications of Gray Iron Castings," ASTM Standard A 48. They shall be sound, smooth, clean and free from blisters and all defects. All castings shall be made by the cupola process. No plugging of defective casings will be permitted. When malleable casings are required they shall be furnished and installed hereunder and shall conform to the Standard Specifications for Cupola, Malleable Iron," ASTM Standard A 197.

All castings shall be made accurately to dimensions shown and shall be placed, chipped, filed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowance for shrinkage shall be made in the patterns so that the specified thickness shall not be reduced. Manhole covers shall be true and shall seat at all points. All drilling and tapping shall be carefully and accurately done.

Steel parts shall be open hearth medium steel of quality conforming to the "Standard Specifications for Structural Steel for Buildings," ASTM Standard A 36.

All parts called for on the Plans as galvanized shall be coated in accordance with "Zinc Coating on Standard Steel Shapes," ASTM Standard A 123. All galvanized metals whose coating are damaged during shipment or installation, shall be touched up with Water Reclamation District 117 zinc rich primer paint.

Bronze bushings shall be of good quality phosphor-bronze. All parts called for as chromium-nickel steel shall be made of a ferrous alloy approved by the Engineer.

The Contractor shall notify the Engineer when castings and material parts are ready for inspection. See the General Specifications, "Inspection and Testing of Materials."

(33) BOLTS AND NUTS

Stud, tap and machine bolts shall be of specified wrought-iron or of specified structural steel of rivet quality unless otherwise specified. In general, square heads and hexagonal close fitting nuts shall be used. All thread shall be clean cut of the U.S. standard sizes.

(34) INSERTS

All inserts to be imbedded in the concrete shall be malleable castings, heavily galvanized or primed with Water Reclamation District 117 zinc rich primer suitably normalized and of a type approved by the Engineer.

(35) CAST IRON PIPE

All cast iron pipe shall be furnished in accordance with ANSI Standard A21.15 with the type of joint as specified in the Detail Specifications and/or shown on the Plans. Pipe shall be furnished in full lengths except where shown

on the Plans in shorter lengths or where necessary to make closure.

All fittings shall conform to ANSI Standard A21.10 at the pressure rating as specified in the Detail Specifications and/or shown on the Plans. Where ANSI Standard A21.10 is not applicable, the fittings shall conform to ANSI Standard B 16.1 Specification.

All rubber gasket joints for cast iron pipe and fittings shall conform to ANSI Standard A21.11.

Fittings for pipes over 12 inches in diameter shall have a pressure rating of 150 psi. Fittings for pipes 12 inches in diameter or less shall have a pressure rating of 250 psi.

Wall pipes and wall sleeves shall be furnished with intermediate wall collars and shall have end types as shown on the Plans and shall have a pressure rating of 150 psi except where they extend beyond the outside surface of the wall in which case they shall have a pressure rating of 250 psi.

Pipe and fittings shall be furnished bituminous coated inside and outside unless otherwise specified in the Detail Specifications and/or shown on the Plans.

Cement linings specified in the Detail Specifications and/or shown on the Plans shall conform to ANSI Standard A21.4. Pipe furnished with cement lining shall be bituminous coated on the outside.

Ductile Iron Pipe specified in the Detail Specifications and/or shown on the Plans shall conform to ANSI Standard A21.51 with all other requirements as listed above for cast iron pipe, except all thickness which shall be designated by a class number based on ANSI Standard A21.50.

BACKFILLING

(36) BACKFILL-GENERAL

In locations where the Permits, Easements, Ordinances, Contract Plans or the General Specifications require sand or other granular backfill, material shall be as specified in Section 38, Sand, Gravel or Limestone Backfill of the General Specifications-Sewers.

Where sand or other granular backfill is not required, regular backfill may be used. Regular backfill shall be a uniformly divided material free from debris, stones larger than 6", objectionable organic matter and frozen materials and must be capable of compacting to a dense, stable backfill free of after-settlement.

Backfilling, unless otherwise specified, shall take place in accordance with the requirements of applicable easements, ordinances, or permits. The Contractor's attention is directed particularly to the backfill requirements of the State Highway Permits and other applicable permits.

Sheeting shall be extracted where practicable ahead of the backfilling where this procedure can progress without endangering the side of the excavation and in such a manner as to leave no voids in the space previously occupied by the sheeting.

Sheeting extracted after backfilling shall be removed in such a manner as to preclude leaving voids in the space previously occupied by the sheeting and in such a manner as to be consistent with Sections 21, Excavation and 22, Sheeting, Bracing and Timbering of the General Specifications-Sewers.

All excavations in open cut shall be backfilled to the line and grades shown on the Plans or the ground surface as found where no lines or grades are shown on the Plans. The backfilling shall be well tamped in such a manner as to allow as little after-settlement as possible.

After the sewer or structure has been constructed and the concrete has hardened to the satisfaction of the Engineer, the Contractor shall backfill the trench in such a manner that will cause no damage to the sewer or structure by the shock of falling earth or otherwise. The backfill shall be deposited in such a manner as to prevent eccentric loading and excessive stress on the sewer or structure. Topsoil stripped in excavation shall be replaced on top of the backfilled material.

All backfilling operations shall be accomplished as soon as possible, the trench being filled as soon as the concrete is sufficiently set to safely support the imposed loads. In streets and in other places when the Engineer shall so order, the backfilling shall not be left unfinished more than four hundred (400) feet behind the completed sewer structure.

Where existing structures have been removed and backfilled or where additional fill or mounds are placed around manholes or structures, topsoil equal in depth to that in surrounding areas shall be placed in the backfilled section and fertilized, seeded and rolled to the satisfaction of the owner of the land.

All fill slopes shall not be steeper than 3 horizontal to 1 vertical, unless otherwise directed by the Engineer.

(37) SAND, GRAVEL OR LIMESTONE BACKFILL

All excavations under or adjacent to a structure, railroad or to any type of pavement, including concrete, concrete base, bituminous, gravel or crushed stone, shall be backfilled and compacted as follows:

Sand, gravel, limestone screenings or crushed limestone backfill shall be used from the bottom of the sewer trench or excavations up to a point where the distance to the top of the natural ground surface equals the distance from the nearest edge of the sewer trench or excavation to the pavement, railroad tie or structure. It may contain material passing a No. 200 mesh sieve not to exceed ten percent by weight, but shall contain no organic matter. Material passing a No. 16 mesh sieve shall not exceed eighty-five percent by weight. Not less than eighty-five percent of the material shall pass the one inch sieve and shall not contain stone larger than four inches. Backfill shall not contain any frozen or cemented material.

Backfill shall be placed in 6 inch lifts prior to hand compaction. Backfill shall be placed in 12 inch loose lifts prior to compaction with heavy mechanical compactors.

Compaction for granular material shall be at least 95 percent of maximum density as determined by ASTM Standard D 1557.

Sand and gravel material shall be obtained from an approved sand and gravel pit or limestone screens or crushed limestone from an approved material yard or quarry.

Material removed from the excavated trench will not be allowed as backfill, unless it is approved by the Engineer as meeting the above specifications.

Cinders or slag will not be approved as backfill.

The use of surplus concrete or concrete truck wash as backfill will not be permitted unless specifically approved by the Engineer.

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Description of Work.

1.2 DESCRIPTION OF WORK

A. General: The Work to be done under this Contract consists of the construction of improvements at a location as shown and specified in Contract Documents entitled:

**Flood Control Project on Midlothian Creek
in
Robbins, Illinois, CSA
Contract 14-253-5F
Metropolitan Water Reclamation District of Greater Chicago**

B. The Work includes:

1. Furnishing all labor, material, superintendence, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.
2. Obtaining all permits required to complete Work.
3. Coordination with utility companies and municipalities necessary to complete Work.
4. Sole responsibility for adequacy of equipment.
5. Maintaining the Work area and site in a clean and acceptable manner.
6. Maintaining existing facilities in service at all times except where specifically provided for otherwise herein.
7. Protection of finished and unfinished Work.
8. Repair and restoration of Work damaged during construction.
9. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
10. The following is a listing and brief description of the main construction activities that will be required for the work under this Contract:
 - a. Construction of a rain garden (approximately 12,000 square feet) and approximately 1,250 linear feet of bioswales along Sawyer Ave. and Spaulding Ave. between 139th St. and 137th St., and on 138th St. between Kedzie Ave. and Sawyer Ave. in Robbins, IL, including clearing, debris removal and disposal, topsoil stripping and stockpiling, unsuitable and surplus soil, rock, and other material removal and disposal, grading, topsoil import, plantings, culvert and manhole installation, and pavement removal and replacement associated with culvert installation.
 - b. Improvements to Midlothian Creek between 139th St. and 137th St. in Robbins, IL, including clearing, debris removal and disposal, topsoil stripping and

stockpiling, excavation, unsuitable and surplus soil, rock, and other material removal and disposal, fill, grading, construction of diversion weir structure, removal and replacement of existing sidewalk, topsoil import, plantings, and installation of in-channel pools and riffles.

- c. Construction of 1,120 linear feet of storm sewer along Midlothian Creek between 139th St. and 137th St. and 130 linear feet of storm sewer beneath Kedzie Ave. in Robbins, IL, including manholes, and connection to existing 84-inch diameter storm sewer near the intersection of 137th St. and Kedzie Ave., and including associated pavement removal and replacement. Storm sewer beneath Kedzie Ave. requires bored and jacked installation.
- d. Construction of a wetland pond near 137th St. and Kedzie Ave. in Robbins, IL, including clearing, debris removal and disposal, utility removal, topsoil stripping and stockpiling, earth and rock excavation, unsuitable and surplus soil, rock, and other material removal and disposal, contaminated soil removal and disposal, grading, construction of pond inlet structure, construction of fish habitats, landscaping, topsoil import, plantings, mown lawn paths, and channel dredging and debris clearing in Midlothian Creek between 137th St. and Sacramento Ave.
- e. Construction of paved access and walking paths in the wetland park, including asphalt road and parking area, precast concrete bridge, and concrete paths.
- f. Construction of approximately 800 linear feet of diversion channel from the wetland pond to the intersection of 135th St. and Claire Blvd. in Robbins, IL, including clearing, debris removal and disposal, utility removal, topsoil stripping and stockpiling, earth and rock excavation, unsuitable and surplus soil, rock, and other material removal and disposal, contaminated soil removal and disposal, grading, landscaping, topsoil import, plantings, mown lawn paths, and channel drop structures.

Note: The above list is not all inclusive of all of the construction activities required under this contract. The Contractor is responsible for performing all detailed and specified construction activities to provide the stormwater benefits of the project.

- C. **Implied and Normally Required Work:** It is the intent of these Specifications to provide the District with complete operable systems, subsystems, and other items of Work. Any part or item of Work that is reasonably implied or normally required to make each installation satisfactorily and completely operable is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.
- D. **Quality of Work:** Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 11 05

INSURANCE

PART 1 - GENERAL

1.1 INSURANCE AND LIMITS

- A. Provide insurance as specified below in accordance with Article 17 of the General Conditions:

<u>Line of Insurance</u>	<u>Minimum Acceptable Limits of Liability by Grouping</u>
1. Worker's Compensation	Statutory
2. Employer's Liability	
a. Each accident	\$5,000,000.00
b. Each employee-disease	\$5,000,000.00
c. Policy aggregate-disease	\$5,000,000.00
3. Commercial General Liability	
a. Per occurrence	\$10,000,000.00
b. General aggregate-per project	\$10,000,000.00
c. Products/Completed Operations	\$10,000,000.00
4. Business Auto Liability	\$5,000,000.00
5. Professional Errors & Omissions	\$5,000,000.00
6. Environmental Impairment Liability	\$5,000,000.00
7. Builder's Risk	Per Article 17A - GC

NOTE: THE CERTIFICATION SHALL CLEARLY STATE THAT THE "WATER RECLAMATION DISTRICT, ITS COMMISSIONERS, OFFICERS, AGENTS, AND EMPLOYEES" ARE ADDITIONAL INSURED UNDER COMMERCIAL GENERAL LIABILITY INSURANCE, BUSINESS AUTO LIABILITY INSURANCE AND, IF REQUIRED, ENVIRONMENTAL IMPAIRMENT INSURANCE. THE WATER RECLAMATION DISTRICT SHALL BE THE NAMED INSURED ON THE BUILDER'S RISK POLICY CERTIFICATE.

- B. If the Contractor chooses to utilize an Umbrella Policy to satisfy a portion of the above requirements, only a maximum of \$8,000,000.00 will be allowed for said policy.
- C. The Contractor is to maintain and keep in force all insurance, as required, for the duration of the Contract. The Contractor is to maintain Commercial General Liability Insurance for a period of one year from the date of final acceptance.
- D. If the Certificates are used as proof of insurance, furnish all insurance policies within 30 days after commencing work.
- E. It is strongly recommended that bidders investigate the cost of insurance before submitting bids.
- F. IDENTIFY ALL INSURANCE SUBMITTALS BY THE CONTRACT NUMBER 14-253-5F.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 11 40

CONSTRUCTION LIMITATIONS AND CONSTRAINTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes specific requirements pertaining to the construction associated with the Flood Control Project on Midlothian Creek in Robbins, Illinois, CSA.
- B. The Contractor will be required to execute the work in such a manner that will least interfere with the surrounding community.
- C. Given the flood control constraints associated with this project, the District requires that the Contractor perform certain aspects of the work in a sequenced manner that will minimize flood risk and during periods of low flow that will reduce the potential for erosion and sedimentation. The Contractor is to comply with the construction constraints and limitations for the work contained herein when developing its construction schedule. Construction schedule is subject to District review and approval for adherence to sequencing and low flow construction operations that minimizes flooding, erosion, and sedimentation.
- D. This specification is not intended to specify the means and methods to be used by the Contractor for construction of the Work. The Contractor is solely responsible for all means and methods required to construct the work as shown in this Contract Specifications and Plans.

1.2 RELATED SECTIONS

- A. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:
 - 1. MWRD General Specifications.
 - 2. Section 01 12 16, Sequence of Work.
 - 3. Section 01 32 50, Project Management System.
 - 4. Section 01 17 00, Execution Requirements.

1.3 COORDINATION

- A. The Contractor will be responsible for coordinating the construction sequence requirements between the sub-contractors.
- B. The Contractor will be responsible for coordinating the construction with the Village of Robbins, utility owners, residents, permitting agencies, and other stakeholders as indicated in the Contract Documents or as otherwise identified by the District.
- C. The Contractor is to employ and make necessary arrangements to have adequate workforce, materials, and equipment throughout the contract duration.

D. Work by Others:

1. Work on site which will be, or has been executed prior to, or after, start of work on this Contract and may be concurrent to this Contract, but is excluded from this Contract:
 - a. Work associated with District Contract 14-253-AF – Diversion Channel for Flood Control Project in Robbins, CSA.
 - b. Utility removals, relocations, or other work associated with the project.
2. Contractor shall coordinate work by others to be completed on the project site under separate contract.

1.4 CONSTRAINTS

A. The Contract Documents are intended to allow the Contractor flexibility in construction of the Work, however, the following constraints apply:

1. Prepare and submit a comprehensive schedule of proposed sequence of construction of the various parts of the project for review by the District and the Village of Robbins. Coordinate the construction schedule directly with the District and the Village of Robbins to minimize disturbance to the Village. Arrange the schedule to complete the work in accordance with the construction constraints, limitations, and requirements contained herein.
2. Provide and make as part of the work any temporary structures, connections, piping and other work necessary to complete the work and to maintain utility service during the construction period.
3. Water and sanitary sewer services at the site shall not be disconnected at any point without advance scheduling with and written approval from the District and the Village of Robbins.
4. The Contractor will maintain access roads to the project worksite.
5. The District will be the sole judge of when the Contractor's operations are causing interference with the surrounding community and any orders and instructions will be carried out without delay.
6. Noises:
 - i. Maintain acceptable noise levels in the vicinity of the Work. Limit noise production to acceptable levels by using special mufflers, barriers, enclosures, equipment positioning, and other approved methods.
 - ii. Supply written notification to the District sufficiently in advance of the start of any work which violates this provision. Proceed only when all applicable authorizations and variances have been obtained in writing.
7. Hours of Operation:
 - i. No Work shall be done between 3:30 p.m. and 7:00 a.m., nor on Saturdays, Sundays or holidays without written permission of the District. Work after 3:30

- p.m. or before 7:00 a.m. must be pre-arranged through the District. Request to work during the off hours must be arranged not less than 24 hours before work to begin.
- ii. Night work may be established by Contractor as regular procedure with written permission of the District. Such permission may be revoked at any time by the District if Contractor fails to maintain adequate equipment and supervision for proper prosecution and control of Work at night. Revocation shall not entitle Contractor to change Contract Price or Contract Time.
8. Dust Control: Take measures to prevent unnecessary dust. Keep earth surfaces exposed to dusting moist with water or a chemical dust suppressant. Cover materials in piles or while in transit to prevent blowing or spreading dust.
9. Care of Structures and Property:
- i. All poles, trees, shrubbery, fences, pavements, sewer, water, gas or pipes, wires, conduits, culverts, drainage ditches, manholes, and all other structures and property at or adjacent to the site of the work will be supported and protected from damage or injury by the Contractor during the construction and until the completion of said work. The Contractor will be liable for all damages to structures and property and will save and keep the District harmless from any liability or expense for damage or repairs to the same.
 - ii. The plans show the locations of existing utilities. Not all of the existing utilities may be identified on the plans. The Contractor, therefore, is to satisfy itself by such means as it may deem proper as to the location of all utilities or structures that may be encountered in the construction of the work. Additionally, the Contractor must contact JULIE prior to construction.
 - iii. All areas affected by the Contractor's work will be thoroughly cleaned of all surplus materials, earth, and rubbish placed thereon by the Contractor, and such areas will be restored to as good condition as existed before the commencement of the work. Where sod has been removed or damaged, new live sod will be replaced as hereinafter provided. Where the areas are to be seeded, top soil equal to that removed will be placed, the area fertilized, seeded, and rolled to the satisfaction of the owner of the land, as hereinafter provided. All tree shrubs, and plants damaged, unless directed otherwise by the District, will be replaced during the proper season of the year with live growing stock of the same variety and reasonable size as that which was damaged.
 - iv. The Contractor is to arrange with all persons, partnerships or corporations for the support, removal, relocation and/or maintenance of any conduits wires, poles, pipes, gas mains, cables, or other structures within public alleys and highways and easements to be occupied or used during the performance of the work specified under this Contract, and will do all work necessary for such support, removal, relocation and/or maintenance of such conduits, wires, poles, pipes, gas mains, cables, or other structures encountered, as may be rendered necessary by the construction of said work.
 - v. The Contractor will, at its own expense, repair any damage to buildings, or other property damaged by the Contractor in the execution of this Contract.
 - vi. All of the described work under this section will be done with no additional expense to the District.
 - vii. The Contractor will assume full responsibility for the security and safety of

everything he may have on the project site or on the property of other owners.

10. Maintenance of Traffic:

- i. Work within the travelled way will be required. Anticipated Work Zones for activities requiring lane closures are shown on Drawing C-011. Work within the Kedzie Avenue right-of-way will require a permit from Cook County Department of Transportation and Highways. Work within 139th Street, 138th Street, 137th Street, Sawyer Avenue, Spaulding Avenue, and Claire Boulevard will require approval from the Village of Robbins. Contractor shall comply with conditions of the permits.
- ii. For duration of the project, including work that does not require lane closures, provide traffic control devices alerting pedestrians, cyclists, and vehicles of construction activities. Provide advance notice of construction traffic and turning trucks at all construction entrances to the site.
- iii. Maintain pedestrian access for the duration of the work. Provide fencing, concrete wall barrier, or other physical separation between pedestrian routes and construction activities.

11. Midlothian Creek In-Stream Work:

- i. In-stream work shall comply with the conditions of the USACE Section 404 Permit Authorization included in Appendix A of Volume 3.

12. Dewatering:

- i. Groundwater was encountered during soil boring operations at the project site. Contractor shall provide dewatering as required. Refer to Section 31 23 19 – Dewatering and Control of Water.

13. Erosion and Sediment Control:

- i. Contractor shall obtain coverage under the Illinois Environmental Protection Agency (IEPA) General NPDES Permit for Stormwater Discharges from Construction Site Activities (General NPDES Permit No. ILR10). The District will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) to the IEPA. Contractor shall submit the required fee to IEPA a minimum of thirty (30) days before planned activities at the site. Contractor shall install erosion and sediment controls before disrupting the site. The District will submit a Notice of Termination (NOT) after land disturbing activities are complete and the site has achieved final stabilization.

14. Permitting:

- i. Contractor shall obtain all required construction permits.
- ii. Contractor shall comply with all provisions of construction permits.
- iii. Right-of-way within the project limits is owned by the Village of Robbins and Cook County Department of Transportation and Highways. Contractor shall obtain all necessary permits from Cook County Department of Transportation and Highways for work occurring in the right-of-way. Contractor is not required to obtain municipal permits from the Village of Robbins.
- iv. Permits that have been granted or are currently in the permit review process are listed below. See Volume 3, Appendix A for permits received to date:
 - a. Illinois Department of Natural Resources (IDNR) Office of Water Resources

(OWR).

- b. United States Army Corps of Engineers (USACE) Section 404 Permit – Permit pending.

Note: Conditions of this permit requires review by other agencies. Status of these reviews are as follows:

- 1. Will-South Cook Soil and Water Conservation District – Submitted erosion and sediment control plans accepted.
- c. Cook County Department of Transportation and Highways Permit – Permit pending.

15. Potholing:

- i. Contractor shall perform exploratory excavation (“potholing”) of all utilities that will be crossed with proposed piping, including utilities to be crossed by piping installed by trenchless methods. Contractor shall pothole elsewhere on the project site as required to satisfy themselves that no utility conflicts exist with the proposed work.

16. Utilities:

- i. Contractor shall coordinate with owners of utilities located within the limits of work. Contractor shall comply with the utility owners’ requirements for work occurring in proximity to their facilities, including “watch and protect” requirements.
- ii. The following utilities are known to be located within the project area.
 - a. Petroleum
 - i. Valero/Premcor
 - ii. Buckeye Partners (Westshore Pipeline)
 - b. Natural Gas
 - i. Nicor
 - ii. ONEOK
 - c. Electric
 - i. ComEd
 - d. Telephone/Cable/Communications
 - i. AT&T
 - ii. Comcast
 - e. Water
 - i. Village of Robbins
 - f. Sewer
 - i. Village of Robbins
 - g. Storm
 - i. Village of Robbins
 - ii. Cook County Department of Transportation and Highways

17. Contractor’s Use of Site

- i. In addition to the requirements of the General Specifications, limit use of site and premises for work and storage to allow for the following:
 - a. Coordination of the Work under this Contract with the work of the other contractors where Work under this Contract encroaches on the work of other contractors, including in the area overlap between Contract 14-253-AF and this Contract (14-253-5F).

- b. Coordination of site use with the District, the Village of Robbins, and Cook County Department of Transportation and Highways.
- c. Responsibility for protection and safekeeping of products under this Contract.
- d. Providing additional off-site storage at no additional cost to District as needed.
- e. Access to Midlothian Creek and Wetland Park work areas limited to construction entrances indicated on the Drawings.

18. Sequence of Construction

- i. The Contractor shall plan and use a construction sequence as required to meet all of the contract requirements in a timely manner.
- ii. Refer to Section 01 12 16 for specific requirements.

PART 2 - PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 12 16
SEQUENCE OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sequence of work requirements.
2. Site verification requirements.
3. Site preparation requirements.
4. Site restoration requirements.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 SUBMITTAL PROCEDURES

A. Submit in accordance with Section 01 33 00 - Submittal Procedures.

B. Contractor shall submit to MWRD, Contractor's proposed sequence of work.

1.3 SEQUENCE OF WORK REQUIREMENTS

A. Contractor shall maintain a work sequence, which will be established prior to commencement of Work, to keep the Work progressing in accordance with approved project schedule.

B. Contractor shall incorporate the anticipated conditions and constraints of the project into their construction schedule.

C. MWRD may consider other work sequences proposed by Contractor if such sequences can be demonstrated to reduce the impact on existing operations, and in general, to benefit the project.

D. Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation and surrounding transportation functioning during the entire duration of the project.

E. Verifications of dimensions, elevations, and characteristics of existing facilities

required by the Contract Documents shall be completed prior to beginning Work on any portion of the project.

F. Milestones:

1. The following work items shall begin no later than September 15, 2024 and be completed no later than December 15, 2024:
 - a. Midlothian Creek pool and riffle construction.
 - b. Bioswale, rain garden, and culvert installation in the project area west of Kedzie Avenue, and installation of the storm sewer beneath Kedzie Avenue at 138th Street. The storm sewer beneath Kedzie Avenue at 138th Street shall not be placed in service until construction of the Kedzie Avenue storm sewer is complete. Contractor shall provide temporary bulkhead on upstream end of the storm sewer beneath Kedzie Avenue at 138th Street to prevent stormwater from entering until the storm sewer may be placed in service.

G. Work Sequencing Constraints

1. Channel improvements on Midlothian Creek between 139th Street and 137th Street shall not commence until construction of the Diversion Weir at 137th Street and all downstream stormwater improvements are substantially complete. Such improvements include, but are not limited to, the following key hydraulic features as shown on Drawing C-005.
 - a. Midlothian Creek Low Flow Control
 - b. Dredging of Midlothian Creek dredging downstream of 137th Street
 - c. Stormwater Pond
 - d. High Flow Overflow to existing wetland and Midlothian Creek
 - e. Bridge Structure
 - f. Drop #1
 - g. Drop #2

Substantial completion in this context shall be defined as conforming to the lines and grades shown on the Drawings and hydraulically operational for the design storm event (1% probability storm). Channel improvements shall be defined as earthwork resulting in alterations to the existing Midlothian Creek cross section. Exceptions to this sequencing requirement include construction of the pools and riffles in Midlothian Creek between 139th Street and 137th Street, and earthwork required to complete the Diversion Weir at 137th Street.

2. Construction of stormwater improvements shall generally proceed from downstream to upstream. Areas disturbed by clearing or grading work shall be protected and shall not be exposed to creek flow until temporary or final stabilization is achieved. Contractor shall protect work and repair damage to completed work caused by storm events at no additional cost to Owner.

1.4 SITE VERIFICATION REQUIREMENTS

- A. Site Survey: Prior to commencing any on-site construction activities, the Contractor and MWRD shall make a joint condition survey of project site.

B. Utilities Location:

1. Contractor shall contact "JULIE" and private utility owners before beginning work and make arrangements to have utility representatives locate all utilities at project site.
2. Contractor shall not begin work until the location of utilities has been reviewed by MWRD and MWRD has issued authorization to proceed. Utilities to be located include, but are not limited to:
 - a. Electric.
 - b. Gas.
 - c. Water.
 - d. Telephone.
 - e. Cable television.
 - f. Sewer (Storm, Sanitary).
 - g. Petroleum.
3. Contractor shall not submit shop drawings or other related submittals for items requiring field verification prior to performing verifications as specified above. Failure to provide this information will be grounds for rejection of submittals.

1.5 SITE PREPARATION REQUIREMENTS

- A. Prior to construction commencing, work areas shall be cleared and grubbed and graded as indicated on Drawings.
- B. Perform clearing and grubbing work as specified in Section 31 11 00 - Site Clearing and Grubbing.
- C. Designated structures shall be demolished and removed from project site.
- D. Designated fencing within the work area shall be removed or salvaged for reuse as specified or as indicated on Drawings.
- E. Perform site demolition work in accordance with Section 02 41 13 - Site Demolition.

1.6 SITE RESTORATION REQUIREMENTS

- A. Contractor shall restore project site to the lines and grades as indicated on Drawings.
- B. Contractor shall remove work platforms, temporary fencing and related items from project site.
- C. Existing soils that were disturbed and damaged during construction shall be seeded, mulched and fertilized until an acceptable stand of grass shall be in place before Contractor may remove erosion and sediment controls.
- D. Asphalt, concrete, and gravel areas that were damaged during construction activities shall be replaced with equal or greater materials and mixtures.
- E. Removed fencing that was removed and salvaged shall be restored as specified or as indicated on Drawings.

- F. Trees and shrubs removed prior to or damaged during construction shall be replaced as specified or as indicated on Drawings.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 13 10

COORDINATION AND MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project coordination.
2. Document coordination.
3. Field engineering.
4. Preconstruction meeting.
5. Site mobilization meeting.
6. Progress meetings.
7. Pre-installation meetings.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of the Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 PROJECT COORDINATION

- A. Coordinate scheduling, submittals, and Work of various sections to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Take field measurements and verify field conditions and carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities.
- C. Field measurement and condition errors, inconsistencies, or omissions discovered shall be reported in writing, to MWRD immediately.
- D. Verify compatibility with equipment and Work of other sections.
- E. Verify requirements and characteristics of individual proposed improvements are compatible with other proposed improvements and existing conditions.
- F. Review the effect of changes on existing facilities, equipment and systems and how changes affect work of other contracts.

- G. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and phasing the Work.
- H. Coordinate space requirements, supports, and installation of Work indicated diagrammatically on Drawings.
- I. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- J. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- K. After occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of activities.
- L. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion.
- M. Following substantial completion, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of MWRD operations and activities.

1.3 DOCUMENT COORDINATION

- A. Location of items required by the Drawings or Specifications may not be definitely fixed by dimension and indicate approximate location only.
- B. Exact locations necessary to secure the best installation conditions and results shall be determined at project site.
- C. Contractor shall submit corrected shop drawings and submit to MWRD for review.
- D. Work not shown on Drawings, but mentioned in the Specifications, or vice versa, necessary to make the work complete, shall be completed without additional expense or change in time to MWRD.
- E. Items not shown on Drawings or specified, but incidental to the installation, as required by applicable codes, as practiced by the trade, or which is stipulated by the manufacturer of equipment being installed or connected, shall be furnished and installed without additional expense or change in time to MWRD.

1.4 FIELD ENGINEERING

- A. Contractor shall employ a Land Surveyor registered in State of Illinois and acceptable to MWRD.
- B. Locate and protect survey control and reference points. Promptly notify MWRD of discrepancies discovered.
- C. Control datum for survey is that established by MWRD provided survey or as

indicated on Drawings.

- D. Verify set-backs and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- F. Submit copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- G. Maintain complete and accurate log of control and survey work as Work progresses.
- H. On completion of foundations and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.
- I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- J. Promptly report to MWRD loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to MWRD.

1.5 CONTRACT EXECUTION MEETING

- A. Contractor shall arrange a meeting with the Director of Procurement and Materials Management at MWRD offices for the formal signing of the contract upon being informed that all post qualification standards have been met and the contract shall be awarded.
- B. Contractor shall present and execute at that meeting the Payment and Performance surety bonds required by the contract.
- C. Upon execution of the contract, the Contractor shall meet with the MWRD or the MWRD's representative for coordination of mobilization, scheduling of follow-on meetings, and initialization of users in the various electronic systems to be used on the project.
- D. The Contractor shall provide a copy of the executed bonds at the MWRD's meeting.
- E. The Contractor may provide paper copies of certificates of insurance and key submittals at the MWRD's meeting needed to advance the project in the interim until training on the electronic documents system is completed.

1.6 PRECONSTRUCTION MEETING

- A. MWRD will schedule and administer a preconstruction meeting at MWRD offices after Notice of Award.
- B. Attendance Required: MWRD Engineer, Contractor, Contractor's Superintendent,

Contractor's Technical Engineer and Contractor's Safety Engineer.

C. Agenda:

1. Distribution of Contract Documents.
2. Submission of preliminary list of Subcontractors, list of products, schedule of values, and progress schedule.
3. Designation of personnel representing parties in Contract.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
5. Scheduling activities of Geotechnical Engineer.
6. Discussion of Contractor's quality control system, including the forms for recording the Quality Assurance and Quality Control operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with MWRD Quality Assurance requirements.
7. Use of premises by MWRD and Contractor.
8. MWRD's requirements and occupancy.
9. Construction facilities and controls provided by MWRD.
10. Temporary utilities provided by MWRD.
11. Survey and building layout.
12. Security and housekeeping procedures.
13. Safety procedures and requirements:
 - a. MWRD lockout and tagout procedures and requirements.
 - b. Additional requirements established by Contractor.
14. Schedules.
15. Procedures for testing.
16. Procedures for maintaining record documents.
17. Requirements for start-up of equipment.
18. Inspection and acceptance of equipment put into service during construction period.

D. MWRD will record minutes and distribute copies within two (2) days after meeting to participants.

1.7 PROGRESS MEETINGS

- A. Contractor shall schedule and administer on-site meetings throughout progress of the Work at maximum monthly intervals, unless stipulated otherwise.
- B. Contractor shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two (2) days to MWRD, participants, and those affected by decisions made.
- C. Attendance Required: Contractor's Superintendent, Contractor's Technical Engineer, Contractor's Safety Engineer, major subcontractors and suppliers, MWRD Representative, and any others appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.

4. Identification of problems impeding planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

- E. Record minutes and distribute copies using MWRD e-Builder® within two (2) days after meeting to participants.

1.8 PRE-INSTALLATION MEETINGS

- A. When required in individual technical specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Notify MWRD one (1) week in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of installation, preparation and installation procedures.
 2. Review coordination with related work.
- E. Record minutes and distribute copies using MWRD e-Builder® within two (2) days after meeting to participants.

1.9 CONTRACTOR COORDINATION MEETINGS

- A. Contractor shall schedule and administer on-site coordination meetings throughout progress of the Work at maximum bi-weekly intervals.
- B. Contractor shall coordinate with other contractors contracted with MWRD under separate contracts who are performing Work either on project site concurrently, adjacent to project site, or scheduled to commence work at a later date or during the duration of this contract.
- C. Contractor shall also make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute meeting minute copies within two (2) days to MWRD, participants, and those affected by decisions made.
- D. Attendance Required:
 1. Contractor responsible for work of this Contract.
 2. Major subcontractors responsible for work under this contract.
 3. Contractors from other MWRD contracts interfacing with this contract
 4. MWRD representative.
 5. Others as appropriate to address and resolve agenda topics for each meeting.

E. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Maintenance of progress schedules.
6. Corrective measures to regain projected schedules.
7. Planned progress during succeeding work period.
8. Coordination of projected progress.
9. Effect of proposed changes on progress schedule and coordination.
10. Other business relating to Work.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 13 50

WASTE MANAGEMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Waste Management performance goals.
2. Waste management plan.
3. Waste management program profits.
4. Waste management implementation.
5. Salvaging demolition waste.
6. Recycling demolition and construction waste requirements.
7. Recycling demolition waste.
8. Recycling construction waste.
9. Disposal of waste.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste and packaging resulting from construction, remodeling, renovation, or repair operations.
- B. Clean Construction or Demolition Debris (CCDD): Clean construction or demolition debris (CCDD) is uncontaminated broken concrete without protruding metal bars, bricks, rock, stone, or reclaimed asphalt pavement generated from construction or demolition activities. When uncontaminated soil is mixed with any of these materials, the uncontaminated soil is also considered CCDD. Uncontaminated soil that is not mixed with other CCDD materials is not CCDD.
- C. General Construction or Demolition Debris (GCDD): General construction or demolition debris is construction or demolition debris not meeting the definition of CCDD, and which may include non-hazardous, uncontaminated materials resulting from the construction, remodeling, repair, and demolition of utilities, structures, and roads, limited

to the following: bricks, concrete, and other masonry materials; soil; rock; wood, including non-hazardous painted, treated, and coated wood and wood products; wall coverings; plaster; drywall; plumbing fixtures; non-asbestos insulation; asphalt roofing shingles and other roof coverings; reclaimed or other asphalt pavement; glass; plastics that are not sealed in a manner that conceals waste; electrical wiring and components containing no hazardous substances; and corrugated cardboard, piping or metals incidental to any of those materials.

- D. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- E. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- F. Hazardous Waste: Any material or byproduct of construction that is regulated by the Environmental Protection Agency and that may not be disposed in any landfill or other waste end-source without adherence to applicable laws.
- G. Landfill: Any public or private business involved in practice of trash disposal.
- H. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- I. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- J. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
- K. Trash: Any product or material unable to be returned, reused, recycled or salvaged.
- J. Waste: Any material that has reached end of its intended use. Waste includes salvageable, returnable and reusable material.
- K. Waste Management Plan: Project-related plan for collection, transportation, and disposal of waste generated at construction site.

1.3 WASTE MANAGEMENT PERFORMANCE GOALS

- A. Salvage and Recycle Goals: MWRD's goal is to salvage and recycle as much non-hazardous demolition and construction waste as possible including the following materials:
- B. Demolition Waste:
 - 1. Asphaltic concrete paving.
 - 2. Concrete.
 - 3. Concrete reinforcing steel.
 - 4. Brick.
 - 5. Concrete masonry units.
 - 6. Wood studs.

7. Wood joists.
8. Plywood and oriented strand board.
9. Wood paneling.
10. Wood trim.
11. Structural and miscellaneous steel.
12. Rough hardware.
13. Roofing.
14. Insulation.
15. Doors and frames.
16. Door hardware.
17. Windows.
18. Glazing.
19. Metal studs.
20. Gypsum board.
21. Acoustical tile and panels.
22. Carpet.
23. Carpet pad.
24. Demountable partitions.
25. Equipment.
26. Cabinets.
27. Plumbing fixtures.
28. Piping.
29. Supports and hangers.
30. Valves.
31. Sprinklers.
32. Mechanical equipment.
33. Refrigerants.
34. Electrical conduit.
35. Copper wiring.
36. Lighting fixtures.
37. Lamps.
38. Ballasts.
39. Electrical devices.
40. Switchgear and panelboards.
41. Transformers.

C. Construction Waste:

1. Site-clearing waste.
2. Clay Masonry Units and Concrete Masonry Units.
3. Lumber.
4. Wood sheet materials.
5. Wood trim.
6. Metals.
7. Roofing.
8. Insulation.
9. Carpet and pad.
10. Gypsum board.
11. Piping.
12. Electrical conduit.

- D. Packaging: Regardless of salvage and recycling goals indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1. Paper.
 - 2. Cardboard.
 - 3. Boxes.
 - 4. Plastic sheet and film.
 - 5. Polystyrene packaging.
 - 6. Wood crates and pallets.
 - 7. Plastic pails.

1.4 SUBMITTALS

- A. Waste Management Plan: Submit plan using e-Builder within 30 days of date established for Notice to Proceed to MWRD. MWRD will review the Waste Management Plan and reserves the right to reject any proposed disposition site. The Contractor will only implement the portions of the Plan approved by the MWRD.
- B. Waste Reduction Progress Reports: Concurrent with each Applications for Payment approximately 33 percent, 67 percent and Substantial Completion, submit three (3) copies of report that includes the following information:
 - 1. Material category.
 - 2. Total quantity of waste per category in tons.
 - 3. Quantity of waste salvaged.
 - 4. Quantity of waste recycled.
 - 5. Total quantity of waste recovered, salvaged plus recycled, in tons.
- C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations.
- D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. In paragraph below, identify specific participants not mentioned in Division 01 - General Requirements.
- C. Waste Management Conference: Conduct conference at Project site. Review methods and

procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste reduction work plan. Include separate sections in plan for demolition and construction waste.
- B. Waste Identification: Indicate anticipated types of demolition, site-clearing and construction waste generated by the Work.
- C. Waste Reduction Work Plan: List each type of waste as salvaged, recycled or disposed in landfill or incinerator.
- D. Salvaged Materials for Reuse: Describe methods for preparing salvaged materials before incorporation into the Work for materials that will be salvaged and reused in this Project.
- E. Salvaged Materials for Sale: Include list of buyers of materials that will be sold.
- F. Salvaged Materials for Donation: Include list of individuals and organizations receiving donated materials.
- G. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept.
- H. Disposed Materials: Indicate how and where materials will be disposed.
- I. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

1.7 WASTE MANAGEMENT PROGRAM PROFITS

- A. All profits from recycling of construction waste and demolition waste shall be granted to Contractor. The Contractor shall be considered the owner of all material destined for recycling.

PART 2 – PRODUCTS

2.1 WASTE MANAGEMENT IMPLEMENTATION

- A. General: Implement waste management plan as approved by MWRD. Provide

handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during entire duration of the Contract.

- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, training, monitoring and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures as appropriate for the Work occurring at Project site.
- D. Distribute waste management plan to all subcontractors, material suppliers and other concerned parties.
- E. Distribute waste management plan as work first begins on-site. Review plan procedures and locations established for salvage, recycling and disposal.
- F. Separation Facilities:
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated and sold. Define specific areas to facilitate separation of materials for recycling, salvage, reuse and return.
 - 2. Maintain recycle and waste bins areas in an orderly manner, clearly marked to avoid inter-mixing materials.
 - 3. Store hazardous materials in secure areas.

2.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning.
 - 3. Store and protect items from damage until installation.
 - 4. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
 - 5. Salvaged items for sale and donation shall not be permitted to remain on Project site.
- B. Designated Salvaged Items for MWRD's future use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to MWRD.
 - 4. Transport items to storage area designated by MWRD.
 - 5. Protect items from damage during transport and storage.

2.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE REQUIREMENTS

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
- D. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
- E. Stockpile processed materials on-site without intermixing with other materials. Place, grade and shape stockpiles to drain surface water.
- F. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
- G. Store components off ground and protect from weather.
- H. Remove recyclable waste from site and transport to recycling receiver or processor.

2.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products and treated wood materials.
- C. Metals: Separate metals by type.
- D. Storm Sewers and Appurtenances: Separate by size and type.

2.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Chip brush, branches and trees; burning may be used with MWRD's approval.
- C. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

2.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose in landfill or incinerator acceptable to authorities having jurisdiction.

1. Dispose of uncontaminated surplus soil, Clean Construction or Demolition Debris (CCDD) and GCDD in accordance with Section 02 22 00.
 2. Dispose of material determined to be contaminated (hazardous waste or certified non-hazardous non-special/special waste) in accordance with Section 02 61 13.
- B. Contaminated soil shall not be commingled with uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. General Construction or Demolition Debris shall not be comingled with Uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. Any avoidable, additional cost resulting from or associated with comingling of materials shall be considered Contractor's expense.
- C. The Contractor shall be responsible for avoiding comingling of materials as described. If Contaminated Soils, Special Waste or Hazardous Waste come in contact with CCDD, Uncontaminated Soils, or General Construction or Demolition Debris, the resulting material will now be considered contaminated, and the Contractor shall dispose of the newly designated material as Contaminated Soils at its own expense in accordance with Section 02 61 13.
- D. Except as otherwise specified, do not allow waste materials that are to be disposed accumulate on-site.
- E. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- F. Burning: Do not burn waste materials.
- G. Generator: The MWRD is the generator of all waste, other than that resulting from Contractor negligence or maintenance. The MWRD will review and sign all waste characterization forms and manifests.

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 17 00

EXECUTION REQUIREMENTS

PART 1 – GENERAL

1.1 PREPARATION

- A. **Site Conditions:** Where existing site conditions are shown on the plans hereto attached, the elevations are believed to be reasonably correct but are not guaranteed, and with any schedule of quantities, are presented only as an approximation. The Contractor shall conduct an actual examination of the site of the work, as to the existing elevations and the amount of work required under this Contract.
- B. **Geotechnical Information for the Site:**
1. Any geotechnical information, included in the Contract Documents, is for information only. Opinions expressed are those of the geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. The District and the geotechnical engineer shall not be held responsible for interpretations or conclusions drawn from this data by Contractor. There is no guarantee, either expressed or implied, that the conditions indicated are representative of those existing throughout the work or any part of it, or that unforeseen developments may not occur.
 2. Bidders making their own subsurface explorations shall obtain the permission of the District prior to commencing borings.
 3. The Contractor may make additional test borings and conduct other exploratory operations as necessary, after obtaining the permission of the District prior to commencing borings, at no additional expense to the District.
- C. **Checking Plans:** The Contractor shall check all plans furnished by the District and by himself for dimensions, quantities and coordination with other parts of the work under this Contract, and notify the District of all errors or omissions which he may discover by examining and checking the same. Contractor will not be allowed to take advantage of any error or omission on the plans. The District is to furnish full instructions, should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified. The work is to be made complete and to the satisfaction of the District should such error or omission be discovered, and the Contractor to carry out such instructions as if originally specified. The work is to be made complete and to the satisfaction of the District, notwithstanding any minor omissions in the specifications or plans.
- D. **Keeping Plans and Specifications On Site:** The Contractor will keep on hand at the construction site, for reference, a complete set of contract documents (specification and plans), copies of all plans furnished by the Contractor, revised plans furnished by the District and all orders issued to the Contractor by the District related to Work under this Contract.

- E. **As-Built Drawings:** The Contractor shall keep and maintain at the construction site a working set of plans for recording as-built conditions. This set of record drawings shall be kept up to date and available for the District's use. It shall have marked or noted thereon all field information, properly dated, recording as-built conditions that may differ from the plans. These drawings shall be utilized to prepare the As-Built Drawings as herein specified.
- F. **Lines and Grades:** Establish horizontal and vertical controls in accordance with the District General Specifications.
- G. **Existing Structures and Utilities:**
1. Maintain in continuous service existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and other utilities encountered along the line of Work, unless other arrangements satisfactory to owners of said utilities have been made.
 2. Not all of the existing utilities may be identified on the plans. The Contractor, therefore, is to satisfy himself by such means as he may deem proper as to the location of all utilities or structures that may be encountered in the construction of the Work.
 3. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance: Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
 4. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
 5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
 6. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, the Contractor is to arrange with the owners of said structures and utilities for the shifting, temporary removal, and restoration and protection of same where necessary for the prosecution of work under this Contract, at no additional expense to the MWRD except as otherwise specified herein. The cost of all of the above-described work is to be considered incidental to the Contract.
- H. **Utility Installations and Structures:**
1. Utility installations and structures include all poles, tracks, pipes, wires, conduits, vaults, manholes, and other appurtenances and facilities.

2. The Contract Documents contain data relative to existing utility installations and structures above and below the ground surface. Existing utility installations and structures are indicated on the Drawings only to the extent such information was made available to, or found in preparing the Drawings. These data are not guaranteed for completeness or accuracy, and the Contractor is responsible for making necessary investigations to become fully informed as to the character, condition, and extent of all utility installations and structures that may be encountered and that may affect the construction operations.
3. Remove, replace, relocate, repair, rebuild, and secure any utility installations and structures damaged as a direct or indirect result of the Work under this Contract. Costs for such work are incidental to the Contract. Be responsible and liable for any consequential damages done to or suffered by any utility installations or structures. Assume and accept responsibility for any injury, damage, or loss which may result from or be consequent to interference with, or interruption or discontinuance of, any public utility service.
4. Repair or replace any water, electric, sewer, gas, or other service connection damaged during the Work with no addition to the Contract price.
5. At all times in performance of the Work, employ proven methods and exercise reasonable care and skill to avoid unnecessary delay, injury, damage, or destruction to utility installations and structures. Avoid unnecessary interference with, or interruption of, utility services.

PART 2 - PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 CONSTRUCTION SEQUENCE

- A. The Contractor shall plan and use a construction sequence as required to meet all of the contract requirements in a timely manner.

3.2 CONTRACTOR'S RESPONSIBILITY

- A. The acceptance or approval of any order of procedure, methods, structures, or equipment submitted or employed by the Contractor shall not in any manner relieve the Contractor of any responsibility for the safety, maintenance, and repairs of any structure or work, or for construction, maintenance and safety of work hereunder, or from any liability whatsoever on account of any procedure or methods employed by the Contractor, or due to any failure or movement of any structures or equipment furnished by him. When constructed, even with the approval of the District, should any structure or equipment installed hereunder afterwards prove insufficient in strength or fail on account of poor workmanship or any procedure or methods employed by the Contractor, such failure shall in no way form the basis of any claim for extra compensation for delay, or for damages or

expenses caused by such failure, or for extension of time for completion of their Contract, or for material, labor or equipment required for repairing or rebuilding such structure or equipment, or for repairing or replacing any other work that may be damaged in any way by the failure or movement of any structure or equipment or by any other happening.

3.3 ENGINEERING RESPONSIBILITY

- A. All structures to be provided by the Contractor (except those structures for which design details are shown on the Contract plans) which require structural design shall be designed and constructed under the supervision of a structural engineer, licensed in the State of Illinois, acting for and retained by the Contractor. Drawings and calculations for such structures shall be prepared and stamped by the structural engineer and submitted to the District for approval. A clear outline of the proposed construction procedure shall be shown on the drawings. A statement in writing by the structural engineer attesting that he has visited the site of the work, that the design does satisfy the conditions as actually encountered and that the actual construction conforms to the drawings and calculations as submitted and approved must be submitted to the District before the work related to such structures will be considered complete.

3.4 SURVEY REQUIREMENTS

- A. Control datum for survey is that shown on Drawings or noted in the Specifications.
- B. The Contractor shall provide field engineering services, establish elevations, lines, and levels, utilize recognized engineering survey practices.
- C. The Contractor shall submit a copy of registered drawings and certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

3.5 CLEANING

- A. Cleaning Work Sites and Restoration:
 1. The Contractor shall keep the site of the work and adjacent premises as free from material, debris and rubbish as is practical and shall remove from any portion of the site, if, in the opinion of the District, such material, debris or rubbish that interferes with the operation of the traffic, constitute a nuisance, or is objectionable in any way to the public. The Contractor further agrees to remove all machinery, materials, implements, barricades, staging, false work, debris and rubbish connected with or caused by said work immediately upon the completion of the same and to clean all structures and work constructed under this Contract to the satisfaction of the District, regrade all areas which have been rutted or disturbed so that the areas will drain without pockets and to leave the premises, upon completion of the Contract, in at least as good condition as when he entered upon them.
 2. Restoration work shall follow construction as the work progresses and be completed as soon as possible. Restoration work shall not be delayed, and shall be completed no later than 30 days after the work is in place, or as directed by the District. Any testing

or further inspection necessary for final completion and inspection of the work shall not be cause for any delay of restoration work required under this Contract. This provision for restoration shall include all public, private, and District property, which were affected by the Contractor's construction operations. Such final restoration that cannot be performed within the 30-day period due to adverse weather conditions may, upon written request including a proposed procedure and time schedule, be perform as approved by the District. Any delayed restoration will be contingent upon providing suitable safe temporary facilities without inconvenience or nuisance in the interim.

3. Whenever public or private property is damaged or destroyed, the Contractor shall, at its own expense, restore such property to a condition equal to the existing before such damage or injury was done by repairing, rebuilding, or replacing it as may be directed, or it shall otherwise make good such damage or destruction in a manner acceptable to the District. If he fails to do so, the District may, after the expiration of a period of 30 calendar days after giving him notice in writing, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof shall be deducted from any compensation due, or which may become due, to the Contractor under this Contract.
4. This provision for restoration work shall apply to all work under this Contract.

3.6 PROTECTING INSTALLED CONSTRUCTION

- A. The Contractor shall furnish such protection as may be necessary against damage in any way to the work and, material included under this Contract before and after the same have been installed (including all necessary protection for structures that may be damaged by winter conditions), and shall be fully responsible for such work until its final acceptance.

END OF SECTION

SECTION 01 26 66

EXTENSION OF CONTRACT TIME

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work consists of preparing and submitting a request for an extension of contract time using the latest approved Project Schedule prior to experiencing the delay.

1.2 PURPOSE

- A. The purpose of this specification is to describe the conditions under which a Contractor is entitled to an extension of contract time and the process for obtaining the extension of contract time.

1.3 RELATED SECTIONS

- A. 01 32 16 – Construction Project Schedule
- B. 01 31 25 – Project Management System
- C. 01 33 00 – Submittal Procedures

1.4 REFERENCES

- A. Oracle Corporation:
 - 1. Primavera P6 Project Management Software
- B. The Association for the Advancement of Cost Engineering (AACE) International:
 - 1. AACE International Recommended Practice No. 29R-03, FORENSIC SCHEDULE ANALYSIS.

1.5 TYPES OF DELAY

- A. Excusable, Non-Compensable Delays
 - 1. Excusable, non-compensable delays are delays to the critical path for which the Contractor is entitled to additional contract time, but is not entitled to recovery of any additional compensation. Excusable, non-compensable delays are defined as:
 - a. Delays due to the inability of the Contractor, with the exercise of due diligence, to obtain necessary railroad and transportation facilities.
 - b. Delays due to strikes. An example would be the inability of the Contractor, with the exercise of due diligence, to obtain specific materials or equipment for the Work due to a strike.
 - c. Delays due to acts or delays of Federal Government agencies.
 - d. Delays due to acts or delays of public authorities other than the MWRDGC.
 - e. Delays due to riots, insurrection, war, pestilence, fire, earthquake, and cyclone.
 - f. Delays due to unforeseeable inclement weather.
 - g. Delays that cause the Work to be performed under abnormal weather conditions

that were not contemplated during the original time of performance specified in the Agreement.

B. Excusable, Compensable Delays

1. Excusable, compensable delays are delays to the critical path for which the Contractor is entitled to recover both additional contract time and compensation. Excusable, compensable delays are defined as:
 - a. Delays due to material alteration or additions to the Work.
 - b. Delays due to an Engineer-ordered suspension of the Work.
 - c. Delays due to any act or delay of the District.
 - d. Delays due to any act or delay of other parties under contract with the District.
2. The recoverable compensation is limited to:
 - a. Additional premiums actually paid by the Contractor on its bond and insurance.
 - b. Additional direct labor, equipment, and material costs that are required for the proper maintenance of the Project site during the delay or during a complete suspension of the Work and rental costs for jobsite facilities dedicated solely to the Project.
 - c. It is further expressly understood and agreed that any damages or compensation for an excusable, compensable delay allowed as part of the delay shall specifically exclude any general conditions labor, any non-direct labor, any anticipated profits and all costs for home office overhead.

C. Non-Excusable Delays

1. Non-excusable delays are delays that the Contractor could foresee or that are the Contractor's fault or responsibility. The Contractor is not entitled to recovery of any additional Contract time and damages or compensation for non-excusable delays. Non-excusable delays are defined as:
 - a. Delays due to the Contractor's, subcontractor's, or supplier's insolvency or mismanagement.
 - b. Delays due to slow delivery of materials from the supplier or fabricator when the material was available in warehouse stock, or when delivery was delayed for reasons of priority, late ordering, financial considerations, or other causes.
 - c. Delays due to the Contractor's failure to provide sufficient forces and equipment to maintain satisfactory progress in accordance with the Project Schedule.
 - d. Delays caused by plant and equipment failure or delays due to the Contractor's failure to provide and maintain the equipment in good mechanical condition or to provide for immediate emergency repairs.
 - e. Delays caused by conditions on the project that could be foreseen or anticipated prior to the date of bid opening.

D. Concurrent Delays

1. Concurrent delays are separate delays to the critical path or near critical paths that occur at the same time. If the Contractor is delayed by an excusable delay and a non-excusable delay at the same time, then the Contractor is entitled to recover additional time, but no additional compensation. Also, if the Contractor is delayed by an excusable, compensable delay and an excusable, non-compensable delay at the same time, then the Contractor is entitled to recover additional time, but no additional compensation. Near critical activities shall be considered as activities with total float

that is within 10 workdays or 2.5% of the Contract duration, whichever is greater, from the value of the total float on the critical path.

PART 2 - PRODUCTS

2.1 SCHEDULING SOFTWARE

- A. The MWRDGC will provide Oracle's Primavera P6 Project Management software, or a newer release, and its Oracle's Enterprise Primavera P6 Project Management Database (EPMD) on internet-accessible network servers for Contractors to develop, maintain, and submit the Project Schedules for MWRDGC personnel and Consultants to review, evaluate, and accept request for extensions of contract time. The MWRDGC will determine the location to store the Project Schedule files on the EPMD and will provide the Contractor with the naming convention for all Project Schedule submissions. See 01 32 16 - Construction Project Schedule.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall prosecute the Work continuously, effectively, and with the least possible delay.
- B. The Contractor's plea that insufficient time was specified is not a valid reason for an extension of the contract time.
- C. The Contractor must submit a "Notice of Delay" in e-Builder to the Engineer within three (3) business days of the commencement of said delay. If the Contractor fails to submit said notice within three (3) business days of the commencement of delay, the District will not grant any time extension and the Contractor will be responsible to recover any time lost due to the delay at no expense to the District. The District will respond to a "Notice of Delay" within three (3) business days after receipt of said notice.
- D. If MWRDGC grants an extension of the contract time, the extended time for completion will be in full force and effect as though it was originally specified.
- E. The MWRDGC will only extend the contract time if an excusable delay, as defined above, delays the Critical Path as described in Section B "Evaluation of Delays" below.
- F. The Contractor shall not be entitled to any compensation or damages from the District on account of any action undertaken by the Contractor to prevent or mitigate any avoidable delay.

3.2 TIME EXTENSION REQUEST SUBMITTAL REQUIREMENTS

- A. Time Extension Request Submittals.
 - 1. If the contractor believes that it is entitled to an extension of contract time, then they shall submit a request, comprised of the following, using the last approved Quarterly Schedule Update that did not contain the delay.

- a. The “Notice of Delay” associated with the Time Extension Request
 - b. The .XER export file of the Quarterly Schedule Update that forecasts the late completion for which the time extension is being sought.
 - c. Printout of the Critical Path of the last approved Quarterly Schedule Update that forecasts the late completion date for which the time extension is being sought in a format determined by the MWRDGC and provided to the contractor upon request.
 - d. Results of a schedule analysis performed in accordance with Association for the Advancement of Cost Engineering, International: Recommended Practice No. 29R-03, Forensic Schedule Analysis, MIP 3.4 Observational/Dynamic/Contemporaneous Split approach, including by not limited to:
 - i. A table listing all start and finish variances of critical and near-critical activities within each analysis period. At a minimum, the table shall include columns for early start and finish dates, actual start and finish dates, original duration, remaining duration, and total float.
 - ii. A summary table listing all the net gains and losses to the overall project or the interim milestone by analysis period for the time extension being requested.
 - e. The description of the extension of contract time request, submitted in e-Builder.
2. The description of the extension of contract time request should include, at a minimum:
- a. Detailed description of the event(s) responsible for the need for an extension of the contract time and the amount of additional contract time being requested.
 - b. Listing of the new activities, if any, which were added in the last approved Quarterly Schedule Update to represent the event(s).
 - c. Detailed description of how these new activities were connected into the network and a listing of the existing network activities that are now successors to these activities.
 - d. Description of the analysis performed in accordance with subsection 3.2.B., below.

B. Evaluation of Delays

1. The evaluations of delays and the calculation of the appropriate time extension due the Contractor will be based on the following:
 - a. The schedules submitted to and accepted by the MWRDGC will form the basis upon which the MWRDGC evaluates delays and calculations of the appropriate time extensions due the Contractor. The MWRDGC will not recognize schedules submitted by the contractor to demonstrate entitlement to a time extension that did not exist on the project.
 - b. The Contractor shall base its submission and calculations related to the determination of extensions of time on the Critical Path as established by the schedules submitted to and accepted by the MWRDGC. The Contractor is not entitled to a time extension for delays that do not delay the Critical Path.
 - c. The schedules relevant to the evaluation and calculation of time extensions are the most recently approved Monthly Schedule Update by the MWRDGC. The Contractor shall follow the procedure specified in Subsection 3.5.C. Incorporating Changes to the Contract in Section 01 32 16 – Construction Project Schedule for adding activities into the schedule for changed or added work.
 - d. For its evaluation of delays, MWRDGC may, at its discretion, re-examine the

schedules previously approved by MWRDGC for any errors not previously discovered. MWRDGC may then determine the effect of such errors, if any, on the contractor's time extension request.

- e. The Contractor's evaluations and calculations shall comply with the following Recommended Practices published by the Association for the Advancement of Cost Engineering, International: Recommended Practice No. 29R-03, Forensic Schedule Analysis, MIP 3.4 Observational/ Dynamic/Contemporaneous Split approach. The Contractor shall use MIP 3.4 when evaluating delays.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROJECT SCHEDULE

PART 1 - GENERAL

1.1 DESCRIPTION

This work consists of preparing, maintaining, and submitting a Critical Path Method (CPM) Schedule, referred to as the Project Schedule that depicts the sequence and timing of all of the Work.

1.2 PURPOSE

- A. The purpose of the Project Schedule and this specification is to:
1. Ensure that the Contractor has a detailed plan to complete the Project in accordance with the Contract Documents;
 2. Ensure that the Project Schedule is regularly updated and revised to accurately depict the Contractor's plan;
 3. Provide a means of monitoring the Work;
 4. Aid in communication and coordination of activities among all parties;
 5. Provide Notice of events for observation, inspection, or participation.

1.3 DEFINITIONS

A. General

1. **Activity** – A discrete, identifiable task listed in the work schedule or event that usually has a planned duration, has a definable start date and finish date, and can be used to plan, schedule, and monitor a project.
2. **Activity, Controlling** – The first incomplete activity on the Critical Path.
3. **Activity, Critical** – An activity on the Critical Path.
4. **Actual Start Date** – The date that meaningful work actually started on an activity.
5. **Actual Finish Date** – The date that meaningful work actually ended on an activity.
6. **Business Days, District** – Any calendar day that is not a Saturday, Sunday, or District-recognized holiday.
7. **Completion Date, Contract** – The date specified in the Contract for completion of the Project or a revised date resulting from a properly executed Time Extension.
8. **Start Date, Contract** – The day following the District's approval of the Contractor's Performance Bond.
9. **Completion Date, Scheduled** – The date forecasted by the Project Schedule for the completion of the Project.
10. **Constraint** – An early or late date restriction imposed on an activity or milestone. Will alter Total Float values and the forecasted start or finish of an activity or milestone.
11. **Contemporaneous Period Analysis Method** – Also known as the Contemporaneous Schedule Analysis, it is an observation schedule analysis technique used to identify and quantify critical delay. The method is identified and described in AACEI's

- Recommended Practice for Forensic Schedule Analysis, Method Implementation Protocol (MIP) 3.4.
12. **Critical Path** – The longest continuous path, time wise, of activities that determine the Schedule Completion Date or other Contract Milestones, also called the Longest Path. The Critical Path may change from time to time as activities are completed ahead of or behind schedule.
 13. **Critical Path Method (CPM)** – A method of planning and scheduling that relies on activities, activity durations, activity relationships, and network calculations to forecast when activities will be performed. This method also allows for the identification of the Critical Path of the Project.
 14. **Data Date (DD)** – The date entered in the Project Details, in the Dates tab, which is used as the starting point to calculate the schedule. For the As-Planned Schedule, the Data Date shall be the Contract Start Date; for Progress Schedule Update submissions, the Data Date shall be the date up to which the Contractor is reporting progress (generally the day after the last working day for the corresponding contract payment period).
 15. **Duration, Original (OD)** – The original estimated number of working days (not including holidays) in which the Work associated with an activity is expected to be performed. (The number of calendar days may be different based on the calendar assigned to the activity.)
 16. **Duration, Remaining (RD)** – The estimated time, expressed in working days (not including holidays or other non-working periods), needed to complete an activity that has started, but has not finished.
 17. **Early Dates** – The earliest date an activity can start or finish based upon activity relationships, duration, and placement within the network. These dates are calculated by the software during the forward pass.
 18. **Early Completion Schedule** – A Project Schedule that forecasts a Scheduled Completion Date(s) that is earlier than the Contract Completion Date(s). This includes Project Schedules that are planned to finish early based on the Project plan and estimate.
 19. **Enterprise Project Management Database (EPMD)** – The District’s database of Project Schedules.
 20. **Enterprise Project Structure (EPS)** – A hierarchy used to organize projects which controls access to project data at any level.
 21. **Float, Free (FF)** – Number of working days by which an activity in the Work Schedule may be delayed from its early dates without necessarily delaying successor activities.
 22. **Float, Total (TF)** – Number of working days by which an activity in the Work Schedule may be delayed from its early dates without necessarily extending the time stated in the Agreement.
 23. **Fragnet** – A “fragmentary network” that consists of an activity or collection of activities that represents work added to the Contract. The fragnet representing the added work is inserted into the Project Schedule to measure the resulting delay, if any, in a Time Impact Analysis.
 24. **Global Data** – Data classified by Primavera software as Global, including Project Codes, Global Activity Codes, Global Calendars, Resource, Global Filters, Global Reports, User Defined Fields, and Unit of Measure.
 25. **Lag** – An amount of time, measured in workdays, between an activity and its successor used during the schedule calculation.

26. **Late Dates** – The latest date an activity can start or finish based upon activity relationships, duration, and placement in the network. These dates are calculated by the software during the backward pass.
27. **Longest Path** – The sequence of activities in the Project Schedule network that calculates the Scheduled Completion Date. Also referred to as the Critical Path.
28. **Milestone** – An activity with zero duration that represents a significant event. For example, the beginning and end dates of the Project specified by the Contract, a project phase, interface point with other contracts, or revised date resulting from a properly executed Change Order.
29. **Narrative Report** – A descriptive report that accompanies each Project Schedule submission. The required contents of this report are set forth in this specification.
30. **Open End** – The condition that exists when an activity has either no predecessor or no successor, or when an activity's only predecessor relationship is a finish-to-finish relationship or only successor relationship is a start-to-start relationship.
31. **Organizational Breakdown Structure (OBS)** – An OBS is a hierarchical arrangement of a program or project management structure. User access and privileges to nodes and projects within the Enterprise Projects Structure (EPS) hierarchy are implemented via a responsible manager defined in the enterprise-wide OBS hierarchy.
32. **Predecessor** – An activity that is defined by schedule logic to precede another activity.
33. **Project Scheduler** – The person designated by the Contractor and approved by the District that is responsible for developing and maintaining the Project Schedule.
34. **Project's Must-Finish-By-Date** – A date constraint entered in the Project Details, in the Dates tab, that reflects the Contract Completion Date specified by the Contract or revised date resulting from properly executed Change Order.
35. **Relationships** – The interdependence among activities in the network. Relationships link an activity to its predecessor(s) and successor(s). Relationships are defined as:
 - a) Finish-to-Start (FS) – The successor activity can start only when the predecessor activity finishes.
 - b) Finish-to-Finish (FF) – The successor activity can finish only when the predecessor activity finishes.
 - c) Start-to-Start (SS) – The successor activity can start only when the predecessor activity starts.
 - d) Start-to-Finish (SF) – The successor activity can finish only when the predecessor activity starts.
36. **Schedule, As-Built (AB#)** – This schedule is typically the final Schedule Update for the project and records the completion of all Contract work. This schedule shall be submitted for final payment in accordance with specification section 01 3300 – Submittal Procedures.
37. **Schedule, As-Planned (AP)** – This schedule fully details the plan to complete the Project in accordance with the Contract Documents. Once the As-Planned Schedule is accepted by the District, it shall be archived and a copy of it shall be used as the basis to create Schedule Update No. 1.
38. **Schedule, Forensic** – A schedule (or schedules) developed retrospectively or well after the fact to replace or approximate a contemporaneous schedule (or schedules). The District does not accept forensic schedules.
39. **Schedule, Look-Ahead or Monthly Work Plan (MWP)** – These are short excerpts from the Project Schedule that are presented in construction or progress meetings for coordination purposes. Usually referred to by the MWRDGC as the “four-week-look-ahead schedule” or whatever time duration the MWRDGC Engineer directs. These

schedules should contain more detail than the Project Schedule and should be coordinated with and reflect the dates, logic, etc. with the latest Schedule Update.

40. **Schedule, Project** – This term will be used when referring generally to the Project’s CPM Schedules. This term only refers to the As-Planned Schedule, Look-Ahead or Monthly Work Plan, Schedule Update, Recovery Schedule, or any other schedule accepted by the Engineer.
41. **Schedule, Recovery (RS#)** – A schedule that the District’s Engineer instructs the Contractor to develop to recover or mitigate the forecasted project delay depicted in an unaccepted Schedule Update.
42. **Schedule, Current** – A version of the Project Schedule that reflects the status of activities that have started or have finished as of the Data Date. This schedule depicts the activities’ actual start dates, actual finish dates, and remaining durations as of the Data Date and is developed on a quarterly basis.
43. **Schedule Update Submittal (SU#)** – A version of the Project Schedule that reflects the status of activities that have started or have finished as of the Data Date, as required at specific dates for submittal to the Engineer and to preserve the record.
44. **Schedule Log Report (F9 Report)** – The report generated by the software application when a user “schedules” the Project Schedule. It documents the settings used when scheduling the project, along with project statistics, error/warning, scheduling/leveling results, exceptions, etc.
45. **System Administrator** – The individual who manages the Primavera scheduling system and EPMD for the District.
46. **Substantial Completion** – A milestone event or a point in time when the Work, or a District-designated portion of the Work, has been declared in writing by the Engineer to have been completed in accordance with the Contract Documents, to a sufficient extent that it can be used by the District for its intended purpose and/or begin a 60 day test. Substantial Completion is not substantial performance of the contract.
47. **Successor** – An activity that is defined by schedule logic to succeed another activity. The Start Date or Finish Date of a successor may be controlled by its predecessor.
48. **Work Breakdown Structures (WBS)** – A deliverable oriented grouping of project elements that organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of project components or work packages.
49. **Working Day** – A Working Day is a calendar day designated as a day that work can occur in the work calendars of the Project Schedule.

1.4 RELATED SECTIONS

- A. 01 26 66 - Extension of Contract Time
- B. 01 32 50 - Project Management System
- C. 01 13 10 – Project Coordination and Meetings

1.5 REFERENCES

- A. Oracle Corporation:
 1. Primavera P6 Project Management Software

- B. The Association for the Advancement of Cost Engineering (AACE):
 - 2. AACE International Recommended Practice No. 29R-03, FORENSIC SCHEDULE ANALYSIS.
 - 3. AACE International Recommended Practice No. 37R-06, SCHEDULE LEVELS OF DETAIL – AS APPLIED IN ENGINEERING, PROCUREMENT AND CONSTRUCTION.
 - 4. AACE International Recommended Practice No. 52R-06, TIME IMPACT ANALYSIS – AS APPLIED IN CONSTRUCTION.
 - 5. AACE International Recommended Practice No. 78R-13, ORIGINAL BASELINE REVIEW AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION.

PART 2 – PRODUCTS

2.1 SCHEDULING SOFTWARE

- A. The District will provide Oracle’s Primavera P6 Project Management software, or a newer release, and its Oracle’s Enterprise Primavera P6 Project Management Database (EPMD) on internet accessible network servers for Contractors to develop, maintain, and submit the Project Schedules for District personnel and Consultants to review, evaluate, and accept the Project Schedules. The District will determine the location to store the Project Schedule files on the EPMD and will provide the Contractor with the naming convention for all Project Schedule submissions.

PART 3 – EXECUTION

3.1 EPMD ACCESS AND USAGE

- A. Submit a request for access to the District for one proposed user, unless otherwise specified, to obtain a User ID and Password for access to the District’s EPMD. Upon receipt of the Notice of Award, contact the Resident Engineer to request access for a username and password via e-Builder or directly to the District’s Resident Engineer via email if the Contractor does not have access to e-Builder. If at any point the contract is terminated, the Contractor’s access to the project will be rescinded.
- B. Early Access to the District’s EPMD will be provided upon request to the lowest apparent bidder. The District will provide the Contractor with a Project Schedule template for the Contractor’s use in developing its Project Schedule. The Contractor shall develop, update, and revise the Project Schedules in the District’s EPMD. The Contractor’s Narrative shall include and address all items listed in Part 3.5-D.
- C. The District will not “Import” or accept Project Schedule files from any other computer system.
- D. The District will create and maintain access rights within the EPMD. As this software is an enterprise application, the District will be the sole entity to modify the EPS structure,

the OBS Structure, Global Project Codes, Global Activity Codes, Global Calendars, User Defined Fields, Security Profiles, Admin Categories, and Admin Preferences.

Table No. 1 provides the District Schedule Filename Convention. Use this naming convention for all Project Schedules.

Table No. 1: Schedule Filename Convention		
Project Schedules	Initial Submission	Resubmission
As-Planned Schedule	XX-XXX-XX AP-R0	XX-XXX-XX AP-R1
Schedule Update No. 1	XX-XXX-XX APH-R0 and XX-XXX-XX SU1-R0	XX-XXX-XX APH-R1 and XX-XXX-XX SU1-R1
Schedule Update No. 2	XX-XXX-XX SU1H-R0 and XX-XXX-XX SU2-R0	XX-XXX-XX SU1H-R1 and XX-XXX-XX SU2-R1
1st Recovery Schedule	XX-XXX-XX RS1-R0	XX-XXX-XX RS1-R1
2nd Recovery Schedule	XX-XXX-XX RS2-R0	XX-XXX-XX RS2-R1
As-Built Schedule	XX-XXX-XX AB1-R0	XX-XXX-XX AB1-R1
* XX-XXX-XX is the District Contract Number.		
** Note that a half step update (APH, SU1H, SU2H...) and a full step update (SU1, SU2, SU3...) are required for each update.		

- E. The District’s EPMD will generally be available for the Contractor’s use at all times unless system maintenance (i.e., backups, upgrades, etc.) is being performed. No time extensions will be granted for users being unable to access the system due to system maintenance.
- F. The District does perform regular backup of data contained in the EPMD and will make every effort to restore the latest historical copy of schedule submissions in the event of any failure of the EPMD. The Contractor is responsible for its own backup of these submissions. In the event a Contractor’s authorized user cannot access the EPMD from 6:00 a.m. to 10:00 p.m., Monday through Friday, the Contractor shall provide notification in e-Builder to the System Administrator.
- G. Project Schedules are developed in part based on the Contractor’s knowledge of the project, the Contractor’s means and methods, and the Contractors’ understanding of the Contract and past experience. Note that all other schedule data, and all Enterprise data residing on the EPMD, are the sole property of the District and the Contractor is not to use the EPMD system for non-District projects.

3.2 PROJECT SCHEDULE SUBMITTALS:

A. Project Scheduler:

1. Designate an individual, entitled the Project Scheduler, who will develop and maintain the Project Schedule. Ensure that the Project Scheduler is present at the As-Planned Schedule Meeting and attends all meetings, or is knowledgeable of the meeting minutes that outline schedule-related issues during those meetings, which may affect the CPM schedule, including but not limited to those between the Contractor and their Subcontractors and between the Contractor and the District. The Project Scheduler must be knowledgeable of the status of all aspects of the Work throughout the duration of the Contract, including but not limited to original Contract Work, alterations or additions, and unanticipated conditions.
2. Provide a Project Scheduler with the following minimum qualifications:
 - a) The Project Scheduler shall have at least three (3) years of experience using Oracle's Primavera P6 Project Management software. A Project Scheduler with less experience may be acceptable if he or she can document the completion of at least three (3) days of training in Oracle's Primavera P6 Project Management from a certified instructor and has one (1) year of experience in the use of Oracle's Primavera P6 Project Management Software.
 - b) The Project Scheduler duties should not be shared by more than one person at any time. It may be a full or part-time position or may be filled by a Consultant.
 - c) The Contractor may fill the Project Scheduler position using a person who is not on the Project, except for meetings and other times when the Project Scheduler's presence is required on the Project to satisfactorily fulfill the Project Schedule requirements of the Contract Documents.
 - d) The Contractor's submittal to the District proposing the Project Scheduler shall contain a resume and other documentation sufficient to establish the Project Scheduler's compliance with the requirements of this specification. The District will review the submittal and indicate its approval, ask for additional information regarding the proposed Project Scheduler's qualifications or other responsibilities, or reject the Contractor's proposed candidate. The District will not accept the Contractor's Project Schedule submission before the Contractor has submitted and the District has accepted the Contractor's proposed Project Scheduler.

B. As-Planned Schedule Meeting:

1. After receipt of the Notice of Award, contact the Engineer to schedule an As-Planned Schedule Meeting. Ensure that the As-Planned Schedule Meeting occurs within 30 calendar days of the approval of the Contractor's Performance Bond. The purpose of this meeting is to discuss all essential matters pertaining to the satisfactory scheduling of the Project, and to resolve questions regarding interpretation of the Contract related to the Project Schedule.
2. The Contractor is required to submit the Project As-Planned Schedule draft that demonstrates how the Project Scheduler's entire proposed alphanumeric coding structure and the activity identification system for labeling work activities in the Project Schedule will conform to the detailed requirements of this specification. The Contractor may submit the Project As-Planned Schedule draft at any time following the Notice of Award, but before the As-Planned Schedule Meeting.
3. At the As-Planned Schedule Meeting, ensure that the Project Scheduler is prepared to discuss the following:

- a) A construction plan describing the proposed sequence of Work and means and method of construction.
 - b) How the Contractor plans to depict its planned sequence of Work in the Project Schedule.
 - c) The proposed hierarchal Work Breakdown Structure (WBS) for the Project Schedules. The Project Scheduler shall provide a paper copy of the proposed WBS at the meeting.
 - d) The proposed project calendars.
 - e) The proposed project activity codes and code values for each activity code and shall provide a paper copy of this information at the meeting.
4. The System Administrator will be available to answer questions regarding scheduling, including the availability of District-supplied electronic file(s) containing sample Project Schedule information, such as WBS, Global Activity Codes, and Calendars, sample Project Schedule Narratives, Special Notes for CPM Scheduling, the CPM Scheduling Manual, and required standard format for Project Schedules.
 5. Schedule meetings as necessary with the System Administrator and Engineer to discuss schedule development and resolve schedule issues until the As-Planned Project Schedule is accepted by the Engineer.
 6. Critical items for this review should include, but are not limited to the proposed WBS for subsequent progress schedules; the proposed project Calendars; the Project planned start date; the Project Must-Finish-By-Date; major Milestone activities; critical procurement items; and the critical path (i.e. – Approval of Performance Bond, Contract Completion).

C. Project Schedule Submission on the EPMD:

1. Submit the Project Schedule to the Engineer for review and acceptance. Ensure that the filename conforms to the requirements of Table No. 1. The Project Scheduler can change the Project ID and Name through the WBS at the top node, as they do not have privileges to edit data through the Project Details tab. Ensure that all submissions meet the requirement of specification section 01 3300 – Submittal Procedures.
 - a) Project Schedule shall be copied and renamed in the EPS. Place the renamed file in the “Current EPS folder for the Engineer’s review.
 - b) The Project Schedule printouts, Scheduling Log (F9) report, and Narrative Report shall be submitted through the submittal module in e-Builder. A copy of the .XER Export shall also be included in the submittal for record, but only the schedule file copied over in the EPMD will be reviewed. If information in the schedule files is found to be different, the schedule file in the EPMD will govern.
2. Schedule submittals will be immediately rejected without review for the following reasons:
 - a) All submittal items required by subsection 3.2.D are not included in the submittal package.
 - b) The data date is not correct for the type of schedule being submitted. For schedule updates the data date should be the first calendar day following the period for which progress was recorded.

D. Project Schedule Submittal Requirements:

1. As-Planned Schedule Submittal Requirements.
 - a) A Narrative Report in Adobe Acrobat Format.
 - b) The .XER export file of the Project Schedule (archived copy) shall be copied and

- renamed as the As-Planned Schedule and saved in the Current EPS folder.
- c) A Project Schedule electronic printout in Adobe Acrobat Format using the Global Layout named “As-Planned Schedule – Critical Path,” with activities sorted by Start Date in ascending order, grouped by WBS, and the “Longest Path” filter applied. This plot shall provide a clear longest path from the Data Date to the last activity in the schedule.
 - d) A Project Schedule electronic printout in Adobe Acrobat Format of the entire schedule using the Global Layout named “As-Planned Schedule – Full Schedule”, with activities sorted by Start Date in ascending order and grouped by WBS.
 - e) A Schedule Log Report (F9 report) in Adobe Acrobat Format.
 - f) A three (3) month Look Ahead Schedule in Adobe Acrobat Format using the Global Layout named “Three-Month Look Ahead,” with activities sorted by Start Date in ascending order and grouped by WBS. This plot depicts the activities that are forecasted to occur from DD to DD+90 (3-month Look-ahead).
 - g) A Predecessor/Successor Report in Adobe Acrobat Format.
2. Schedule Update and Recovery Schedule Submittal Requirements
- a) A Narrative Report in Adobe Acrobat Format.
 - b) An export of the Progress Only (Half-Step) .XER Schedule Update File. Progress is entered directly into the Current Schedule file. The file, when complete, should be copied and renamed according to Table No. 1.
 - c) An export of the Progress and Modifications (Full-Step) .XER Schedule Update File. Non-progress modifications are entered directly into the Current Schedule file. The file, when complete, should be copied and renamed according to Table No. 1. If the modifications are not accepted by the District the Contractor may use a copy of the Progress Only (Half-Step) Schedule Update File in Load spring to replace the Current Schedule.
 - d) Project Schedule plots in Adobe Acrobat Format using the Global Layout named “Schedule Update – Critical Path,” with activities sorted by Finish Date in ascending order, grouped by WBS, and the “Longest Path” filter applied. These plots shall provide a clear longest path from the Data Date to the last activity in each schedule. Schedule Update – Critical Path Schedule plots should be provided for both the Progress Only Schedule and the Progress with Modifications Schedule.
 - e) Project Schedule plots in Adobe Acrobat Format of the entire schedule using the Global Layout named “Schedule Update – Full Schedule”, with activities sorted by Start Date in ascending order and grouped by WBS. “Schedule Update – Full Schedule” schedule plots should be provided for both the Progress Only Schedule and the Progress with Modifications Schedule.
 - f) A Project Schedule plot in Adobe Acrobat Format using the Global Layout named “One-Month Look Ahead”, with activities sorted by Start Date in ascending order and grouped by WBS. This plot depicts the activities that show from DD-30 to DD (1-month Look-back) and the activities that are forecasted to occur from DD to DD+30 (1-month Look-ahead). The “One-Month Look Ahead” plot should be provided for only the Progress with Modifications Schedule.
 - g) Schedule Log Reports (F9 reports) in Adobe Acrobat Format for both the Progress Only Schedule and the Progress with Modifications Schedule.
 - h) Predecessor/Successor Reports in Adobe Acrobat Format for both the Progress Only Schedule and the Progress with Modifications Schedule.

3.3 PROJECT SCHEDULE DEVELOPMENT:

A. General

1. Develop and maintain a computer-generated Project Schedule utilizing the Oracle's Primavera P6 Project Management software on the District's EPMD.
2. Use the Project Schedule to manage the work, including but not limited to the activities of subcontractors, fabricators, the District, other involved City and State agencies and authorities, other entities such as utilities and municipalities, and all other relevant parties involved with the project.
3. The Contractor is the sole entity allowed to physically modify the following data within the Project Schedule: Activity IDs; Activity names; Activity durations; relationships between activities; successors and predecessors, actual start and actual finish dates of activities; planned start and planned finish dates of activities; and activity resources.
4. The District may modify certain data associated with the Project Schedule to ensure conformance to the EPMD's standard schedule format. This means that the MWRDGC may create additional layouts, filters, and reports; create and edit additional user defined custom data fields; assign project codes; add and assign additional project activity codes; add and assign additional cost account codes; enter data in Notebook tabs; modify calendar ID's (although not the calendar itself); etc.; that do not alter the established activities or schedule logic of the Contractor.
5. Introduce and request approval of proposed changes to the Project Schedule during the regularly scheduled Project Progress Meetings. Only proposed changes that are approved by the Engineer can be incorporated into the Project Schedule.
6. Develop the Project Schedule using, to the maximum extent practicable, the Global Activity Codes (DISTRICT GLOBAL) identified in the District's EPMD. Any schedule "Layouts", "Filters" and "Report" formats that the Contractor develops for the various Project Schedules submissions to the Engineer shall be saved and made available to all other users of the Project Schedule with a name that includes the Contract Number (XX-XXX-XX).
7. The District may make copies of the Project Schedules to perform what-if type analysis, which may involve any type of modification to those copies of the schedules.
8. In scheduling and executing the work, the Contractor shall:
 - a) Sequence the work commensurate with the Contractor's abilities, resources, and the Contract Documents. The scheduling of activities is the responsibility of the Contractor.
 - b) Ensure that the Project Schedule contains all work constraints and Milestones defined in the Contract. Schedule the work using such procedures and staging or phasing as required by the Contract. Work designated as part of separate stages may be performed concurrently with other stages where allowed by the Contract or where approved by the District.
 - c) Ensure that the Project Schedules prepared by the Project Scheduler for submission to the District are in compliance with the Contract. This includes the Project Schedule submissions and accompanying Narratives are timely, complete, accurate, and in compliance with the Contract.
 - d) Communicate all Contract changes, and decisions or actions taken by the Contractor and all subcontractors, fabricators, etc., that affect the Project Schedule to the Project Scheduler in a timely manner to allow appropriate development, maintenance, and updating of the Project Schedule.
 - e) Include and satisfactorily complete all Work contained in the Contract.

- f) Ensure that the Project Schedule includes all work directed in writing by the Engineer in the next Schedule Update submission.
 - g) Ensure that the Schedule Updates reflect the actual dates that work activities started and completed in the field.
 - h) Break a schedule activity into multiple activities to reflect a discontinuity in the work if a work activity is suspended in the field and restarted at a later date, and the break between when the work was suspended to when it was resumed is significant compared to the original activity duration. Logic for split activities shall be updated according to the Contractor's current plan.
- 9. The Contractor is responsible for the means and methods necessary to complete the Work required by the Contract and as depicted in the Project Schedule. Failure by the Contractor to include any element of work required by the Contract in the accepted Project Schedule does not relieve the Contractor from its responsibility to perform such work.
 - 10. All activities that represent a submittal must have a separate activity for the review of the submittal. Durations for review activities should be no less than 21 calendar days.
 - 11. Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the Contract.

B. Detailed Schedule Requirements

- 1. Defining Project details and defaults – Within the Dates tab, the “Planned Start” shall be 1 day after approval of Bond and the “Must-Finish-By” date shall be the Contract Completion Date. The Contractor may need to adjust the time of the Must-Finish-By date to follow end-of-day convention. Within the Settings tab, define the Critical Activities as the “Longest Path.” The Project Scheduler role does not have security privileges to change this option in the Project Details tab, so requests for changes to this data needs to be forwarded to the System Administrator; the Contractor shall include in your request the contract and the Project ID.
- 2. Detail the Project Schedule to Level 4 in the Schedule Levels Requirement of AACEi's Recommended Practice No. 37R-06, SCHEDULE LEVELS OF DETAIL – AS APPLIED IN ENGINEERING, PROCUREMENT AND CONSTRUCTION. The appropriate number of activities will be largely dependent upon the nature, size, and complexity of the project. In addition to all site construction activities, the Project Schedule shall include activities necessary to depict the procurement/submittal process, including shop drawings and sample submittals; the fabrication and delivery of key and long-lead procurement elements; testing of materials, and equipment; settlement or surcharge period activities; sampling and testing period activities; cure periods; activities related to temporary structures or systems; activities assigned to subcontractors, fabricators, or suppliers; erection and removal of falsework and shoring; inspections; activities to perform punch list work; and activities assigned to the District and other State, County, and City agencies and authorities and other adjacent contractors. The Project Schedule shall indicate intended submittal dates and depict the review and approval periods in accordance with specification section 01 3300 – Submittal Procedures.

3. The following activities shall be incorporated into the Progress Schedule:

Required MWRD Schedule Activities				
Activity ID	Activity	Minimum Duration (CDs)	Predecessor Logic Relationship	RESPONSIBILITY (MWRDGC GLOBAL)
Preconstruction Phase (To Occur 30 days after Award is Actualized)				
REQ-1000	Contract Start Date (Start Milestone)	0		MWRDGC
REQ-1010	Submit Insurance Requirements	1	REQ-1000 - FS	Contractor
REQ-1020	Review Insurance Requirements	7	REQ-1010 -FS	MWRDGC
REQ-1030	Submit Safety Engineer	1	REQ-1000 - FS	Contractor
REQ-1040	Review Safety Engineer	7	REQ-1030 - FS	MWRDGC
REQ-1050	Submit Project Engineer	1	REQ-1000 – FS	Contractor
REQ-1060	Review Project Engineer	7	REQ-1040 - FS	MWRDGC
REQ-1070	As-Planned Meeting	1	REQ-1020 – FS, REQ-1040 – FS, REQ-1060 – FS,	Contractor
Construction Phase				
REQ-1080	Contractor Starts Work/Mobilization (Start Milestone)	0	–All REQ submittals and pre-mobilization submittals - FS	Contractor
REQ-1090	Maintenance Manual (MMS) Listing Submittal	30	Finish No Later Than 1/3 Project Duration	Contractor
REQ-2000	MMS List Approved by M&O	30	REQ-1090 - FS	Contractor
REQ-2010	Submit MMS Manuals	30	REQ-2000 - FS	Contractor
REQ-2020	Approve MMS Manual	30	REQ-2010 - FS	Contractor
REQ-2030	Submit O&M Manuals	30	REQ-2000 - FS	Contractor
REQ-2040	Approve O&M Manuals	30	REQ-2030 - FS	Contractor
REQ-2050	Equipment Training	30	REQ-2040 - FS	Contractor
REQ-2060	60 day Operation Test	60	REQ-2050 - FS	Contractor
REQ-2070	Substantial Completion (Finish Milestone)	0	See Definition, REQ-2060 - FS	Contractor
REQ-2080	Punchlist	30	REQ-2070 - FS	Contractor
REQ-2090	Demobilization/Cleanup	30	REQ-2070 - FS	Contractor
REQ-3000	Final Completion (Finish Milestone)	0	REQ-2090 - FF	Contractor

Note: Deletions or modifications to the table above may be needed to fit the circumstances of this Contract.

4. Work Breakdown Structure (WBS) - A multi-level-hierarchal WBS shall be incorporated. The levels (nodes) shall include, but not be limited to:
- a) Level 1- is the project level;
 - b) Level 2- shall have three nodes; PRECONSTRUCTION, CONSTRUCTION, and POST CONSTRUCTION;

- c) Level 3-
 - 1) The node for PRECONSTRUCTION activities shall have at least three sub nodes; SUBMITTALS, REVIEW/APPROVALS, and PROCUREMENT / FABRICATION;
 - 2) The node for CONSTRUCTION activities shall be broken into nodes for various PHASES/AREAS of construction work;
 - 3) The node for POST CONSTRUCTION activities requires no sub nodes.
- d) Level 4- The nodes for PHASES/AREAS of Construction activities should include sub nodes for the various categories of work;
- 5. Activity ID – Include a unique identification number for each activity. Activity ID numbers shall not be changed or reassigned.
- 6. Scheduling Method – All contractors schedules must use the ‘retained logic’ scheduling feature in Primavera P6 Project Management. Schedules may not use the “Progress Override” feature within the software.
- 7. The Resource Leveling feature of Primavera P6 Project Management may not be used on any Project Schedule to be submitted and will not be considered for approval by the Engineer.
- 8. Activity Name – Clearly and uniquely name each activity with a description of the work that is readily identifiable to inspection staff. Each Activity shall have a narrative description consisting at a minimum of a verb or work function (i.e. form, pour, excavate, etc.), an object (i.e. slab, footing, wall, roof, etc.), and a location. The work related to each Activity shall be limited to one Area of the contract, one Stage of the contract, and one Responsible Party of the contract.
- 9. Milestone Activities – Include activities for all Milestones that define significant contractual events such as Notice of Award, Contract Signing/ Bond Approval, Contractor Start Work Date, Substantial Completion, Final Completion, and coordination points with outside entities such as utilities, State agencies, Authorities, municipalities, Time-Related Contract Provisions, etc.
- 10. All milestone activities in the schedule shall be assigned a project calendar based on the standard Global calendar named ‘MWRDGC Milestone / 365 Day / 8 hour,’ this calendar should also be assigned to any activities for concrete curing.
 - a) The Notice of Award milestone shall have a primary constraint of “Start On or After.”
 - b) The Final Completion milestone shall have a primary constraint of “Finish on or before” of the Contract Completion Date.
 - c) All contractual Interim Milestones shall have a primary constraint of “Finish On or Before” using the dates established within the contract.
- 11. Activity Durations – Except for submittal and procurement activities, ensure that durations do not exceed 20 workdays unless approved by the Engineer and that durations for District- submittal reviews meet the requirements set forth in the Contract. If requested by the Engineer, the Contractor shall justify the reasonableness of planned activity time durations. The activity durations should include allowances for anticipated inclement weather. The planning unit is workdays.
- 12. Activity Relationships – Clearly assign predecessors and successors relationships to each activity, and assign appropriate relationships between activities (Finish-to-Start, Start-to-Start, Finish-to-Finish, etc.). Ensure that there are no open-ended activities, with the exception of the first activity and last activity in the schedule. Do not include inappropriate logic ties with Milestone activities (For example, a finish milestone activity, a predecessor shall only be assigned a Finish-to-Finish relationship and a

successor shall only be assigned a Finish-to-Start or Finish-to-Finish relationship. For a start milestone, a predecessor shall only be assigned a Finish-to-Start or Start-to-Start relationship and a successor shall only be assigned with a Start-to-Start relationship). The use of each Lag within the Project Schedule must be approved by the Engineer. Lag durations may not exceed 10 days. The Contractor shall not use negative Lag durations.

13. Assign the “Contract Award Date” activity as a predecessor to all submittal preparation activities.
14. Activity Constraint Dates – The Contractor shall not use constraint activities, with the exception of contractual, unless the Engineer approves the use of such constraints in writing.
15. Activity Dates – With the exception of Milestone dates, “Actual Start” and “Actual Finish” dates and “Planned Start” and “Planned Finish” dates, ensure that activity dates are calculated by software. No Actual Start or Actual Finish dates shall be entered in the As-Planned Schedule.
16. Global Calendars – Global Calendars are those established by the District. There are only two Global Calendars developed and maintained by the District for use by Contractor’s, as templates for creating Project Calendars, they are the following:
 - a) MWRDGC7D-MWRDGC 7-Day Work Week W/ no Holidays
 - b) MWRDGC5DWH-MWRDGC Business Day, 5-Day Work Week w/ MWRDGC recognized Holidays
17. Project Calendars – All activities shall be assigned project calendars and the project calendars shall be unlinked from the global calendars. The Contractor may make additional project calendars that include expected seasonal weather conditions (such as winter shutdown periods) and environmental permit requirements, for the planning and scheduling of activities. Do not incorporate an activity with a description of “Winter Shutdown” that requires constraints. Provide the working days per week, holidays, the number of shifts per day, and the number of hours per shift by using the Calendar modifier in the P6 software.
 - a) All Calendars should be based on an 8-hour shift.
 - b) If the Contractor needs to perform work outside of the typical 8-hour workday, then the Contractor should request approval from the Engineer to work more than 8 hours per day. Upon receipt of the Engineer’s approval, create a Project Calendar with a title that describes the non-standard working hours. The working hours within the newly created calendar must not deviate from an 8 hour day. Remaining durations should be adjusted to reflect any time gain expected by working non-standard hours or non-business days (i.e. weekends or holidays).
 - c) No resource calendars are to be used in the Project Schedule unless requested by the Contractor and approved in writing by the Engineer.
 - d) Ensure that all calendars developed by a Contractor use the following naming convention: Contract No. XX-XXX-XX and describing the function (i.e., XX-XXX-XX – Concrete Calendar, XX-XXX-XX – Landscape Calendar, XX-XXX-XX – Painting Calendar, XX-XXX-XX – Contractor’s 5 Day/8 Hour Workweek).
 - e) Assign activities for shop drawing reviews and other approvals by District-personnel the District-’s standard Global – “DISTRICT Business Day, 5-Day Work Week w/DISTRICT Holidays,” Calendar.
 - f) The As-Planned Schedule cannot include a calendar that reflects any workers working more than 8 hours in any one calendar day or more than 5 days in any one week, without approval of the Engineer, unless otherwise specified. Following the

Contract Award the Contractor may submit a request for an overtime dispensation and if approved can add additional calendars in their next Schedule Update submission. The working hours within any newly created calendar must not deviate from an 8 hour day. Remaining durations should be adjusted to reflect any time gain expected by working non-standard hours or non-business days (i.e. weekends or holidays).

- g) The Contractor shall include weather calendars that include expected seasonal weather conditions (such as winter shutdown periods, rain days, snow days, and other expected normal weather conditions). The weather calendar shall be assigned to activities which would normally be impacted or stopped due to weather. (The Contractor shall provide evidence from a nationally recognized published source, that the expected weather for each month is based on historical data). Delays caused by the Contractor's failure to anticipate expected seasonal weather conditions for activities will not be considered excusable.
 - h) Project calendars created by the Contractor must be "unlinked" from the global calendars to prevent updates to the global calendars from impacting the project calendars. Project calendars can be unlinked by selecting "Calendars" from the Enterprise menu, selecting the project calendar and click "Modify", and deleting the Global Calendar listed under "Inherit holidays and exceptions from Global Calendar."
18. Clearly define significant hand-over points between the Contractor, the District, and other entities including, but not limited to, Federal, State, and local agencies/authorities; and utilities. Include all activities of the District-, utility companies, adjacent contracts, and other entities that affect progress and influence Contract-required dates in the Project Schedule. This includes dates related to all Permits or Agreements. Ensure that the Project Schedule includes special consideration to sensitive areas and shall indicate any time frames when work is restricted in these sensitive areas as outlined in the permits issued by the regulatory agencies, and provided in the Contract Documents.
19. Activity Resources – The District may require labor and equipment resource loading within the project schedule. If requested by the Engineer or District, and at no additional cost, the Contractor will load resources using the following methods.
- a) The Contractor will create an activity code or codes to identify each labor crew planned to be used by the Contractor. Each construction type activity in the project schedule must have a labor crew activity code assigned. Within the written narrative that accompanies each schedule submittal, the Contractor will identify each labor crew type used in the project schedule. The Contractor will detail the count and type of each craft in the crew, the standard days of the week the crew will work, and the standard number of hours each day the crew will work.
 - b) The Contractor will create an activity code or codes to identify each major piece of equipment planned to be used by Contractor. The equipment activity codes will be assigned to construction type activities where the major equipment is needed to perform the work as planned by the Contractor. Within the written narrative that accompanies each project schedule submittal, the Contractor will identify each major piece of equipment that has been used In the Project Schedule. The Contractor will detail the standard working hours and days of the week that the equipment will be available.
20. Activity Codes – Include a well-defined activity coding structure that allows project activities to be sorted and filtered. Activity Codes shall include, but not be limited to,

Responsible Party; Stage; Area of Work; CSI Code; Subcontractor; Non-Standard Work Hours; and additionally, as required by the Engineer to meet the needs of the specific contract work to facilitate the use and analysis of the schedule.

- a) Ensure that only Global Activity Codes established by the District- are incorporated in the Project Schedule.
 - b) Use the Global Activity Codes established by the District- to the maximum extent practicable. Assign the appropriate activity code values to each activity in the progress schedule for the following Global Activity Codes that are in the District's enterprise database:
 - 1) RESPONSIBLE PARTY (MWRDGC GLOBAL)
 - 2) STAGE (MWRDGC GLOBAL)
 - 3) AREA (MWRDGC GLOBAL)
 - 4) CSI CODE (MWRDGC GLOBAL)
 - 5) PAY ITEM (MWRDGC GLOBAL)
 - 6) NON-STANDARD CALENDAR (MWRDGC GLOBAL)
 - 7) CHANGED (ADDED/DELETED) WORK (MWRDGC GLOBAL)
 - 8) TIME RELATED CLAUSES (MWRDGC GLOBAL)
 - 9) DELAY (MWRDGC GLOBAL)
 - c) Any additional Activity Codes developed for specific projects will be Project Activity Codes.
21. Activity Code Values – Ensure that each Activity Code contains individual Activity Code Values that are then assigned to activities.

C. Early Completion Schedules

1. If the Project Schedule forecasts a Completion Date earlier than required by the Contract, or a revised Contract Completion Date resulting from a properly executed Time Extension, the difference between such an Early Completion Date and the Contract Completion Date or any other Milestone Date shall be defined as Float. Total Float and Free Float are owned by the Project and are not for the exclusive benefit of the Contractor or the District-. Total Float and Free Float are available for use by both the Contractor and the District-. The Engineer may use available Total Float and Free Float for the proper interfacing of Work performed by the District or other parties, to accommodate work added by change orders, or to mitigate any unavoidable delays.
2. The Contractor is not entitled to recover delay damages for owner-caused issues that result in delay between the early Scheduled Completion Date and the Contract Completion Date or any other contractual completion date as detailed in the contract.

3.4 AS-PLANNED SCHEDULE:

A. As-Planned Schedule Requirements

1. Submit an As-Planned Schedule Draft any time after the Notice of Award, but before the As-Planned Schedule Meeting. Ensure that the Draft depicts the Contractor's original plan to complete the project based on the contract documents as of award and that the timing and sequence of the work meets the requirements of the contract. See section 3.1 "EPMD Access and Usage" for access to the system and templates.
2. Within 45 calendar days of Bond Approval, submit the As-Planned Schedule. Ensure that the As-Planned Schedule depicts all of the Work to Level 4 as described in ACEi's Recommended Practice No. 37R-06, SCHEDULE LEVELS OF DETAIL –

AS APPLIED IN ENGINEERING, PROCUREMENT AND CONSTRUCTION. Ensure that this schedule depicts the Contractor's plan to complete the project based on only the Contract Documents as of Award and the timing and that the sequence of the Work meets the requirements of the Contract.

3. Once the Project Schedule has been accepted, the Contractor shall not deviate from it without first notifying the Engineer during a Progress Meeting.

B. As-Planned Schedule Narrative

1. Include a Narrative in Adobe Acrobat format that describes:
 - a) The Contractor's general approach to construct the work depicted in the As-Planned Schedule. Address the reasons for the sequencing of work and describe any resource limitations, potential conflicts, and other salient items that may affect the As-Planned Schedule and how they may be resolved.
 - b) If not provided in the contract plans, or if modified by the Contractor, provide copies of the appropriate contract plan sheets marked up as Key Plans, to correlate values on the contract plans (for Area of Work and Stage of Work) to the Contractor's planned breakdown of the project (i.e. - Activity Codes, Activity Names) for scheduling purposes.
 - c) The justification(s) for each activity with a duration exceeding 20 working days.
 - d) The reason for all lag durations used. All Lags must be approved in writing by the Engineer.
 - e) The justification(s) for Contractor imposed activity constraints used in the As-Planned Schedule. All non-contractual constraints must be approved in writing by the Engineer.
 - f) A list of calendars that are being used in the Project Schedule, along with the general reason for their use.
 - g) The Critical Path and challenges that may arise associated with the Critical Path.
 - h) Anticipated coordination issues related to work activities by other entities that require additional information from or action by the Engineer.
 - i) Appendix 1 to the Narrative shall be the "Schedule Log" (F9 report) created when the project was scheduled.
 - j) Include a written representation to the District that the Contractor's Project Manager has determined and verified all data on the Schedule and assumes full responsibility for it, and that the Contractor, subcontractors and suppliers have reviewed and coordinated the activities and sequences in the work schedule with the requirements of the Contract Documents.
 - k) If labor and equipment loading has been required by the Engineer or District, the Contractor will add a section to the written narrative to provide the details of the labor crews and equipment as stated in section 3.3.B "Detailed Schedule Requirement".

3.5 SCHEDULE UPDATE:

A. Schedule Update Requirements

1. General – Maintain the schedule in a current state and prepare an update of the Project Schedule on a monthly basis in the Bifurcated Schedule Update Method described by RP29R-03, Chapter 2.3. Submit the Progress Only (Half-Step) Schedule Update that includes all progress achieved from the Data Date of previous Project Schedule submission through the last working day of the current Contract payment period and

- the Progress with Modifications (Full-Step) Schedule Update that includes the Progress Only Schedule with all non-progress modifications made to keep the schedule up-to-date with the Contractor's current plan.
2. Submit the quarterly CPM Schedule Update prior to processing that month's application for payment. Payment applications are due on the 10th day of the following month. Ensure that the data date of the quarterly Schedule Update files is the first of the next month and that the Schedule Update files depict all progress achieved through the end of the current quarter. Schedule Updates will be checked for adequacy based on the items listed in Section 3.2.C.2. After the 10th day of the following month, or as soon as time allows, and after the requirements listed in Section 3.2.C.2 have been met, the Engineer will review the schedule and determine if any deficiencies exist. If deficiencies exist, the Contractor shall correct those deficiencies prior to the following month's submission of the payment application.
 3. Submission of the schedule update is required for approval of any progress payment unless waived by the engineer. Failure to submit the schedule may incur a 10% hold back of the current month's progress payment until the submission is received.
 4. Ensure that the Progress only and Progress with Modification Schedule Update files reflect the status of activities that have commenced or have been completed, including the following items:
 - a) Actual dates in activity Actual Start and Actual Finish columns as appropriate.
 - b) Remaining Duration for activities that have commenced and not completed.
 - c) If applicable, Suspension or Resume dates for activities that have commenced and not completed.
 5. The Progress with Modification Schedule Update file are to reflect the contractor's current construction plan.
 6. The Contractor shall minimize the number of modifications. Describe the reasons for each modification to the Schedule Update in the Narrative. If a modification is significant, then the Contractor shall obtain the Engineer's acceptance of the modification before making the modification in the Schedule Update. A significant modification is defined as a modification that results in one of the following:
 - a) Alters the Critical Path(s) or Near Critical Path(s).
 - b) Extends the Scheduled Completion Date or other contractual milestone dates.
 7. When preparing a formal submission of the Project Schedule, create a copy of the current Project Schedule and name it according to the file naming convention provided by the District in Table 1 for both the Progress Only Schedule Update File and the Progress with Modifications Schedule Update File.
 8. Additional Schedule Requirements – In addition to the schedule requirements detailed for the submission of the As-Planned Project Schedule, also provide:
 - a) Activity Status:
 - 1) Durations: Do not change the Original Duration without prior written justification by the Contractor and written approval by the Engineer. The Contractor shall edit the Remaining Durations to reflect progress made on work activities, and shall not use Duration %. If a proposed change to the Original Duration is due to additional or changed work to the Contract, the Contractor shall instead add an activity to reflect this additional work, and assign the appropriate Activity Code.
 - 2) Actual Start and Actual Finish Dates: For each activity where work was started during the update period, enter the date the work started. For each activity where work was completed during the update period, enter the date

the work finished.

- 3) Calendars: To change a project calendar for activities scheduled in the future, copy the calendar and use a revised name that includes a reference to which Project Schedule Update the change was incorporated (i.e. – XX-XXX-XXX - Concrete Calendar should be revised to XX-XXX-XXX – Concrete Calendar 2). Document the reason for the change in the calendar in the Narrative.
- 4) Notebook: For any activities on the Critical Path that are delayed, enter the dates the activity was delayed and the reason for such delay in the Notebook tab of that activity. Any information contained within any activity notebook does not constitute a notification of delay or entitlement to a Time Extension.

B. Data Date of the Schedule Update

1. Ensure that the Data Date of the Schedule Update is the day after the last working day of the Contract payment period. The Project Scheduler can modify the project's Data Date through the Schedule tool.
2. The Data Date of the first schedule update will be the day after the last working day of the Contract payment period during which the As-Planned Schedule was accepted.

C. Incorporating Changes to the Contract

1. When the Contractor is performing additional work that has not yet been formally added to the Contract by an executed Change Order, the Contractor should obtain the Engineer's acceptance before inserting a fragnet representing the additional work into the Project Schedule. Fagnets shall only be added to the Progress with Modifications Schedule Update File. When adding these fragnet activities into the Project Schedule, they should assign the "At Risk Work" Activity Code Value in the CHANGED (ADDED/DELETED) MWRDGC GLOBAL Activity Code. Also, describe these changes in the Schedule Update Narrative. When the work represented by the new activities is formally added to the Contract by an executed Change Order, change the "At Risk Work" Activity Code Value in the CHANGED (ADDED/DELETED) MWRDGC GLOBAL Activity Code to "Change Order No. XX"
2. The Engineer's direction to add activity representing additional work to the Project Schedule alone does not demonstrate entitlement to a Time Extension.
3. When adding new activities to the Project Schedule for work that has formally been added to the Contract by an executed Change Order, obtain the Engineer's approval before inserting the new activities into the Project Schedule. Ensure that these activities are assigned the "Change Order No. XX" Activity Code Value in the CHANGED (ADDED/DELETED) MWRDGC GLOBAL Activity Code. The Change Order No. XX Activity Code Value should match the corresponding Contract Change Order Number.
4. If the effect of the change results in a critical delay, then submit a Time Extension Request in accordance with the Contract. Extra work or additional work that does not affect the Critical Path will not be considered as the basis for a time extension.
5. Non approved changes shall not be tied into the existing schedule.

D. Schedule Update Narrative

1. For each Project Schedule Update submission, the Contractor shall submit a narrative in Microsoft Word, or Adobe Acrobat format that includes, but is not limited to:
 - a) The Contract Number, project name, project location, and name of the Contractor.

- b) The Contract Award date, the current Contract Completion Date, and the Scheduled Completion Date.
- c) Any contractual Interim or Completion Milestone dates (I/D, B-Clock, LD, etc), and scheduled start and finish dates for those Milestone activities.
- d) Amount of time gained or lost in the Progress Only Schedule Update since the As-planned Schedule or the previous Schedule Update.
- e) Amount of time gained or lost by modifications as measured between the Progress Only Schedule Update and the Progress with Modifications Schedule Update.
- f) In the event of the Progress Only Schedule Update indicating the project finishing after the contractual completion date, identify the activity that is the current primary delay and list all activities on the Critical Path (include Activity ID's and Activity Descriptions) where work is currently being delayed, and for each such activity provide detailed information including:
 - 1) The events that caused the delay.
 - 2) The written "Notice of Delay" that was submitted to the Engineer within three (3) business days after the commencement of said delay.
 - 3) The party(s) responsible for the delay event(s).
 - 4) The number of days the activity has been delayed.
 - 5) The activities in the construction schedule affected by the events.
 - 6) The reasonable steps needed to minimize the impact of the delay, and which party needs to take the action(s).
- g) List any other problems experienced during the previous quarter, the party responsible for the problems, and the Contractor's intentions to resolve the problems.
- h) List all activities for procurement of long lead time materials that are behind schedule and the reason(s) why.
- i) For major work items describe the differences between the actual work performed and the work planned for the period as represented in the preceding Schedule Update submission, including explanations for the deviations.
- j) For all suspended work activities that could otherwise logically be progressed, identify the responsible party prohibiting the progression of the work, as well as the detailed reasons why.
- k) Description of any changes to the Critical Path since the last Schedule Update submission and the impacts of such changes.
- l) List of all added or deleted activities included in this Schedule Update submission, and the reason(s) for and the impact(s) of such changes.
- m) List all changes in activity Original Durations, the justification for such change(s), and the impact(s) of such changes.
- n) List all changes in relationships between activities included in this Schedule Update submission, and the reason(s) for and the impact(s) of such changes.
- o) List any addition or deletion of activity or project constraints, and the reason(s) for and the impact(s) of such changes.
- p) List all changes to the project calendars, and the reason(s) for and the impact(s) of such changes.
- q) The major work elements, as defined in the WBS, to be accomplished during the next quarterly update period.
- r) Any potential problems that are anticipated for the next quarterly work period and the proposed solutions to such problems. Identify potential problems or risks that either the District or the Contractor may be potentially responsible for. Explain

- what action the responsible party (i.e. District or Contractor) needs to take and the date by which time the action needs to be taken to avoid the problem.
- s) Any planned acceleration of activities that the Contractor anticipates to undertake within the next quarterly work period that either District directed, or that the Contractor believes is necessary. Indicate why the acceleration is necessary and if the acceleration is self-directed by the Contractor or by the District.
 - t) If labor and equipment loading has been required by the Engineer or District, the Contractor will add a section to the written narrative to provide the details of the labor crews and equipment as stated in section 3.3.B “Detailed Schedule Requirement”.

3.6 RECOVERY SCHEDULE

A. Recovery Schedule Requirements

1. The Engineer may require the Contractor to submit a Recovery Schedule and written description of the plan to recover all lost time and maintain the Contract Completion Date or specified Interim Milestone Date(s) if the Scheduled Completion Date forecasts that the project will finish thirty (30) calendar days or ten (10) percent of the total contract days, whichever is the greater amount of calendar days, later than that required by the Contract, as adjusted, if appropriate.
2. Refusal, failure, or neglect by the Contractor to take appropriate recovery action or submit a recovery statement when required as specified herein shall constitute reasonable evidence that the Contractor is not prosecuting the work with all due diligence, and shall represent sufficient basis for the Engineer to increase retention monies by an amount equal to the amount of potential liquidated damages.
3. The Contractor shall not be entitled to any compensation or damages from the District on account of any action undertaken by the Contractor to prevent or mitigate an avoidable delay or by the District’s determination to increase retention monies.

B. Data Date of Recovery Schedule

1. Ensure that the Data Date of the Recovery Schedule is the Data Date of the Schedule Update that forecasts the late completion.

C. Recovery Schedule Narrative

1. Describe the actions that it plans to implement to mitigate the forecasted delay. This includes describing:
 - a) Any additional labor or equipment resources that it plans to use.
 - b) Any re-sequencing of the work that it plans to follow.
2. Or if the Contractor believes that the forecasted delay is not its responsibility, then submit a Time Extension Request in accordance with the Contract.

3.7 REVIEW AND ACCEPTANCE OF THE PROJECT SCHEDULE

A. Immediate Rejection of Progress Schedule Submissions

1. If the Contractor’s Project Schedule submission does not meet the requirement specified in Subsection 3.2.C., then the Engineer will immediately reject the submission, without further review, analysis, or comments.

B. Project Schedule Meetings

1. Project schedule meetings shall be held one week prior to submission of each schedule update. The review of the Look Ahead Schedule or Monthly Work Plan serves as the forum to discuss project progress and delays, suggested remedies, necessary modifications to the Project Schedule, coordination requirements, change orders, potential Contractor time extension requests, and other relevant issues. Ensure that the Contractor is represented at a minimum by the Project Manager, Field Superintendent and Project Scheduler at the progress meeting.
2. If contract work is falling behind the Project Schedule, the responsible party (i.e. Contractor or District) shall be ready to discuss what measures it will take in the next thirty (30) days to put the work back on schedule so as to meet the Contract Completion Date specified in the Contract.
3. One topic of the regular progress meetings held by the Engineer and attended by the Contractor will be a review of the Look-Ahead Schedule or Monthly Work Plan generated from the Project Schedule. A detailed Look-Ahead Schedule or Monthly Work Plan (MWP) may be created outside the Project Schedule using alternate software if the conditions listed below are met.
 - a) Look-Ahead or MWP schedules should contain more detail than the Project Schedule and should be coordinated with and reflect the dates, logic, etc. with the latest Schedule Update.
 - b) A column must be included for "Activity ID" within Look-Ahead or MWP Schedule. Each detailed activity within the Look-Ahead or MWP must have the Activity ID from the most recently submitted Schedule Update that the detailed activity is related to.
 - c) A column must be included with the heading "Critical Path" in the Look-Ahead or MWP Schedule.
 - d) All detailed activities that are related to a critical path activity within the most recently submitted Update Schedule will be marked with an asterisk in the "Critical Path" column.
4. At the meeting, the Contractor shall keep minutes of this meeting, and shall compile an action item list that describes who is responsible for existing or pending issues and the date by which the issue needs to be resolved to avoid delays. The Contractor shall forward a copy of the meeting minutes and action item list to the Engineer within 2 business days following the meeting.

C. Review and Acceptance of Project Schedules.

1. The engineer shall copy a submitted schedule from current folder to a review folder in the EPS. No schedules will be imported from outside the District's hosted Primavera P6 EPMD.
2. The Engineer will review the Project Schedule submissions and will prepare a written response (Progress Schedule Review Report) to the Contractor's submission within five (5) District Business Days following receipt of the Contractor's complete schedule submission. The Engineer will either "acknowledge" the schedule, "acknowledge with comments," or "reject" the schedule for re-submittal by the Contractor.
3. If the Project Schedule submission is not in compliance with the Contract, the Engineer may reject the submittal and forward any comments and requests for schedule modifications to the Project Scheduler with a copy to the Contractor. The Project

Scheduler shall address all comments in writing or make the requested modifications and resubmit the modified schedule within five (5) District Business Days of the Engineer's reply. If the Engineer determines the revised submission still does not meet the contract requirements, any further modifications required thereafter shall also be submitted for acceptance within five (5) District Business Days of the request for modifications by the Engineer.

4. For schedules that are "acknowledged with comments," the Engineer shall forward any comments or requests for modifications, to the Contractor. The Project Scheduler shall address all comments in writing or make the requested modifications as part of the next Project Schedule submission.
5. The Project Scheduler shall make adjustments to the Project Schedule in accordance with the Engineer's comments and resubmit copies for review consistent with the requirements of this section.
6. Once accepted, the engineer will copy the reviewed schedule file from the review folder to the approved folder. An export of the contractors accepted schedule file, .XER, will be transmitted with the schedule review correspondence.
7. The Engineer, by accepting the Project Schedule, does not warrant that the Project Schedule is reasonable or that by following the Project Schedule the Contractor can complete the work in a timely manner. If, after a Project Schedule has been accepted by the Engineer, either the Contractor or the Engineer discover that any aspect of the Project Schedule is in error, the Contractor shall correct the Project Schedule in the next Project Schedule submission and describe this modification in the Narrative report.
8. Acceptance of Project Schedules by the Engineer shall not be construed to imply approval of any particular construction methods or sequence of construction or to relieve the Contractor from its responsibility to provide sufficient labor, equipment, and materials to complete the Contract in accordance with the contract documents.
9. Acceptance of the Project Schedule by the Engineer does not attest to the validity of assumptions, activities, relationships, sequences, resource allocations, or any other aspect of the Project Schedule. The Contractor is solely responsible for the planning and execution of the work.
10. Acceptance of the Progress Schedule by the Engineer shall not be construed to modify or amend the Contract or the date of completion. Completion dates can only be modified or amended by standard contractual means, through an executed Contract Order.
11. Acceptance of the Progress Schedule by the Engineer shall not be construed to mean that the Engineer agrees with the accuracy or validity of any historical information placed in the progress schedule relating to the Contractor's position on any claims.
12. If any resources are included in the Project Schedule, then the Engineer's acceptance of schedule does not represent an acceptance of the Contractor's planned resources. The Engineer will only use Contractor's resource data to determine the reasonableness of achieving the Contractor's production rates. Resources included with the accepted Project Schedule shall not be misconstrued as a cost benchmark for the performance of planned or actual work.
13. If any cost data is included in the Project Schedule, then the Engineer's acceptance of schedule does not represent an acceptance of the Contractor's cost data. Cost data included with the accepted Project Schedule shall not be misconstrued as a cost benchmark for the performance of planned or actual work.

14. Upon receipt from the Contractor of the Revised Project Schedule submission, a new review period by the Engineer of five (5) District Business Days will begin.

END OF SECTION

SECTION 01 32 50

PROJECT MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 GENERAL PROJECT MANAGEMENT OBJECTIVES

- A. All documentation required by the Contract shall be transmitted between the Contractor and the District in accordance with the requirements of this Section.
- B. The Contractor shall use e-Builder Enterprise project management system (e-Builder) to exchange information and track all project documentation. The e-Builder is an Internet/Web-based project management software used to exchange information required by the Contract in an electronic environment. Documents that require hardcopy originals shall be uploaded into e-Builder when completed. The uploaded documents shall be the official documentation of the project.
- C. Use of this project management system will not replace or change terms of the Contract.
- D. Each project team member of the Contractor including, but not limited to: Project Manager, Project Engineer, Scheduler, and Superintendent and any other personnel or subcontractor(s) designated by the Contractor that will interact directly with the District on behalf of the Contractor, shall have access to the Internet and have an Internet e-mail address in order to communicate with various project team members. The Contractor shall provide, upon receipt of the Start of Contract Notice, confirmation of these conditions and the names, positions, and e-mail addresses to the District. Training of these individuals and software licenses for use of the software will be provided by the District. The software contains user manuals, and there are several venues for assistance after training.

1.2 DOWNTIME

- A. In the event that the e-Builder system is temporarily unavailable, continue with Project communications utilizing electronic means (email) or hard copies to transmit and receive Project Communications.
- B. Maintain records of all Project Communications during the e-Builder downtime and upload the records to the software when it becomes operational.
- C. Notify the District by phone or email when e-Builder is not functional.

1.3 TRAINING

- A. Submit a proposed schedule of attendance for e-Builder training sessions including a list of back-up personnel.
- B. Each authorized e-Builder user shall attend a minimum of one training session.

- C. Mandatory attendance for listed users of e-Builder prior to use, including any training sessions as requested.

1.4 RESTRICTIONS AND LIMITATIONS

1. All project communications submitted to the District through e-Builder after 3:00 PM, Monday through Friday, will be acknowledged no earlier than the following business day,
2. For project communication purposes, business days and hours are defined as Monday through Friday, 7:00 AM to 5:00 PM, Central Time, excluding the District's holidays.
3. User access rights to e-Builder will restrict access to this contract only.
4. Access permission levels will be established by agreement with the District.

PART 2 - PRODUCTS

2.1 SOFTWARE AND HARDWARE REQUIREMENTS

- A. For users designated by the Contractor, the District will arrange user access to the District's e-Builder website. There is no user fee or licensing fee required of the Contractor. The District shall reserve the right of the license upon completion of the contract and project closeout.
- B. If the Contract requires the Contractor to maintain a field office(s), the following requirements must be met. Otherwise, e-Builder must be used through the Internet at the Contractor's home office.
 1. The Contractor shall maintain in its field office(s): computers, scanners, plotters, and color printers for inputting and retrieving documents from the electronic document environment for the mutual use of the Contractor, his subcontractors, and the District staff.
 2. The Contractor shall procure high speed internet access for computers located in the Contractor's field office(s).
- C. Additional information on e-Builder may be obtained via the Internet, at www.e-builder.net or by calling (800) 580-9322.

PART 3 - EXECUTION

3.1 SYSTEM MANAGEMENT AND USE

- A. The District will administer the e-Builder user accounts and licenses.
- B. All costs associated with utilizing this system, not specifically designated to be covered by the District, including, but not limited to, computer hardware and high speed internet access, are the responsibility of the Contractor, for the full term of this Contract. The

Contractor will not be eligible for any “extra” costs which may be claimed as necessary to comply with the requirements of this Section, including Requests for Proposals (RFPs), Change Orders (CCOs) and/or Contract Time Extensions. (CTOs)

3.2 USE BY SUBCONTRACTORS

- A. The District encourages the Contractor to utilize e-Builder for communicating with their subcontractors. The Contractor shall inform all subcontractors of the purpose of the project management system and how it can assist them in obtaining project information.
- B. The Contractor shall obtain user accounts for all MBE, WBE, and SBE subcontractors to provide contract required reporting to the District’s Diversity Section. The Contractor shall obtain user accounts for all MBE, WBE, and SBE subcontractors) subcontractors to provide contract required reporting to the District’s Diversity Section.

3.3 COMMUNICATION PROCESS

- A. Project communication shall take place in e-Builder by creating and distributing documents, filling out forms, and completing processes, directly within the system. All documents requiring formal (wet) signatures shall be printed and signed. The signed originals shall be scanned, uploaded to, and distributed in e-Builder. Examples of documents requiring formal signatures include but are not limited to: certification statements on Payment Requests, Certified Payroll, Change Orders, and contract Time Extensions. The Contractor shall maintain possession of its signed originals.
- B. The Contractor shall enter Submittals, CCO proposals, Requests for Information (RFIs), Logs, Meeting Agenda, Meeting Minutes, Daily Reports, insurance documents, other items and required documents in e-Builder.
- C. Samples, by their nature, cannot be transmitted electronically, and shall be distributed in the traditional manner but tracked in e-Builder. The system shall be used to track and expedite the processing of items that do not lend themselves to being in an electronic environment.
- D. Support documentation in hard copy format for any document in e-Builder shall be scanned into an electronic file and attached in e-Builder to the document. Each submittal shall be clearly marked (highlighted, arrows, and/or crossed out) to indicate equipment, materials, etc. that are relevant to this contract. All support documentation electronic files shall be scanned and/or saved in PDF (Portable Document Format) format. Drawings can be saved in PDF or DWF (Design Web Format) format. Digital photos shall be uploaded in jpeg format. All electronic files shall be searchable.
- E. Operation and Service (O&M) and Maintenance Management System (MMS) Manuals
 1. The Contractor shall submit two (2) hard copies and one (1) electronic version via e-Builder of the O&M and MMS Manuals for purposes of review by the Engineer.
 2. If a Manual is rejected, the Contractor must revise and resubmit two (2) hard copies and one (1) electronic version via e-Builder.

3. Once approved, the Contractor shall furnish five (5) hardcopies, four (4) compact disks (CDs), and one electronic version (via e-Builder) of each volume of the O&M and MMS Manuals.
 4. The electronic version must be organized to follow the same layout as the hardcopy. Manuals shall be scanned and/or saved in searchable PDF format. Each volume shall be one PDF file.
- F. The Contractor shall distribute two (2) hardcopies of approved or final submittals, shop drawings, prints, documents, reports, etc. to the Resident Engineer

3.4 ELECTRONIC PROGRESS PAYMENT REQUESTS

- A. Once each month the Contractor may submit to the Engineer a request for partial payment for work completed for the previous calendar month. The Contractor must submit payment requests by close business on the 10th of the following month or the first District working day after the 10th. It is expected that preliminary informal versions of the request will be reviewed with the Engineer prior to the due date.
- B. Payment requests shall be submitted by the Contractor using the Pay Application process in e-Builder. The payment request shall include attached scanned files of the signed hard copies of the affidavit, regulatory affidavit, and certified payroll. Other requisite items for payment shall be submitted separately. The work completed as shown shall be subject to approval by the Engineer and may be revised by the Engineer if necessary.
- C. The Schedule of Values, as dictated in the Agreement, will be created and maintained by the District. Any Change Orders, Extras, Credits, or other adjustments to the contract values shall be integrated into the Schedule of Values by the District upon authorization. These adjustments shall then be reflected in the updated Schedule of Values.
- D. The Contractor shall submit the originals of all signed Affidavits to the District for record purposes.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal procedures.
2. Proposed products list.
3. Product data.
4. Shop drawings.
5. Samples.
6. Design data.
7. Test reports.
8. Certificates.
9. Manufacturer's instructions.
10. Manufacturer's field reports.
11. Erection drawings.
12. Construction photographs.

B. Related Documents:

1. Applicable provisions of Volume 1 (Signature Book) shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 SUBMITTAL PROCEDURES

- A. Submittals shall be made electronically in MWRD's current version of e-Builder package.
- B. Identify subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- C. Schedule submittals to expedite Contract by providing sufficient lead time on submittals. Contractor shall identify critical submittals with detailed timeline requirements.
- D. Clearly identify on submittals when an item is a substitution or variation from the specification.
- E. Submittals packages will be divided into submittal items whenever possible to facilitate

partial approvals.

- F. Submittals involving samples or physical items shall include written submittal information that shall be sent electronically through e-Builder.
- G. Physical samples or items shall be delivered to MWRD at 111 E. Erie, Chicago, IL 60611, to the attention of: Assistant Director of Engineering-Construction, identified as recipient on the transmittal form.
- H. Each submittal, electronic or hard-copy, shall include MWRD's Contract Name and Number identified on the submittal.
- J. Submittals not requested shall not be recognized or processed.

1.3 PROPOSED PRODUCTS LIST

- A. Within 60 days after date of contract signing between the Contractor and MWRD, Contractor shall submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product, material or system.
- B. For products specified only by reference standards, provide manufacturer name, trade name, model or catalog designation, and referenced standards.

1.4 PRODUCT DATA

- A. Product Data: Submit to MWRD for review, for the limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review, produce copies and distribute in accordance with Submittal Procedures article and for record documents described in Section 01 78 39 - Project Record Documents.

1.5 SHOP DRAWINGS

- A. Shop Drawings: Submit as electronic attachments to MWRD for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual specification sections, provide shop drawings signed and sealed by a Professional or Structural Engineer, licensed in the State of Illinois, who is responsible for designing components shown on shop drawings.

1. Include signed and sealed calculations to support design.
2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
3. Make revisions and provide additional information when required by authorities having jurisdiction.

1.6 SAMPLES

- A. Samples: Submit to the MWRD for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Samples For Selection as Specified in Product Sections:
 1. Submit to MWRD for aesthetic, color, or finish selection.
 2. Submit samples of finishes from full range of manufacturers' standard colors, or in custom colors selected, textures, and patterns for MWRD selection.
- C. Submit samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include project identification on each sample, identifying MWRD project name and number.
- E. Submit number of samples specified in individual specification sections. MWRD will retain one sample.
- F. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- G. Samples shall not be used for testing purposes unless specifically stated within the individual specification section.
- H. After review, produce duplicates and distribute in accordance with Submittal Procedures article and for record documents purposes described in Section 01 78 39 - Project Record Documents.

1.7 DESIGN DATA

- A. Submit design data for MWRD's knowledge.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.8 TEST REPORTS

- A. Submit test reports for MWRD's knowledge.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation or application subcontractor, or Contractor to MWRD.
- B. Indicate material, product or system conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to MWRD.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to MWRD in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.11 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for MWRD's benefit as contract administrator for project.
- B. Submit report within five (5) days of observation to MWRD for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.12 ERECTION DRAWINGS

- A. Submit for MWRD's information purposes only.
- B. Submit for information and for limited purpose of assessing conformance with information given, and design concept expressed in Contract Documents.
- C. MWRD may require a Structural Engineer's review and stamp on these Drawings. Structural Engineer shall be licensed in the State of Illinois.

1.13 CONSTRUCTION PHOTOGRAPHS

- A. Provide digital photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to MWRD.
- B. Submit photographs with each Application for Payment.
- C. Photographs shall be uploaded to e-Builder and placed in the File Director, which is a module of e-Builder, under the folder identified as Contractor Photos.
- D. MWRD's Resident Engineer shall determine the amount and locations of required photographs to be taken of the project by the Contractor.

- E. Identify each photograph included in the submittal. Identify name of MWRD Project and contract number, phase orientation of view, date and time of view, name and address of photographer, and photographer's numbered identification of exposure.
- F. Project photographs shall be uploaded to e-Builder with required identification in an organized system under Contractor Photos in the File Director Module.
- G. The Contractor shall upload a PDF file of all photos as well as individual *.jpg files.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 36 00

SAFETY AND CONFINED SPACE ENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Safety, Health and Accident prevention.
2. Safety, Health and Accident Prevention Program.
3. Contractor's Safety Representative Responsibilities.
4. Safety Equipment Monitoring.
5. Confined Space Entry Requirements.
6. Mine and Tunnel Safety Requirements.
7. Overhead Safety Protection Requirements.
8. Safety Barriers, Signage and Warning Lights.
9. Traffic Control Requirements.
10. MWRD Project Safety Review.
11. Contractor Accident and Injury Reporting.
12. Safety Meetings and Training Requirements.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 SAFETY RESPONSIBILITY

- A. Contractor shall be responsible for implementing a program to maintain a healthy and safe jobsite.
- B. Contractor shall also be responsible for the safety of Contractor's employees, MWRD's personnel and all other personnel at the site of work. The Contractor is solely responsible for the adequacy and safety of all construction methods and the safe prosecution of the work.

1.3 REFERENCES

A. Metropolitan Water Reclamation District of Greater Chicago:

1. Safety Rules dated January 7, 2007 and subsequently amended.

- B. American Conference of Governmental Industrial Hygienists:
 - 1. Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- C. American Red Cross Standard First Aid Training Course.
- D. State of Illinois Manual of Uniform Traffic Control Devices, Current Edition.
- E. U.S Department of Labor - Occupational Safety and Health Act of 1970 including Amendments and Rules and Standards implementing the Act.
- F. U.S. Department of Department of Labor - Occupational Health and Safety Act (OSHA):
 - 1. OSHA 29, CFR 1926: OSHA 30-Hour Construction Safety Training Program.
 - 2. OSHA 29, CFR 1910.146: Permit-Required Confined Spaces.
 - 3. OSHA 29, CFR 1926.552: Material Hoists, Personnel Hoists and Elevators.
 - 4. OSHA 29, CFR 1926.602: Material Handling Equipment.
 - 5. OSHA 29, CFR 1926.1000: Rollover Protective Structures (ROPS) for Material Handling Equipment.
 - 6. OSHA 29, CFR 1926 - Subpart W: Rollover Protective Structures and Overhead Protection;
 - a. Subpart .1000 - Rollover Protection.
 - b. Subpart .1001 - Performance Criteria.
 - c. Subpart .1002 - Frame Test Procedures.
 - d. Subpart .1003 - Overhead Protection.
- G. U.S. Department of Labor Mine Safety and Health Administration (MSHA):
 - 1. Training Requirements, Code of Federal Regulations 30 CFR Part 46 and Part 48.

1.4 SUBMITTALS

- A. Contractor Site Specific Safety Health and Accident Prevention Program.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SAFETY, HEALTH AND ACCIDENT PREVENTION

- A. Contractor shall conduct all operations in a manner to avoid the risk of bodily harm and risk of damage to any property.
- B. Contractor shall immediately take necessary and adequate precautions against any condition which may involve a risk of bodily harm or a risk of damage to any property.
- C. Contractor shall continuously inspect all Work and conduct health surveys of all work areas to discover and determine any unsafe condition.
- D. Contractor shall be solely and exclusively responsible for such surveys for the discovery, determination, and correction of any such condition. This requirement shall apply during

all hours throughout the period Contractor is at the Jobsite.

3.2 SAFETY, HEALTH AND ACCIDENT PREVENTION PROGRAM

- A. Contractor shall implement and maintain a written Safety, Health, and Accident Prevention Program specifically applicable to the Work, which Program shall adhere, at a minimum, to MWRD Safety Rules.
- B. Contractor's Safety, Health, and Accident Prevention Program shall meet the requirements of laws, codes, and regulations, and the requirements of all other authorities having jurisdiction over the Work, including the requirements of Federal and State Safety and Health Regulations for Construction.
- C. Contractor's written Safety, Health, and Accident Prevention Program shall include disciplinary procedures and safety orientation training procedures applicable to Contractor's and its Sub-Contractors' personnel.
- D. MWRD will monitor Contractor's safety and health measures and may require changes in Contractor's Safety, Health, and Accident Prevention Program during the performance of the Work and when not in conformance with the Project Safety and Health Program.
- E. Prior to the use of any materials, the Contractor shall provide MWRD with a current Safety Data Sheet (SDS) for any material requiring a SDS document.

3.3 CONTRACTOR'S SAFETY COMPLIANCE OFFICER RESPONSIBILITIES

- A. Contractor's Safety Compliance Officer and their other designated safety representatives shall have successfully completed and be currently certified in the American Red Cross Standard First Aid Training Course and the OSHA 29, CFR 1926; 30-Hour Construction Safety Training Course.
- B. Contractor's Safety Compliance Officer and their other designated safety representatives shall be completely familiar with all applicable health and safety requirements of all governing legislation and ensure compliance with all governing legislation.
- C. Contractor's Safety Compliance Officer or their other designated safety representative shall post appropriate notices regarding safety and health regulations at locations which provide maximum exposure to all personnel at project site.
- D. Contractor's Safety Compliance Officer or their other designated safety representative shall:
 - 1. Post the name, address and hours of the nearest medical doctor;
 - 2. Post name and addresses of nearby clinics and hospitals;
 - 3. Post telephone numbers of the local fire and police departments.
 - 4. Post appropriate instructions and warning signs in regards to all hazardous areas and conditions.
 - 5. Have proper safety and rescue equipment adequately maintained and readily available for any contingency.
- E. Safety equipment shall include, but not be limited to, such items as:
 - 1. Fire Extinguishers.

2. First Aid Kits.
 3. Safety Ropes, Lanyards and Harnesses.
 4. Stretchers.
 5. Life Ring with Rope Lanyard.
 6. Resuscitators.
 7. Gas Detectors.
 8. Oxygen Deficiency Indicators.
 9. Explosimeters.
- F. Contractor's Safety Compliance Officer or their other designated safety representative shall make inspections to ensure that all machines, tools and equipment are in safe operating condition; all work methods are safe; work areas are free of hazards; and provide MWRD, upon request, a daily report of all activities and findings.
- G. Contractor's Safety Compliance Officer shall provide MWRD, upon request, copies of all safety records and submit all safety inspection reports and certifications from regulating agencies.

3.4 SAFETY EQUIPMENT MONITORING

- A. Contractor's written Safety, Health, and Accident Prevention Program shall include equipment to be used, sampling strategy and calculations, methods of compliance, and personnel protective equipment.
- B. Calibration, sampling, and analytical laboratory procedures used shall be in conformance with OSHA's Technical Manual and the Project Safety and Health Program.

3.5 CONFINED SPACE ENTRY REQUIREMENTS

- A. Confined space entry shall be performed in accordance with OSHA 29, CFR 1910.146, including all appendices of this regulation.
- B. When work is being performed in sewers, pipe, underground structures or other related confined spaces, the Contractor shall provide all necessary and appropriate safety equipment.
- C. Atmospheric tests shall be taken as often as the Contractor's Safety Officer or designated safety representative requires such testing, as required by applicable local State or Federal regulations.
- D. No employee of the Contractor or sub-contractor shall be allowed to work in areas where contamination exceeds current MWRD or OSHA Permissible Exposure Limits.
- E. Respirators shall not be substituted for environmental control measures and shall be used only as prescribed by OSHA.
- F. Internal combustion engines other than mobile diesel powered equipment shall not be used underground.
- G. All mobile diesel powered equipment used underground shall be certified by the Department of Energy-Mine Safety and Health Administration.

- H. All internal combustion equipment shall be operated in such a manner as to prevent any health hazards to personnel from exhaust fumes.
- I. All haulage equipment such as hoists, cages and elevators operating in excavations and shafts shall conform to all requirements described in OSHA 29, CFR 1926.552 - Material Hoists, Personnel Hoists, and Elevators.

3.6 OVERHEAD SAFETY PROTECTION REQUIREMENTS

- A. Overhead safety protection shall be performed in accordance with OSHA 29, CFR 1926-Subpart W - Rollover Protective Structures: Overhead Protection, Parts 1000, 1001 and 1002.
- B. All skid steer and self-propelled compactor equipment shall be equipped with rollover protective structures as provided by OSHA 29, CFR 1926.1000 and be equipped with seatbelts as provided by OSHA 29, CFR 1926.602 as designed and installed by original equipment manufacturer.
- C. Any such equipment not meeting the above requirements shall not be allowed on the project site.
- D. Side boom laying tractors are exempt.

3.7 SAFETY BARRIERS, SIGNAGE AND WARNING LIGHTS

- A. Contractor shall provide and maintain all necessary safety equipment, such as barriers, signs, warning lights and guards to provide protection of persons and property.

3.8 TRAFFIC CONTROL REQUIREMENTS

- A. Reference Section 01 55 26 - Traffic Control for traffic control requirements.

3.9 MWRD PROJECT SAFETY REVIEW

- A. Contractor's written Safety, Health, and Accident Prevention Program shall be submitted for review by MWRD not later than (30) thirty days prior to the start of the Work at project site.
- B. MWRD review will not relieve Contractor of its sole responsibility for safety and health on a given project.
- C. MWRD review shall not be construed as limiting in any manner, the Contractor's obligation to undertake any action which may be necessary or required to establish and maintain safe working conditions regarding their Work at project site.
- D. Contractor shall immediately correct any unsafe conditions identified by MWRD.
- E. In the event Contractor fails to immediately correct such unsafe conditions, MWRD may either have unsafe conditions corrected by others at Contractor's expense, or direct that the Work be stopped in the area of the unsafe conditions.

- F. MWRD's right to stop the Work shall not release any duty contractually assigned to Contractor or to any third party.
- G. MWRD will resolve conflicts regarding safety and health measures and practices.
- H. Contractor shall furnish and maintain all necessary safety equipment, such as barriers, signs, warning lights, and guards to provide adequate protection of persons and property.

3.10 CONTRACTOR ACCIDENT AND INJURY REPORTING

- A. Contractor shall maintain accurate accident and injury reports and shall furnish MWRD a monthly summary of injuries and man-hours lost due to injuries by the third (3rd) of each month.
- B. Contractor accident rates will be calculated monthly in accordance with the Bureau of Labor Statistics incident rate, frequency rate, and severity rate methods.
- C. Project's safety goal is to maintain accident rates below 25 percent of the national average for construction as reported by the Federal Government.
- D. Contractor and their sub-contractors shall endeavor to attain the project safety goals.
- E. If Contractor accident rates exceed the Project's safety goal, Contractor shall take immediate corrective action.
- F. Corrective action shall include additions or modifications to Contractor safety programs already in place. Contractor shall submit to MWRD a written corrective action plan.
- G. Corrective action may include, but shall not be limited to, removal from project site of any supervisor or employee not implementing or following the necessary safety and health measures, and increasing the amount of employee safety and health training.

3.11 SAFETY MEETINGS AND TRAINING REQUIREMENTS

- A. Contractor shall hold regularly scheduled meetings to instruct their personnel and their Sub-Contractors' personnel in safety and health practices and the requirements of the Project Safety and Health Program.
- B. Contractor shall furnish safety and health equipment and enforce the use of such equipment by their employees and employees of their Sub-Contractors.
- C. Contractor shall provide documentation indicating employee(s) that received appropriate MSHA safety training in accordance with 30 CFR Part 46 and 48.
- D. Nothing contained in this section shall be construed to shift responsibility or risk of loss for injuries or damages sustained as a result of violation of the provisions of this section from Contractor to MWRD.
- E. Contractor shall remain solely and exclusively responsible for compliance with all safety requirements and for the safety of all persons and property at project site.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quality control of installation.
2. Tolerances.
3. References.
4. Labeling.
5. Mock-up requirements.
6. Testing and inspection services.
7. Manufacturers' field services.
8. Documentation.
9. Notification of noncompliance.
10. Materials and equipment.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from MWRD before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.

- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- H. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, instrument calibration, surveying) shall be maintained in the Contractor's field office, available for inspection by the MWRD. Copies shall be made available to the MWRD upon request.
- I. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the MWRD to supersede or void that responsibility.
- J. Contractor quality control is the means by which the Contractor assures that construction complies with the requirements of the Contract Drawings and Specifications. The controls shall be adequate to cover all construction operations, including both onsite and offsite operations and will be keyed to the proposed construction sequence. The controls shall include at least three phases of inspection for all definitive features of work as follows:
 - 1. Preparatory Inspection: This shall be performed prior to beginning any definable feature of work. It shall include:
 - a. A review of contract requirements;
 - b. A check to assure that all materials and/or equipment have been tested, submitted and approved;
 - c. A check to assure that provisions have been made to provide required quality control testing;
 - d. Examination of the work area to ascertain that all preliminary work has been completed and a physical examination of materials. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.
 - e. Equipment and sample work to assure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand.
 - 2. Initial Inspection: This shall be performed as soon as a representative portion of the particular feature of work has been accomplished and shall include examination of the quality of workmanship and a review of control testing for compliance with contract requirements, use of defective or damaged materials, omissions, and dimensional requirements.
 - 3. Follow-up Inspection: These shall be performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. Such inspection shall be made a matter of record in the quality control documentation as required below. Final follow-up inspections shall be conducted and deficiencies corrected prior to the addition of new features of work.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from MWRD before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- A. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and MWRD.
- C. When specified reference standards conflict with Contract Documents, request clarification from MWRD before proceeding.
- D. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of MWRD shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.

1.6 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices,

flashings, seals, and finishes.

- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by MWRD and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by MWRD.

1.7 TESTING AND INSPECTION SERVICES

- A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing.
- B. Laboratory Qualifications
 - 1. Prior to start of Work, Contractor shall submit testing laboratory name, address, and telephone number, and names of full time registered Professional Engineer and responsible officer.
 - 2. Laboratory shall meet basic requirements of ASTM E329.
 - 3. Laboratory shall be authorized to operate in state in which Project is located.
 - 4. Laboratory shall maintain full time registered Professional Engineer on staff to review services.
 - 5. Testing equipment shall be calibrated at reasonable intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards.
 - b. Accepted values of natural physical constants.
 - 6. Contractor shall submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.
- C. Laboratory Duties
 - 1. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by MWRD, or authority having jurisdiction.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify MWRD and Contractor of observed irregularities or deficiencies of Work, equipment, or material.
 - 5. Provide qualified personnel at site. Cooperate with MWRD and Contractor in performance of services.
 - 6. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by MWRD.
 - 7. Promptly notify MWRD and Contractor of observed irregularities or non-conformance of Work or products.
 - 8. Perform additional tests required by MWRD.
 - 9. Attend preconstruction meetings and progress meetings.

10. Promptly submit written report of each test and inspection; one copy each to MWRD, material supplier, and Contractor, and one copy to record document file. Each report to include following:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name, and telephone number.
 - d. Name and signature of laboratory inspector.
 - e. Date and time of sampling or inspection.
 - f. Record of temperature and weather conditions if test performed in field.
 - g. Date of test.
 - h. Identification of product and Specification section.
 - i. Location of sample or test in Project.
 - j. Type of inspection or test.
 - k. Results of tests and compliance with Contract Documents.
 - l. Interpretation of test results, when requested by MWRD.
 - m. Perform additional tests as required by MWRD or Contractor.
 - n. Submit final report indicating correction of Work previously reported as non-compliant.

D. Limitations of Authority of Testing Laboratory

1. Laboratory is not authorized to:
 - a. Release, revoke, alter or enlarge the requirements of Contract Document.
 - b. Approve or accept any portion of Work.
 - c. Perform duties of Contractor.
 - d. Stop the Work.

E. Contractor Responsibilities

1. Cooperate with independent testing laboratory; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
2. Notify MWRD and independent firm 48 hours prior to expected time for operations requiring services.
3. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
4. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by MWRD. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Price.
5. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

1.8 MANUFACTURERS' FIELD SERVICES

- A. When specified in the technical specifications sections, the Contractor shall arrange for and provide technical representation from manufacturers of respective equipment, items or components. The manufacturer's representative shall be a factory trained service engineer/technician with the type and length of experience specified in the technical specifications.

- B. Services Furnished Under This Contract: An experienced, competent, and authorized factory trained service engineer/technician representative of the manufacturer of each item of equipment for which field services are indicated in the specifications shall visit the site of the Work and inspect, operate, test, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's service representative shall be present when the equipment is placed in operation. The manufacturer's service representative shall revisit the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory to the MWRD.
- C. Submit qualifications of observer to MWRD 30 days in advance of required observations. Observer subject to approval of MWRD.
- D. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- E. Refer to Section 01 33 00 - Submittal Procedures, Manufacturers' Field Reports article.

1.9 DOCUMENTATION

- A. Maintain current records of quality control operations, activities and tests performed including the work of suppliers and subcontractors. These records shall be on an acceptable form and indicate a description of trades working on the project, the numbers of personnel working, the weather conditions encountered, any delays encountered and acknowledgment of deficiencies noted along with the corrective actions taken on current and previous deficiencies. In addition, these records shall include factual evidence that required activities or tests have been performed, including but not limited to the following:
 - 1. Type and number of control activities and tests involved.
 - 2. Results of control activities or tests.
 - 3. Nature of defects, causes for rejection, etc.
 - 4. Proposed remedial action.
 - 5. Corrective actions taken.
- B. These records shall cover both conforming and defective or deficient features and shall include a statement that supplies and materials incorporated in the work comply with the requirements of the contract. Legible copies of these records shall be furnished to the District weekly.

1.10 NOTIFICATION OF NONCOMPLIANCE

- A. The MWRD will notify the Contractor of any noncompliance with the foregoing requirements. After receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or representative at the site of the work, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the District may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

PART 2 – PRODUCTS

1.1 MATERIALS AND EQUIPMENT

- A. Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the MWRD authorizes such use.
- B. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- C. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the MWRD of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless approved otherwise by the MWRD.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 42 10

REFERENCES AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Listing of Referenced Construction Industry Standard Organizations.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 INDUSTRY STANDARDS REQUIREMENTS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into the Contract Documents to extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to MWRD for a decision before proceeding.

1. Minimum Quantity or Quality Levels: Quantity or quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements. Refer uncertainties to MWRD for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable

standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized name of entities indicated in Thomson/Gale Research "Encyclopedia of Associations: International Organizations" or in Columbia Books, Inc. "National Trade & Professional Associations of the U.S.".
- F. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized name of entities in following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of date of the Contract Documents.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 LISTING OF CONSTRUCTION INDUSTRY ORGANIZATIONS

ACOUSTICAL SOCIETY OF AMERICA (ASA)

2 Huntington Quadrangle, Suite 1N01

Melville, NY 11747-4502

Ph: 516-576-2360

Fax: 516-576-2377

Internet: <http://asa.aip.org>

ACI INTERNATIONAL (ACI)

38800 Country Club Drive

Farmington Hills, MI 48331

Ph: 248-848-3700

Fax: 248-848-3701

Internet: <http://www.aci-int.org>

AMERICANS WITH DISABILITIES ACT (ADA)

United States Access Board

1331 F Street, NW, Suite 1000

Washington, DC 20004-1111

Phone: (800) 872-2253

Internet: <http://www.access-board.gov>

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Boulevard, Suite 500
Arlington, VA 22201
Ph: 703-524-8800
Fax: 703-528-3816
Internet: <http://www.ahrinet.org>

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)
2800 Shirlington Road, Suite 300
Arlington, VA 22206
Ph: 703-575-4477
Fax: 703-575-4449
Internet: <http://www.acca.org>

AIR DIFFUSION COUNCIL (ADC)
1901 N. Roselle Road, Suite 800
Schaumburg, Illinois 60195
Tel: (847) 706-6750
Fax: (847) 706-6751
Internet: <http://flexibleduct.org>

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: amca@amca.org
Internet: <http://www.amca.org>

ALLIANCE FOR TELECOMMUNICATIONS INDUSTRY SOLUTIONS (ATIS)
1200 G Street, NW, Suite 500
Washington, D.C. 20005
Ph: 202-628-6380
Fax: 202-393-5453
Internet: <http://www.atis.org>

ALUMINUM ASSOCIATION (AA)
1525 Wilson Boulevard
Arlington, VA. 22209
Ph: 703-358- 2960
Fax: 703-358-2961
Internet: <http://www.aluminum.org>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
Internet: <http://www.aamanet.org>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION
OFFICIALS (AASHTO)

444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
Internet: <http://www.aashto.org>

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS
(AATCC)

1 Davis Drive, P.O. Box 12215
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax: 919-549-8933
Internet: <http://www.aatcc.org>

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

2025 M Street, NW, Suite 800
Washington, DC 20036-3309
Ph: 202-367-1155
Fax: 202-367-2155
Internet: <http://www.abma-dc.org>

AMERICAN BOILER MANUFACTURERS ASSOCIATION (ABMA)

8221 Old Courthouse Road, Suite 202
Vienna, VA. 22182
Ph: 703-356-7172
Fax: 703-356-4543
Internet: <http://www.abma.com>

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

8445 Freeport Parkway, Suite 305
Irving, TX 75063-2595
Ph: 972-506-7216
Fax: 972-506-7682
Internet: <http://www.concrete-pipe.org>

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
(ACGIH)

1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
Internet: <http://www.acgih.org>

AMERICAN WOOD COUNCIL
803 Sycolin Road, Suite 201
Leesburg, VA 20175
Ph: 202-463-2766 or (800)-890-7732
Fax: 202-463-2791
Internet: <http://www.awc.org/>

AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street N.W.
Washington, D.C. 20001
Ph: 202-824-7000
Fax: 202-824-7115
Internet: <http://www.aga.org>

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)
1001 North Fairfax Street, 5th Floor
Alexandria, VA 22314-1587
Ph: 703-684-0211
Fax: 703-684-0242
Internet: <http://www.agma.org>

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL. 60067
Ph: 847-934-8800
Fax: 847-934-8803
Internet: <http://domensino.com/AHA/default.htm>

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)
2700 Prosperity Ave., Suite 250
Fairfax, VA 22031
Tel: 703-849-8888
Fax: 703-207-3561
Internet: <http://www.aiha.org>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Internet: <http://www.aisc.org>

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)
7012 South Revere Parkway, Suite 140
Centennial, CO 80112
Ph: 303-792-9559
Fax: 303-792-0669
Internet: <http://www.aitc-glulam.org>

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1140 Connecticut Avenue, NW, Suite 705
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6573
E-mail: webmaster@steel.org
Internet: <http://www.steel.org>

AMERICAN LADDER INSTITUTE (ALI)
410 North Michigan Avenue
Chicago, IL 60611
Tel: 312-644-6610
Fax: 312-673-6929
Internet: <http://www.americanladderinstitute.org>

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004
Internet: <http://www.alsc.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW, 11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
Internet: <http://www.ansi.org/>

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)
1200 G Street, NW, Suite 800
Washington, DC 20005
Ph: 202-789-2900
Fax: 202-789-1893
Internet: <http://www.anla.org>

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 202-682-8000
Fax: 202-682-8223
Internet: <http://www.api.org>

AMERICAN PUBLIC HEALTH ASSOCIATION (APHA)
800 I Street, NW
Washington, DC 20001
Ph: 202-777-2742
Fax: 202-777-2534
Internet: <http://www.apha.org>

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY
ASSOCIATION (AREMA)

10003 Derekwood Lane, Suite 210
Lanham, MD 20706
Ph: 301-459-3200
Fax: 301-459-8077
Internet: <http://www.arema.org>

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

1711 Arlingate Lane, P.O. Box 28518
Columbus, OH 43228-0518
Ph: 800-222-2768; 614-274-6003
Fax: 614-274-6899
Internet: <http://www.asnt.org>

AMERICAN SOCIETY FOR QUALITY (ASQ)

600 North Plankinton Avenue
Milwaukee, WI 53203
Ph: 414-272-8575 or 800-248-1946
Fax: 414-272-1734
Internet: <http://www.asq.org>

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

1801 Alexander Bell Drive
Reston, VA 20191
Ph: 703-295-6300 or (800)-548-2723
Fax: 703-295-6222
Internet: <http://www.asce.org>

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-
CONDITIONING ENGINEERS (ASHRAE)

1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 404-636-8400 or (800)-527-4723
Fax: 404-321-5478
Internet: <http://www.ashrae.org>

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

1800 East Oakton Street
Des Plaines, IL 60018-2187
Ph: 847-699-2929
Fax: 847-196-3769
Internet: <http://www.asse.org>

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
901 Canterbury, Suite A
Westlake, OH 44145
Ph: 440-835-3040
Fax: 440-835-3488
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Ph: 303-794-7711 or (800)-926-7337
Fax: 303-347-0804
Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 305-443-9353 or (800)-443-9353
Fax: 305-443-7559
Internet: <http://www.aws.org>

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
100 Chase Park South, Suite 116, P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
Internet: <http://www.awpa.com>

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th Street
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
Internet: <http://www.apawood.org>

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165-5874
Ph: 571-323-3636
Fax: 571-323-3630
Internet: <http://www.awinet.org>

ASM INTERNATIONAL (ASM)
9639 Kinsman Road
Materials Park, OH 44073-0002
Ph: 440-338-5151
Fax: 440-338-4634
Internet: <http://www.asminternational.org/>

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: (800)843-2763
Fax: 212-591-7674
Internet: <http://www.asme.org>

ASPHALT INSTITUTE (AI)
2696 Research Park Drive, P.O. Box 14052
Lexington, KY 40511-8480
Ph: 859-288-4960
Fax: 859-288-4999
Internet: <http://www.asphaltinstitute.org>

ASPHALT ROOFING MANUFACTURER'S ASSOCIATION (ARMA)
529 14th Street, NW
Washington D.C. 20045
Ph: 202-207-0917
Fax: 202-223-9741
Internet: <http://www.asphaltroofing.org>

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW, Suite 503
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
Internet: <http://www.aabchq.com>

ASSOCIATION FOR IRON AND STEEL TECHNOLOGY (AIST)
186 Thorn Hill Road
Warrendale, PA 15086-7528
Ph: 724-776-6040
Fax: 724-776-1880
Internet: <http://www.aistech.org>

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 North 18th Street, P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-2530
Fax: 205-257-2540
Internet: <http://www.aeic.org>

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS (AHAM)
1111 19th Street NW, Suite 402
Washington, DC 20036
Ph: 202-872-5955
Fax: 202-872-9354
Internet: <http://www.aham.org>

ASSOCIATION OF THE WALL AND CEILING INDUSTRIES -
INTERNATIONAL (AWCI)

513 West Broad Street, Suite 210
Falls Church, VA 22046
Ph: 703-538-1600
Fax: 703-534-8307
Internet: <http://www.awci.org>

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

Ph: 610-832-9500
Fax: 610-832-9555
Internet: <http://www.astm.org>

BIFMA INTERNATIONAL (BIFMA)

678 Front Ave. NW, Suite 150
Grand Rapids, MI 49504-5368
Ph: 616-285-3963
Fax: 616-285-3765
Internet: <http://www.bifma.org>

BRICK INDUSTRY ASSOCIATION (BIA)

1850 Centennial Park Drive, Suite 301
Reston, VA 22091
Ph: 703-620-0010
Fax: 703-620-3928
Internet: <http://www.bia.org>

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

355 Lexington Avenue, 15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
Internet: <http://www.buildershardware.com>

CSA INTERNATIONAL (CSA)

8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990
Fax: 216-642-3463
Internet: <http://www.csa-international.org>

CARPET AND RUG INSTITUTE (CRI)

730 College Drive, P.O. Box 2048
Dalton, GA 30722-2048
Ph: 706-278-3176
Fax: 706-278-8835
Internet: <http://www.carpet-rug.com>

CAST IRON SOIL PIPE INSTITUTE (CISPI)

1064 Delaware Avenue, SE
Atlanta, GA 30316
Phone: 404-622-0073
Fax: 678-973-2845
Internet: <http://www.cispi.org>

CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)

405 Illinois Ave. Unit 2B
St. Charles, IL 60174
Ph: 630-584-1919
Fax: 630-584-2003
Internet: <http://www.cisca.org>

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

1600 Clifton Road
Atlanta, GA 30333
Ph: 404-639-3311 or (800)-232-4636
Email: cdcinfo@cdc.gov
Internet: <http://www.cdc.gov>

CODE OF FEDERAL REGULATIONS (CFR)

Available from Federal Government Printing Office
Ph: (888) 293-6498
Internet: <http://www.gpoaccess.gov/cfr/index.html>

CHEMICAL FABRICS & FILM ASSOCIATION (CFFA)

1300 Sumner Avenue
Cleveland OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.chemicalfabricsandfilm.com/>

CHLORINE INSTITUTE (CI)

1300 Wilson Boulevard, Suite 525
Arlington, VA 22209
Ph: 703-894-4140
Fax: 703-741-6068
Internet: <http://www.CL2.com>

COMPOSITE PANEL ASSOCIATION (CPA)

19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588
Internet: <http://www.pbmdf.com>

COMPRESSED AIR AND GAS INSTITUTE (CAGI)
1300 Sumner Avenue
Cleveland OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.cagi.org/>

COMPRESSED GAS ASSOCIATION (CGA)
14501 George Carter Way, Suite 103
Chantilly, VA 20151-2923
Ph: 703-788-2700
Fax: 703-961-1831
Internet: <http://www.cganet.com>

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 North Plum Grove Road
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: <http://www.crsi.org/>

CONCRETE SAWING AND DRILLING ASSOCIATION (CSDA)
13577 Feather Sound Drive, Suite 560
PH: 727-577-5004
Fax: 272-577-5012
Internet: <http://www.csda.org>

CONSUMER ELECTRONICS ASSOCIATION (CEA)
1919 South Eads Street
Arlington, VA 22202
Ph: 703-907-7600 or (866)-858-1555
Fax: 703-907-7675
Internet: <http://www.CE.org>

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)
4330 East-West Highway
Bethesda, MD 20814
Ph: 301-595-7054 or (800)-504-7923
Fax: 301-504-0124
Internet: <http://www.cpsc.gov>

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION (CEMA)
5672 Strand Court, Suite 2
Naples, FL 34110
Ph: 239-514-3441
Fax: 239-514-3470
Internet: <http://www.cemanet.org>

COOLING TECHNOLOGY INSTITUTE (CTI)
2611 FM 1960 West, Suite A-101, P.O. Box 73383
Houston, TX 77068-3730
Ph: 281-583-4087
Fax: 281-537-1721
Internet: <http://www.cti.org>

COPPER DEVELOPMENT ASSOCIATION (CDA)
260 Madison Avenue
New York, NY 10016
Ph: 212-251-7200
Fax: 212-251-7234
Internet: <http://www.copper.org>

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217-3992
Ph: 704-676-1190
Fax: 704-676-1199
Internet: http://www.mhia.org/psc/PSC_Products_Cranes.cfm

DOOR AND HARDWARE INSTITUTE (DHI)
14170 Newbrook Dr.
Chantilly, VA 20151-2232
Ph: 703-222-2010
Fax: 703-222-2410
Internet: <http://www.dhi.org>

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.dasma.com>

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)
245 Riverchase Parkway East, Suite O
Birmingham, AL 35244
Ph: 205-402-8700
Fax: 205-402-8730
Internet: <http://www.dipra.org>

EIFS INDUSTRY MEMBERS ASSOCIATION (EIMA)
513 West Broad St., Suite 210
Falls Church, VA 22046-3257
Ph: 800-294-3462
Fax: 703-538-1736
Internet: <http://www.eima.com>

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)
1650 South Dixie Highway, Suite 400
Boca Raton, FL 33432-7462
Ph: 561-750-5575
Fax: 561-395-8557
Internet: <http://www.egsa.org>

ELECTRONIC COMPONENTS ASSOCIATION (ECA)
2500 Wilson Blvd. Suite 310
Arlington, VA 22201
Ph: 703-907-8024
Internet: <http://www.eaus.org>

ELECTROSTATIC DISCHARGE ASSOCIATION (ESD)
7900 Turin Road, Building 3
Rome, NY 13440-2069
Ph: 315-339-6937
Fax: 315-339-6793
Internet: <http://www.esda.org/>

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)
25 North Broadway
Tarrytown, NY 10591
Ph: 914-332-0040
Fax: 914-332-1541
Internet: <http://www.ejma.org>

FEDERAL ENERGY REGULATORY COMMISSION (FERC)
888 First Street, NE
Washington, DC 20426
Ph: 202-502-6088 or (866)-208-3372
Internet: <http://www.ferc.gov/default.asp>

FEDERAL SPECIFICATIONS (FS)
Available from General Service Administration
Ph: (202) 619-8925
Internet: <http://apps.fas.gsa.gov/pub/fedspecs/>
Available from National Institute of Building Sciences
Ph: (202) 289-7800
Internet: <http://www.nibs.org>

FLUID CONTROLS INSTITUTE (FCI)
1300 Sumner Avenue
Cleveland, OH 44115
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.fluidcontrolsinstitute.org>

FLUID SEALING ASSOCIATION (FSA)
994 Old Eagle School Rd. #1019
Wayne, PA 19087
Ph: 610-971-4850
Internet: <http://www.fluidsealing.com>

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919
Ph: 401-275-3000
Fax: 401-275-3029
Internet: <http://www.fmglobal.com>

FOREST STEWARDSHIP COUNCIL (FSC)
212 Third Avenue North, Suite 504
Minneapolis, MN 55401
Ph: 612-353-4511
Fax: 612-208-1565
Internet: <http://www.fscus.org>

FORESTRY SUPPLIERS INC. (FSUP)
205 West Rankin Street, P.O. Box 8397
Jackson, MS 39284-8397
Ph: (800)-752-8460
Fax: 601-292-0165
Internet: <http://www.forestry-suppliers.com>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC
RESEARCH (FCCCHR)
University of South California, Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032 or 866-545-6340
Fax: 213-740-8399
Internet: <http://www.usc.edu/dept/fccchr>

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
800 SW Jackson Street, Suite 1500
Topeka, KS 66612-1200
Ph: 785-271-0208
Fax: 785-271-0166
Internet: <http://www.glasswebsite.com>

GEOLOGICAL SOCIETY OF AMERICA (GSA)
3300 Penrose Place, P.O. Box 9140
Boulder, CO 80301-9140
Ph: 303-357-1000
Fax: 303-357-1070
Internet: <http://www.geosociety.org>

GEOSYNTHETIC INSTITUTE (GSI)
475 Kedron Avenue
Folsom, PA 19033-1208
Ph: 610-522-8440
Fax: 610-522-8441
Internet: <http://www.geosynthetic-institute.org>

GREEN BUILDING INITIATIVE (GBI)
2104 SE Morrison
Portland, Oregon 97214
Ph: 877-424-4241
Fax: 503.961.8991
Internet: <http://www.thegbi.org/>

GREEN SEAL (GS)
1001 Connecticut Avenue, NW, Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
Internet: <http://www.greenseal.org>

GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)
2211 Newmarket Parkway, Suite 110
Marietta, GA 30067
Ph: 770-984-9903 or (800)-427-9681
Fax: 770-980-0072
Internet: <http://www.greenguard.org/>

GYPSUM ASSOCIATION (GA)
6525 Belcrest Road, Suite 480
Hyattsville, MD 20782
Ph: 301-277-8686
Fax: 301-277-8747
Internet: <http://www.gypsum.org>

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)
1825 Michael Faraday Dr.
Reston, VA 20190
Ph: 703-435-2900
Fax: 703-435-2537
Internet: <http://www.hpva.org>

HEAT EXCHANGE INSTITUTE (HEI)
1300 Sumner Avenue
Cleveland, OH 44115-2815
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.heatexchange.org>

HOIST MANUFACTURERS INSTITUTE (HMI)
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217-3992
Ph: 704-676-1190
Fax: 704-676-1199
Internet: <http://www.mhia.org/industrygroups/hmi>

HYDRAULIC INSTITUTE (HI)
6 Campus Drive, First Floor North
Parsippany, NJ 07054-4406
Ph: 973-267-9700
Fax: 973-267-9055
Internet: <http://www.pumps.org>

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall Street, 17th Floor
New York, NY 10005-4001
Ph: 212-248-5000
Fax: 212-248-5017
Internet: <http://www.iesna.org>

INDUSTRIAL FASTENERS INSTITUTE (IFI)
6363 Oak Tree Boulevard
Independence, OH 44131
Ph: 216-241-1482
Fax: 216-241-5901
Internet: <http://www.industrial-fasteners.org>

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION
CERTIFICATION (IICRC)
The Clean Trust Headquarters
2715 East Mill Plain Blvd.
Vancouver, WA 98661
Ph: 360-693-5675
Fax: 360-693-4858
Internet: <http://www.iicrc.org/home>

INSTITUTE OF CLEAN AIR COMPANIES (ICAC)
1220 North Fillmore Street, Suite 410
Arlington, VA 22201
Ph: 703-812-4811
Internet: <http://icac.com>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane
Piscataway, NJ 08854-4141
Ph: 732-981-0060
Fax: 732-981-1712
Internet: <http://www.ieee.org>

INSTITUTE OF ENVIRONMENTAL SCIENCES AND TECHNOLOGY (IEST)
Arlington Place One
2340 South Arlington Heights Road, Suite 100
Arlington Heights, IL 60005-4516
Ph: 847-981-0100
Fax: 847-981-4130
Internet: <http://www.iest.org>

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 1568
Carrollton, GA 30112
Ph: 770-830-0369
Fax: 770-830-8501
Internet: <http://www.icea.net>

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)
1500 Bank Street, Suite 300
Ottawa, ON K1H 1B8
Ph: 613-233-1510
Fax: 613-482-9436
Internet: <http://www.igmaonline.org>

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL
OFFICIALS (IAPMO)
4755 East Philadelphia Street
Ontario, CA 91761
Ph: 909-472-4100
Fax: 909-472-4150
Internet: <http://www.iampo.org>

INTERNATIONAL CODE COUNCIL (ICC)
500 New Jersey Avenue, 6th Floor
Washington, D.C. 20001
Ph: 1-888-422-7233
Fax: 202-783-2348
Internet: <http://www.intlcode.org>

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)
10600 West Higgins Road, Suite 607
Ph: 847-827-0830
Fax: 847-827-0832
Internet: <http://www.icri.org>

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
3050 Old Centre Avenue, Suite 102
Portage, MI 49024
Ph: 269-488-6382
Fax: 269-488-6383
Internet: <http://www.netaworld.org>

INTERNATIONAL GROUND SOURCE HEAT PUMP ASSOCIATION (IGSHPA)
1201 South Innovation Way, Suite 400
Stillwater OK 74078
Ph: 405-744-5175 or 800-626-4747
Fax: 405-744-5283
Internet: <http://www.igshpa.okstate.edu/>

INTERNATIONAL INSTITUTE OF AMMONIA REFRIGERATION (IIAR)
1001 North Fairfax Street, Suite 503
Alexandria, VA 22314
Ph: 703-312-4200
Fax: 703-312-0065
Internet: <http://www.iiar.org>

INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION (IMSA)
165 East Union Street, P.O. Box 539
Newark, NY 14513-0539
Ph: 315-331-2182 or (800)-723-4672
Fax: 315-331-8205
Internet: <http://www.imsasafety.org/>

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, ch. de la Voie-Creuse
Case Postale 56
CH-1211 Geneve 20 Switzerland
Ph: 41-22-749-01-11
Fax: 41-22-733-34-30
Internet: <http://www.iso.org>

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)
1901 North Moore Street
Arlington, VA 22209-1762
Ph: 703-525-1695
Fax: 703-528-2148
Internet: <http://www.safetysafetyequipment.org/>

INNOVATIVE PAVEMENT RESEARCH FOUNDATION (IPRF)
9450 West Bryn Mawr, Suite 150
Rosemont, IL 60018
Internet: <http://www.iprf.org>

INSTITUTE OF TRANSPORTATION ENGINEERS (ITE)
1627 Eye Street, NW, Suite 600
Washington, DC 20006
Ph: 202-785-0060
Fax: 202-785-0609
Internet: <http://www.ite.org>

IPI - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES (IPC)
3000 Lakeside Drive, 309 S
Bannockburn, IL 60015
Ph: 847-615-7100
Fax: 847-615-7105
Internet: <http://www.ipc.org>

ISA - THE INSTRUMENTATION, SYSTEMS & AUTOMATION SOCIETY (ISA)
67 Alexander Drive
Research Triangle Park, NC 27709
Ph: 919-549-8411
Fax: 919-549-8288
Internet: <http://www.isa.org>

INTERNATIONAL WINDOW CLEANING ASSOCIATION (IWCA)
400 Admiral Boulevard
Kansas City, MO 64106
Ph: (800)-875-4922
FAX: 816-472-7765
Internet: <http://www.iwca.org>

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)
1899 Preston White Drive
Reston, VA 20191-5435
Ph: 703-264-1690
Fax: 703-620-6530
Internet: <http://www.kcma.org>

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY (MSS)
127 Park Street, NE
Vienna, VA 22180-4602
Ph: 703-281-6613
Fax: 703-281-6671
Internet: <http://www.mss-hq.com>

MARBLE INSTITUTE OF AMERICA (MIA)
28901 Clemens Road, Suite 100
Westlake, OH 44145
Ph: 440-250-9222
Fax: 440-250-9223
Internet: <http://www.marble-institute.com>

MASTER PAINTERS INSTITUTE (MPI)
4090 Graveley Street
Burnaby, BC CANADA V5C 3T6
Ph: 888-674-8937
Fax: 888-211-8708
Internet: <http://www.paintinfo.com/mpi>

MATERIAL HANDLING INDUSTRY OF AMERICA INC (MHIA)
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28717-3992
Ph: 704-676-1190
Fax: 704-676-1199
Internet: <http://www.mhia.org>

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.mbma.com>

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)
16712 Elm Circle
Omaha, NE 68130
Ph: (800)-747-6422
Fax: 402-330-9702
Internet: <http://www.micainsulation.org>

MIDWEST ROOFING CONTRACTORS ASSOCIATION (MRCA)
4700 West Lake Avenue
Glenview, IL 60025
Ph: (800) 497-6722
Internet: <http://www.mrca.org>

MONORAIL MANUFACTURERS ASSOCIATION (MMA)
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217-3992
Ph: 704-676-1190
Fax: 704-676-1199
Internet: <http://www.mhia.org/mma>

NACE INTERNATIONAL (NACE)
1440 South Creek Drive
Houston, TX 77084-4906
Ph: 281-228-6200 or 1-800-797-6223
Fax: 281-228-6300
Internet: <http://www.nace.org>

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS
(NAAMM)
800 Roosevelt Road, Bldg C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-942-6591
Fax: 630-790-3095
Internet: <http://www.naamm.org>

NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS
(NBBPVI)

1055 Crupper Avenue
Columbus, OH 43229-1183
Ph: 614-888-8320
Fax: 614-847-1147
Internet: <http://www.nationalboard.org>

NATIONAL CABLE AND TELECOMMUNICATIONS ASSOCIATION (NCTA)

25 Massachusetts Avenue, NW, Suite 100
Washington, DC 20001-1413
Ph: 202-222-2300
Internet: <http://www.ncta.com>

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

13750 Sunrise Valley Drive
Herndon, VA 20171-4662
Ph: 703-713-1900
Fax: 703-713-1910
Internet: <http://www.ncma.org>

NATIONAL COUNCIL ON RADIATION PROTECTION & MEASUREMENTS
(NCRP)

7910 Woodmont Avenue, Suite 400
Bethesda, MD 20814-3095
Ph: 301-657-2652
Fax: 301-907-8768
Internet: <http://www.ncrp.com>

NATIONAL DRILLING ASSOCIATION (NDA)

1545 West 130th St, Suite A2
Hinckley, OH 44233
Ph: 877-632-4748
Fax: 216-803-9900
Internet: <http://www.nda4u.com/>

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814
Ph: 301-657-3110
Fax: 301-215-4500
Internet: <http://www.necanet.org/>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-5900
Internet: <http://www.nema.org/>

NATIONAL ELEVATOR INDUSTRY, INC. (NEII)
1677 County Route 64, P.O. Box 838
Salem, New York 12865-0838
Ph: 518-854-3100
Fax: 518-854-3257
Internet: <http://www.neii.org/index.cfm>

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)
8575 Grovemont Circle
Gaithersburg, MD 20877
Ph: 301-977-3698 or (866) 497-4447
Fax: 301-977-9589
Internet: <http://www.nebb.org>

NATIONAL FENESTRATION RATING COUNCIL (NFRC)
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Ph: 301-589-1776
Fax: 303-589-3884
Internet: <http://www.nfrc.org>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1401 K Street NW, Suite 500
Washington, D.C. 20005
Ph: 617-770-3000
Fax: 617-770-0700
Internet: <http://www.nfpa.org>

NATIONAL FLUID POWER ASSOCIATION (NFLPA)
3333 North Mayfair Road, Suite 211
Milwaukee, WI 53222-3219
Ph: 414-778-3344
Fax: 414-778-3361
Internet: <http://www.nfpa.com>

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)
6830 Raleigh LaGrange Road, P.O. Box 34518
Memphis, TN 38184-0518
Ph: 901-377-1818
Internet: <http://www.natlhardwood.org>

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING
TECHNOLOGIES (NICET)
1420 King Street
Alexandria, VA 22314-2794
Ph: 888-476-4238
Internet: <http://www.nicet.org>

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
(NIOSH)

1600 Clifton Road
Atlanta, GA 30333
Ph: 800-232-4636
Internet: <http://www.cdc.gov/niosh>

NATIONAL INSTITUTE OF JUSTICE (NIJ)

National Law Enforcement and Corrections Technology Center
2277 Research Boulevard - Mailstop 8J
Rockville, MD 20850
Ph: (800)-248-2742
Fax: 301-519-5149
Internet: <http://www.justnet.org>

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

100 Bureau Drive, Stop 1070
Gaithersburg, MD 20899-1070
Ph: 301-975-6478 or (800)-877-8339
Internet: <http://www.nist.gov>

NATIONAL LIME ASSOCIATION (NLA)

200 North Glebe Road, Suite 800
Arlington, VA 22203
Ph: 703-243-5463
Fax: 703-243-5489
Internet: <http://www.lime.org>

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

1320 City Center Drive, Suite 200
Carmel, IN 46032
Ph: (800) 366 7731
Fax: 317-571-0041
Internet: <http://www.precast.org>

NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA)

900 Spring Street
Silver Spring, MD 20910
Ph: 240-485-1165
Internet: <http://www.nrmca.org>

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

10255 West Higgins Road, Suite 600
Rosemont, IL 60018 - 5607
Ph: 847-299-9070
Fax: 847-299-1183
Internet: <http://www.nrca.net>

NATIONAL SECURITY TELECOMMUNICATIONS AND INFORMATION
SYSTEMS SECURITY (NSTISS)

CNSS Secretariat - National Security Agency

9800 Savage Road, Suite 6716

Fort George G. Meade, MD 20755-6716

Ph: 410-854-6805

Fax: 410-854-6814

Internet: <http://www.cnss.gov/index.html>

NATIONAL TERRAZZO & MOSAIC ASSOCIATION (NTMA)

P.O. Box 2605

Fredericksburg, TX 78624

Ph: 800-323-9736

Fax: 888-362-2770

Internet: <http://www.ntma.com>

NATIONAL WOOD WINDOW AND DOOR ASSOCIATION (NWWDA)

401 North Michigan Avenue, Suite 2200

Chicago, IL 60611

Ph: 312-321-6802

Internet: <http://www.wdma.com>

NATURAL RESOURCE, AGRICULTURAL AND ENGINEERING SERVICE
(NRAES) Cooperative Extension

P.O. Box 4557

Ithaca, NY 14852-4557

Ph: 607-255-7654

Fax: 607-254-8770

Internet: <http://www.nraes.org>

NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION
(NAIMA)

44 Canal Center Plaza, Suite 310

Alexandria, VA 22314

Ph: 703-684-0084

Fax: 703-684-0427

Internet: <http://www.naima.org>

NSF INTERNATIONAL (NSF)

789 North Dixboro Road

P.O. Box 130140

Ann Arbor, MI 48113-0140

Ph: 734-769-8010 or (800)-673-6275

Fax: 734-769-0109

Internet: <http://www.nsf.org>

PIPE FABRICATION INSTITUTE (PFI)
511 Avenue of Americas, #601
New York, NY 10011
Ph: 514-634-3434
Fax: 514-634-9736
Internet: <http://www.pfi-institute.org>

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road, Building C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: <http://www.ppfahome.org>

PLASTICS PIPE INSTITUTE (PPI)
105 Decker Court, Suite 825
Irving, TX 75062
Ph: 469-499-1044
Fax: 469-499-1063
Internet: <http://www.plasticpipe.org>

PLUMBING AND DRAINAGE INSTITUTE (PDI)
800 Turnpike Street, Suite 300
North Andover, MA 01845
Ph: 978-557-0720 or (800)-589-8956
Fax: 978-557-0721
Internet: <http://www.pdionline.org>

PLUMBING-HEATING-COOLING CONTRACTORS NATIONAL ASSOCIATION
(PHCC)
180 South Washington Street, P.O. Box 6808
Falls Church, VA 22040
Ph: 703-237-8100 or (800)-533-7694
Fax: 703-237-7442
Internet: <http://www.phccweb.org>

PORCELAIN ENAMEL INSTITUTE (PEI)
PO Box 920220
Norcross, GA 30010
Ph: 770-676-9366
Fax: 770-409-7280
Internet: <http://www.porcelainenamel.com>

POST-TENSIONING INSTITUTE (PTI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3180
Fax: 248-848-3181
Internet: <http://www.post-tensioning.org/>

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)
200 West Adams Street, Suite 2100
Chicago, IL 60606
Ph: 312-786-0300
Fax: 312-786-0353
Internet: <http://www.pci.org>

RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC)
E-Mail: clarson@lejeunebolt.com
Internet: <http://www.boltcouncil.org>

RUBBER MANUFACTURERS ASSOCIATION (RMA)
1400 K Street, NW, Suite 900
Washington, DC 20005
Ph: 202-682-4800
Fax: 202-682-4854
Internet: <http://www.rma.org>

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)
2000 Powell Street, Suite 600
Emeryville, CA 94608
Ph: 510-452-8000
Fax: 510-452-8001
Internet: <http://www.scs1.com>

SEMICONDUCTOR EQUIPMENT AND MATERIALS INTERNATIONAL (SEMI)
3081 Zanker Road
San Jose, CA 95134
Ph: 408-943-6900
Fax: 408-428-9600
Internet: <http://www.semi.org>

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL
ASSOCIATION (SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1219
Ph: 703-803-2980
Fax: 703-803-3732
Internet: <http://www.smacna.org>

SINGLE PLY ROOFING INDUSTRY (SPRI)
411 Waverley Oaks Road, Suite 331B
Waltham, MA 02452
Ph: 781-647-7026
Fax: 781-647-7222
Internet: <http://www.spri.org>

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096-0001
Ph: 724-776-4841 or (877)-606-7323
Fax: 724-776-0790
Internet: <http://www.sae.org>

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)
4400 Fair Lakes Court, Suite 105
Fairfax, VA 22033
Ph: (800)-523-6154
Fax: 703-222-5816
Internet: <http://www.sprayfoam.org>

SOLAR RATING AND CERTIFICATION CORPORATION (SRCC)
400 High Point Drive, Suite 400
Cocoa, FL 32926
Ph: 321-213-6037
Fax: 321-821-0910
Internet: <http://www.solar-rating.org>

SOUTHERN PINE INSPECTION BUREAU (SPIB)
P.O. Box 10915
Pensacola, FL 32524-0915
Ph: 850-434-2611
Fax: 850-433-5594
Internet: <http://www.spib.org>

STEEL DECK INSTITUTE (SDI)
P.O. Box 25
Fox River Grove, IL 60021
Ph: 847-458-4647
Fax: 847-458-4648
Internet: <http://www.sdi.org>

STEEL DOOR INSTITUTE (SDI/DOOR)
30200 Detroit Road
Westlake, OH 44145
Ph: 440-899-0010
Fax: 440-892-1404
Internet: <http://www.steeldoor.org>

STEEL JOIST INSTITUTE (SJI)
234 West Cheves Street
Florence, SC 29501
Ph: 843-407-4091
Internet: <http://www.steeljoist.org>

STEEL TANK INSTITUTE (STI)
944 Donata Court
Lake Zurich, IL 60047
Ph: 847-438-8265
Fax: 847-438-8766
Internet: <http://www.steeltank.com>

STEEL WINDOW INSTITUTE (SWI)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
Internet: <http://www.steelwindows.com>

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)
15 Technology Parkway South
Norcross, GA 30092
Ph: 770-446-1400 or (800)-322-8686
Fax: 770-446-6947
Internet: <http://www.tappi.org>

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331 or (877) 281-7772
Fax: 412-281-9992
Internet: <http://www.sspc.org>

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
2500 Wilson Blvd, Suite 300
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: <http://www.tiaonline.org>

TESTING, ADJUSTING AND BALANCING BUREAU (TABB)
601 North Fairfax Street, Suite 240
Alexandria, VA 22314
Ph: 703-739-7100
Fax: 703-683-7615
Internet: <http://www.tabbcertified.org>

TILE COUNCIL OF NORTH AMERICA, INC. (TCNA)
100 Clemson Research Boulevard
Anderson, SC 29625
Ph: 864-646-8453
Fax: 864-646-2821
Internet: <http://www.tileusa.com>

TREE CARE INDUSTRY ASSOCIATION (TCIA)
136 Harvey Road, Suite 101
Londonderry, NH 03053
Ph: 603-314-5380 or (800)-733-2622
Fax: 603-314-5386
Internet: <http://www.treecareindustry.org>

TRUSS PLATE INSTITUTE (TPI)
218 North Lee Street, Suite 312
Alexandria, VA 22314
Ph: 703-683-1010
Fax: 866-501-4012
Internet: <http://www.tpinst.org>

TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION (TEMA)
25 North Broadway
Tarrytown, NY 10591
Ph: 914-332-0040
Fax: 914-332-1541
Internet: <http://www.tema.org>

TURFGRASS PRODUCERS INTERNATIONAL (TPI)
2 East Main Street
East Dundee, IL 60118
Ph: 847-649-5555 or (800)-405-8873
Fax: 847-649-5678
Internet: <http://www.turfgrassod.org>

UNDERWRITERS LABORATORIES (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096
Ph: 847-272-8800 or (877)-854-3577
Internet: <http://www.ul.com/>

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)
2711 LBJ Freeway, Suite 1000
Dallas, TX 75234
Ph: 972-243-3902
Fax: 972-243-3907
Internet: <http://www.uni-bell.org>

U.S. BUREAU OF RECLAMATION (BOR)
1849 C Street NW
Washington, D C. 20240-0001
Ph: 202-513-0501
Fax: 202-513-0309
Internet: <http://www.usbr.gov>

U.S. DEPARTMENT OF COMMERCE (DOC)
1401 Constitution Avenue, NW
Washington, DC 20230
Ph: 202-482-4883
Fax: 703-605-6900
Internet: <http://www.commerce.gov/>

U.S. DEPARTMENT OF DEFENSE (DOD)
1401 Constitution Avenue, NW
Washington, DC 20230
Ph: 202-482-2000
Internet: <http://www.dod.gov>

U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independence Avenue, SW
Washington, D.C. 20585
Ph: 202-586-5000
Fax: 202-586-4403
Internet: <http://www.eh.doe.gov>

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
P.O. Box 23268
Washington, DC 20026-3268
Ph: 800-245-2691
Fax: 202-708-9981
Internet: <http://www.huduser.org>

U.S. DEPARTMENT OF STATE (SD)
2201 C Street, NW
Washington, DC 20520
Ph: 202-647-4000
Internet: <http://www.state.gov>

U.S. DEPARTMENT OF TRANSPORTATION (DOT)
1200 New Jersey Avenue SE
Washington, DC 20590
Ph: 202-366-4000
Internet: <http://www.dot.gov>

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Ph: 202-272-0167
Internet: <http://www.epa.gov>

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)
445 12th Street SW
Washington, DC 20554
Phone: 888-225-5322
Fax: 866-418-0232
Internet: <http://www.fcc.gov>

U.S. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)
500 C Street, SW
Washington, D.C. 20472
Ph: 202-646-2500
Internet: <http://www.fema.gov>

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)
FHWA, Office of Safety
1200 New Jersey Ave., SE
Washington, DC 20590
Ph: 202-366-4000
Fax: 202-366-2249
Internet: <http://www.fhwa.dot.gov>

U. S. GREEN BUILDING COUNCIL (USGBC)
2101 L Street NW, Suite 500
Washington, D.C. 20037
Ph: (800) 795-1747
Fax: 202-828-5110
Internet: <http://www.usgbc.org>

U.S. GENERAL SERVICES ADMINISTRATION (GSA)
One Constitution Square
1275 First Street, NE
Washington, DC 20417
Ph: (866)-606-8220
Internet: <http://apps.fss.gsa.gov>

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
Internet: <http://www.archives.gov>

WATER ENVIRONMENT FEDERATION (WEF)
601 Wythe Street
Alexandria, VA 22314-1994
Ph: (800)-666-0206
Fax: 703-684-2492
Internet: <http://www.wef.org>

WATER QUALITY ASSOCIATION (WQA)

4151 Naperville Road
Lisle, IL 60532-3696
Ph: 630-505-0160
Fax: 630-505-9637
Internet: <http://www.wqa.org>

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

6980 S.W. Varns, P.O. Box 23145
Tigard, OR 97281
Ph: 503-639-0651
Fax: 503-684-8928
Internet: <http://www.wclib.org>

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

Yeon Building
522 SW 5th Avenue, Suite 500
Portland, OR 97204-2122
Ph: 503-224-3930
Fax: 503-224-3934
Internet: <http://www2.wwpa.org/>

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

401 North Michigan Avenue, Suite 2200
Chicago, IL 60611
Ph: 312-321-6802
Internet: <http://www.wdma.com>

WIRE ROPE TECHNICAL BOARD (WRTB)

801 North Fairfax Street, Suite 211
Alexandria, VA 22314-1757
Ph: 703-299-8550
Fax: 703-299-9253
Internet: <http://www.wireropetechnicalboard.org/>

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary Utilities:
 - a. Temporary electricity and lighting.
 - b. Telephone and internet service.
 - c. Temporary water service.
 - d. Temporary sanitary facilities.
2. Construction Facilities:
 - a. Field offices and sheds.
 - b. Engineer's field office.
 - c. Parking.
 - d. Progress cleaning and waste removal.
 - e. Project identification.
 - f. Fire prevention facilities.
3. Temporary Controls:
 - a. Barriers.
 - b. Enclosures and fencing.
 - c. Security.
 - d. Water control.
 - e. Dust control.
 - f. Erosion and sediment control.
 - g. Noise control.
 - h. Pollution control.
4. Removal of temporary utilities, facilities, and controls.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 REFERENCES

- A. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current edition, including Supplemental Specifications (Standard Specifications).

1.3 QUALITY ASSURANCE

- A. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 - 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
 - 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.
- B. Regulatory Requirements:
 - 1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.
- C. Comply with federal, state, and local codes and regulations, and with utility company requirements.

1.4 TEMPORARY ELECTRICITY AND LIGHTING

- A. Provide, maintain, and pay for temporary power as required to complete the Work, including power for field offices.
- B. Temporary power and lighting shall be sufficient to enable the Contractor and Subcontractors to complete Work and enable the MWRD to observe Work as it is being performed. Temporary power and lighting shall be provided at all field offices.
- C. Temporary power and lighting shall comply with local and state code requirements at all times.
- D. Temporary power and lighting shall be weatherproof and secured to prevent unauthorized access.
- E. Contractor shall cease operations immediately when requested by the MWRD due to inadequate light levels.

1.5 TELEPHONE AND INTERNET SERVICE

- A. Arrange with local telephone company to provide telephone and internet service throughout duration of Work.

- B. Provide, maintain, and pay for facsimiles service and a dedicated telephone line to field office at time of project mobilization.

1.6 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality water as needed to complete the Work.
- B. Water which has been approved by the Illinois Department of Public Health for drinking or ordinary household use may be accepted without being tested. All other sources will require the MWRD's approval.
 - 1. Water from shallow, muddy, or marshy areas shall not be used.

1.7 TEMPORARY SANITARY FACILITIES

- A. Provide, maintain, and pay for temporary sanitary facilities. Provide facilities at time of project mobilization.
- B. Obtain all necessary permits, and comply with local and state code requirements.
- C. At the end of construction, remove temporary sanitary facilities and restore areas where located to same or better condition than original condition.

1.8 FIELD OFFICES AND SHEDS

- A. Contractor to erect where designated by Engineer, and maintain in good condition, temporary field office, tool, and storage building(s) or trailer(s) for Contractor's use.
- B. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture and drawing display table.
- C. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- D. Provide separate work station, similarly equipped and furnished, for use of Engineer.
- E. Locate offices and sheds minimum distance of 30 feet from existing and new structures.
- F. Do not use permanent facilities for field offices or for storage.
- G. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
 - 1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove at completion of Work.
 - 2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
 - 3. Exterior Materials: Weather resistant, finished color acceptable to Engineer.

4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
 5. Lighting for Offices: 50 ft-C (538 lx) at desk top height, exterior lighting at entrance doors.
 6. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.
 7. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.
- H. Environmental Control:
1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain 68 degrees F heating and 76 degrees F cooling.
 2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.
- I. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00.
1. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.
 2. Installation: Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
 3. Maintenance and Cleaning: Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
 4. Maintain approach walks free of mud, water, and snow.
 5. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.9 ENGINEER'S FIELD OFFICE

A. General.

1. The Contractor shall provide and maintain in good condition for the exclusive use of the Engineer a waterproof building or office trailer complex for use as a temporary field office. The field office shall be provided throughout the period of construction of this Contract and shall be independent of any field office used by the Contractor. The location of the field office at the work site shall be adjacent to that of the Contractor and shall be subject to the approval of the Engineer. After completion of all work, the Building or trailer shall be the property of the Contractor. Upon release, the contractor shall remove the field office from the site and shall restore all areas affected by the office's installation.
2. The field office or office trailer complex shall have a ceiling height of not less than 8 feet and a floor space of not less than 800 square feet. The office shall be equipped with an electric heater to provide sufficient heat and an air-conditioning system, which

meets the approval of the Engineer.

3. Office trailer(s), if used, shall be winterized by providing wood skirts below the floor, shall be interconnected by an enclosed heated/air conditioned passage, shall be tied down at corners, and shall be equipped with stairway(s) and landing(s).
 4. The office trailer(s) shall have security type windows with expanded metal grating or security bars. The security windows shall have storms and screens capable of being opened and shall offer adequate natural light. The security windows shall have roller shades or venetian blinds.
 5. The office trailer(s) shall have 2 solid doors and screen door. The solid doors shall be provided with cylinder locks and master keyed with 10 keys furnished to the Engineer. In addition, padlocks shall be provided for all doors leading into the office trailer(s) to secure against break-in.
 6. Electrical service with wiring, outlets and overhead lighting suitable to light the desks and tables and to provide power to the heater and air conditioning system shall be installed as directed in the office trailer(s).
 7. Vinyl tile floor covering shall also be installed throughout the trailer(s).
- B. The office trailer(s) shall have as a minimum: One office, with a door, and at least 120-square-feet of floor space; an office area 20 feet by 20 feet; a conference room approximately 12 feet by 20 feet; and a changing room.
 - C. One washroom providing suitable sanitary with hot and cold running water shall be installed within the office. The washroom shall have one door with inside lock, a lavatory, a water closet, towel rack, a toilet paper roll holder, a medicine cabinet and suitable exhaust fan. The Contractor shall maintain the washrooms in good working condition and shall stock them with all necessary sanitary supplies at least once a week or as directed by the Engineer at all times during the period of the Contract. Wherever possible, the sanitary waste generated by the field office shall be discharged to the local or MWRDGC sanitary sewer system. Disposal of said waste by other means such as chemical or septic systems shall require the approval of the Engineer.
 - D. The Contractor shall construct and maintain a gravel or paved parking area for a minimum of 10 cars. The parking area shall be adjacent to the office provided for the Engineer and shall be for the exclusive use of the Metropolitan Water Reclamation District personnel. Proper access to the work from the office shall also be provided.
 - E. Office Furniture and Equipment. The Contractor shall arrange, install and maintain the office furniture and equipment as directed by the Engineer. The office shall have the following furniture and equipment. All supplied furniture shall become property of the Contractor after completion of the contract.

1. Four 5-drawer desks about 3 feet by 5 feet with 4 compatible swivel-type arm chairs.
2. Four additional chairs (swivel with armrests).
3. One drafting tables with top 60-inches by 30-inches with stool.
4. Two plan racks and six shelves as directed by the Engineer.
5. A minimum of two each: smoke detectors, carbon monoxide detectors, and air cleaners (portable). Air cleaners shall be Boston Air Purifier 25765 model or equal.
6. Two 4-drawer, legal-size filing cabinets with locks.
7. Six clothes lockers 14-inches by 18-inches by 6 feet with lock, hat shelf and coat rod.
8. Coat rack and hooks.
9. One 36-inch by 60-inch white porcelain remarkable board with aluminum frame.
10. One 36-inch by 60-inch bulletin board.
11. One equipment cabinet with lock and not less than 14 square feet of floor space per cabinet. Equipment cabinet shall be made of steel with concealed hinges and constructed to protect against forced entry.
12. One combination hot/cold/refrigerator water cooler dispensers with bottle water service.
13. Four 3.5 feet high by 3 feet wide metal bookcases.
14. Two OSHA compliant Johnson and Johnson Kits first-aid cabinet with case, Model No. 21-007A, as supplied by Ben Meadows Company, Inc., P.O. Box 80549, Chamblee, Georgia 30366, or equal approved by the Engineer.
15. Two, hand portable fire extinguishers. Extinguishers shall be dry chemical, cartridge operated of model type I-A-30-G as manufactured by Ansul Incorporated, One Stanton Street, Marinette, Wisconsin, 54143-2542 (www.ansul.com) or an approved equal. Each fire extinguisher shall contain no less than 25 pounds of the dry chemical extinguishing agent FORAYR, a register trademark of Ansul Incorporated, or an approved equal. Fire extinguishers shall be rated 20-A:80-B:C by the Underwriters Laboratory. The cartridge guard of each extinguisher shall be made of a composite material consisting of fiber filled polypropylene and additives to resist UV degradation while maintaining strength and integrity. Extinguishers shall be red in color, completely envelope the cartridge and cartridge receiver, and incorporate a nozzle holster as integral part of the one-piece construction. The cartridge shall be factory filled and sealed with a brass seal assembly utilizing a copper seat. The seal assembly shall be imprinted with the name of the manufacturer ("Ansul" for model type I- A-30-G). All extinguishers shall have an operating indicator cap that displays previous activation, and a properly installed ring pin to prevent accidental activation.
16. One Xerox 5325 copying machine, or equal, with copy machine paper as required and service maintenance for the duration of the Contract. Copy machine shall be capable of using multiple paper sizes (letter, legal and 11x17).
17. One electric wall clock.
18. One microwave oven with a minimum of 700 Watts of power and 1.3 cubic feet of capacity.

19. One refrigerator having 12 cubic feet of capacity with freezer section.
20. One Hewlett Packard Standard Plain Paper Ink Jet Facsimile Machine, FAX-200, or equal. Ink jet-printing supplies and full maintenance shall be supplied for the duration of this Contract.
21. One UL listed Smoke and CO Detector.
22. Telephone Service and Maintenance. The Contractor shall furnish the main telephone service line, poles and service lines to a pole in the immediate vicinity of the Engineer's field office. The Contractor shall make all necessary arrangements and pay for all installation charges for the installation of three telephone lines, two with Voicemail service, and connection between the trailer and the pole; and furnish three telephones. The Metropolitan Water Reclamation District of Greater Chicago the hard wire line service. The Contractor will assume and be responsible for all costs that may result from the installation of all other office utilities and the periodic service charges that result from the Engineer's use of the utilities. The Contractor shall also be responsible for weekly janitorial service, all office maintenance and repair and the costs associated with said maintenance and repair for the duration of the Engineer's use of the office.
23. Internet Service and Maintenance. The Contractor shall make all necessary arrangements and pay for all installation charges for the installation of high speed internet services. The contractor shall pay for all monthly service charges for the internet service. The Contractor shall provide the following:
 - a. Business internet connectivity via Comcast or other high speed capacity provider. A minimum of 250 Mbs symmetrical service required.
 - b. Wired and wireless data network for internet access.
 - c. One (1) Meraki MX75 w/5-year advanced security licensing
 - d. One (1) Meraki MR36H access point w/5-year advanced licensing
 - e. One (1) Meraki MS125-24 PoE switch w/5-year advanced licensing
 - f. CAT6 or better 48-port patch panel
 - g. One (1) APC UPS SCL500RM1UC for 30-minute backup power to maintain network connectivity.
 - h. 12U 19in Hinged Wall Mount Server Rack Cabinet (Example: Startech Product ID: RK1219WALHM). Note: Inside of rack must be at least 21 inches deep to ensure closure once equipment is installed.
 - i. CAT6 or better horizontal data cabling and RJ45 keystone jacks. For all workstation/printer/phone locations a minimum of two (2) sets of jacks and cabling are required.
 - j. District phone as required: Part number (Avaya J179).
 - k. The items listed are the minimum specs and should provide seamless connectivity to the District's current network infrastructure.

1.10 PARKING

- A. Construct temporary paved or gravel surface parking areas, as appropriate, to accommodate construction personnel.
- B. Locate as approved by Engineer.

- C. When site space is not adequate, provide additional off-site parking.
- D. Use of existing on-site streets and driveways used for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.
- E. Use of designated areas of existing parking facilities used by construction personnel is permitted where approved by the Engineer.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Do not allow vehicle parking on existing pavement.
 - 1. Permanent Pavements and Parking Facilities:
 - a. Prior to Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
 - b. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
 - 2. Maintenance:
 - a. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
 - b. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
 - 3. Removal, Repair:
 - a. Remove temporary materials and construction when permanent paving is usable.
 - b. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
 - c. Repair existing facilities damaged by use, to original condition.
 - 4. Mud from Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.11 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.12 PROJECT IDENTIFICATION

- A. Contractor shall provide project identification signage as described herein. Project identification sign to be installed prior to the start of Work.
- B. Project Identification Sign:
 - 1. One painted sign, 32 sq ft area; bottom of sign shall be 6 feet above ground.
 - 2. Content:
 - a. Project number, title, logo and name of MWRD as indicated on Contract

- Documents.
 - b. Names and titles of authorities.
 - c. Names and titles of MWRD Engineer and Consultants.
 - d. Name of Prime Contractor and major Subcontractors.
- 3. Graphic Design, Colors, Style of Lettering: Provided by MWRD.
- C. Project Informational Signs:
 - 1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering for legibility at 100 feet distance.
 - 2. Provide sign at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
 - 3. No other signs are allowed without MWRDG permission except those required by law.
- D. Design sign and structure to withstand 80 miles/hr wind velocity.
- E. Sign Painter: Experienced as professional sign painter for minimum five years.
- F. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- G. Provide submittal showing content, layout, lettering, color, foundation, structure, sizes, and grades of members.
- H. Sign Materials:
 - 1. Structure and Framing: New wood, structurally adequate.
 - 2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum $\frac{3}{4}$ inches thick, standard large sizes to minimize joints.
 - 3. Rough Hardware: Galvanized.
 - 4. Paint and Primers: Exterior quality, two coats; sign background of same base color as front.
 - 5. Lettering: Exterior quality paint, contrasting colors as selected.
- I. Installation:
 - 1. Install project identification sign within 15 days after date fixed by MWRD-Contractor Agreement.
 - 2. Erect at location of high public visibility adjacent to main entrance to site.
 - 3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
 - 4. Install sign surface plumb and level, with butt joints. Anchor securely.
 - 5. Paint exposed surfaces of sign, supports, and framing.
- J. Maintenance: Maintain signs and supports clean, repair deterioration and damage.
- K. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.13 FIRE PREVENTION FACILITIES

- A. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- B. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
 - 1. Provide minimum one fire extinguisher in every construction trailer and storage shed.

1.14 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas to allow for MWRD's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing structure or building.
- C. Provide protection for vegetation designated to remain. Replace damaged vegetation.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.15 ENCLOSURES AND FENCING

- A. Provide fence around construction areas as indicated on plans, as indicated in the specifications, and directed by the MWRD.
 - 1. Construction: Commercial grade chain link fence.
 - 2. Provide 6 foot (1.8 m) high fence around entire construction site; equip with vehicular and pedestrian gates with locks.
 - 3. Fencing shall include a site screen fabric covering around the entire site. Fabric to be in accordance with IDOT standards.

1.16 SECURITY

- A. Security Program:
 - 1. Protect Work and existing premises from theft, vandalism, and unauthorized entry.
 - 2. Initiate program at project mobilization.
 - 3. Maintain program throughout construction period.
- B. Entry Control:
 - 1. Restrict entrance of persons and vehicles into Project site per approved phasing plan.
 - 2. Allow entrance only to authorized persons with proper identification.
 - 3. Maintain log of workers and visitors, make available to MWRD on request.
 - 4. Do not work on Sundays, Holidays and days indicated in MWRD-Contractor Agreement, unless approved by MWRD in writing.

1.17 WATER CONTROL

- A. Grade site to drain as depicted on the plans. Maintain excavations free of water. Provide,

operate, and maintain pumping equipment.

- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.18 DUST CONTROL

- A. Reference Section 31 25 00 – Erosion Control for detailed requirements.
- B. Execute Work by methods to minimize raising dust from construction operations.
- C. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.19 EROSION AND SEDIMENT CONTROL

- A. Reference Sections 31 25 00 - Erosion Control, and 31 23 19 – Dewatering and Control of Water for detailed requirements.
- B. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- C. Minimize surface area of bare soil exposed at one time.
- D. Provide temporary measures including berms, dikes, and drains, and other devices to control water flow.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.20 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.
- B. Comply with local noise restrictions and requirements.

1.21 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials prior to Final Application for Payment inspection.
- B. Clean and repair damage caused by installation or use of temporary work.

- C. Restore existing and permanent facilities used during construction to original condition.
Restore permanent facilities used during construction to specified condition.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Traffic Control Plans.
2. Notification Plan and Schedule.
3. Emergency Access Plan.
4. Traffic Control Requirements.
5. Project Traffic Coordination.
6. Traffic Regulation.
7. Traffic Maintenance Requirements.
8. Local Access Requirements.
9. Sidewalk Control Requirements.
10. Mass Transit Requirements.
11. Traffic Safety Requirements.
12. Traffic Signage Maintenance.
13. Construction and Maintenance of Detours.

B. Contract requirements for traffic control plans, notification schedules, temporary barricades, signs, flaggers, lights, road surfaces, detours, and other safeguards necessary to protect life, health, and safety.

C. Related Documents:

1. Applicable provisions of General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

D. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work under this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT)

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).
2. Illinois Supplement to the National Manual on Uniform Traffic Control Devices (MUTCD)

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Contractor shall submit the following plans and schedules to the MWRD for review:
 - 1. Traffic Control Plans.
 - 2. Notification Plan and Schedule.

1.4 TRAFFIC CONTROL PLANS

- A. Contractor shall be responsible for obtaining local Village, City, Township, County, and IDOT approval as required based on jurisdiction for each Traffic Control Plan prior to start of Work.
- B. Submit a minimum of 30 days prior to scheduled start of Work.
- C. Show location of construction signs, location of cones, number of flaggers necessary and location, and other traffic control devices required for the Work.
- D. Prepare separate plans for each work area.
- E. Include traffic that impacts private property.
- F. Unless otherwise indicated, closing any street is not allowed.
- G. Request and obtain written approval from the MWRD and the appropriate jurisdictional agency no later than within seven (7) days of partially closing any street. Approval is not guaranteed.

1.5 NOTIFICATION PLAN AND SCHEDULE

- A. Submit a Notification Plan and Schedule three (3) weeks ahead of work scheduled to maintain access for adjacent or affected properties and businesses.
- B. Update as necessary for the weekly Project Meetings.
- C. Notification Plan and Schedule shall include:
 - 1. Name of affected business and property owners.
 - 2. Mailing address of business or property owners.
 - 3. Contact name and phone number.
 - 4. Estimated week of construction within 150 feet of affected property.
 - 5. Estimated number of days that construction will be fronting the property.
 - 6. Special issues for maintaining access.
- D. Request and obtain written approval from the MWRD and the appropriate jurisdictional agency within seven (7) days of partially closing any street.
- E. Notifications regarding work performed in street areas shall be in such detail as to give the time of commencement and completion of the work including names of streets to be closed, schedule of operation, routes of detours and haul routes.

- F. To accommodate emergency vehicle rerouting, notify, in writing, local fire and law enforcement authorities and other affected agencies not less than 72 hours prior to construction operations which deviate or delay traffic from the existing traffic patterns.

1.6 EMERGENCY ACCESS PLAN

- A. Indicate emergency access and flow through the project site during construction.
- B. Inform emergency response organizations of detour routes.
- C. Coordinate with emergency response teams at all project site locations.

1.7 TRAFFIC CONTROL REQUIREMENTS

- A. Contractor shall comply with Articles 701.01 – 701.08, 701.11 – 701.18 of the IDOT Standard Specifications.
- B. Contractor shall provide all necessary traffic control for the protection of the general public.
- C. Maintain pedestrian and bicycle access at all times.
- D. Traffic on minor arterial streets shall be maintained in each direction at all times.
- E. Identify work on specific streets that the Contractor determines will have a traffic impact.
- F. Unless otherwise indicated, provide for passage and access of emergency vehicles, police, fire, and disaster units at all times. Assume liability for damages resulting from failure to provide said access.
- G. Vehicular and pedestrian routing and traffic flow on streets where the work is not being performed shall not be revised.
- H. Annotate proposed location of barricades, lighting, signing, temporary striping, and other traffic control devices.
- I. Anticipate traffic, bus zone, and driveway effects and relocation resulting from construction operations. Include anticipated movement of bus, passenger, and truck loading zones.
- J. Flaggers:
 - 1. At each site where a two-way roadway is restricted to one lane of two-way traffic, provide a minimum of two flaggers in order to insure safe and effective planning of traffic through the constricted zone.
 - 2. Provide three flaggers when the construction zone length causes sight distance or communication problems between a two-member team of flaggers to operate safely.
 - 3. Flagger shall prevent any conflicts between local access traffic and construction crews and heavy equipment whenever local access is required into and out of the construction zone.

- K. Unless otherwise indicated, provide the following minimum traffic access:
 1. All streets shall be able to maintain two-way traffic at all times.
 2. Each traffic lane shall be at least 12 feet wide.
 3. All traffic realignments not otherwise indicated shall be approved by authority having jurisdiction in writing a minimum of 10 days prior to implementation.
- L. Off-duty, uniformed police officer:
 1. Use in the construction zone when signalized intersections are affected by construction to direct traffic, countermand the traffic signal, and, if necessary, to clear traffic backups.
 2. Each traffic lane shall be at least 12-feet wide.
- M. Provide local access to all businesses, industrial sites, and residences.
- N. Provide fencing and concrete barriers to separate traffic and pedestrian flow from construction work, unless otherwise noted.
- O. Channel traffic flow into the work zone per accepted Traffic Control Plans.
- P. Pedestrian and Cyclist Pathways:
 1. Unless otherwise indicated, provide a temporary five (5) foot wide alternate pathway on the same side of the street when construction interferes with the usual pedestrian and cyclist pathways.
 2. Keep pedestrians, cyclists, vehicles, and open excavations along the arterial all separate from one another to meet safety requirements.
 3. Maintain minimum of three (3) crosswalks at affected intersections.

1.8 PROJECT TRAFFIC COORDINATION

- A. Coordinate construction which provides the least possible obstruction and inconvenience to public.
- B. Coordinate with property and business owners in order to maintain convenient access for local traffic to private properties along the line of work at all times.
- C. Keep existing street lighting systems in operation during progress of the work at all times. When affected by the work, provide temporary lighting as required by the responsible agency.
- D. Do not open up sections of work and leave them unfinished. Finish work in process insofar as practicable.
- E. Have under construction no greater length or amount of work than can be prosecuted properly with due regards to impacts on the community.
- F. Coordinate revisions to existing traffic control with the affected agencies.
- G. Unless otherwise required by the MWRD, keep traffic controls in operation for the benefit of the traveling public during progress of the work.
- H. As work progresses and as conditions permit, reset temporarily relocated or removed

traffic and street name signs in their permanent location.

- I. Replace or repair signs and other traffic control devices damaged or lost.

1.9 TRAFFIC REGULATION

A. Signs, Signals, and Related Devices:

1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
2. Automatic Traffic Control Signals: As approved by local jurisdictions.

B. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.

C. Flagger Equipment: As required by authority having jurisdiction.

1. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
2. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:

1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
2. Confine construction traffic to designated haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

E. Traffic Signs and Signals:

1. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain automatic and manual traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
3. Relocate as Work progresses, to maintain effective traffic control.

F. Removal of Traffic Signs, Signals and Related Equipment:

1. Remove equipment and devices at Substantial Completion.
2. Repair damage caused by installation.
3. Remove post settings completely.

PART 2 - PRODUCTS

2.1 TRAFFIC CONTROL DEVICES

- A. Traffic Control Devices shall conform to the requirements of Article 1106.02 of the IDOT Standard Specifications

PART 3 - EXECUTION

3.1 TRAFFIC MAINTENANCE REQUIREMENTS

- A. Take necessary measures to maintain a normal flow of vehicular and pedestrian traffic to prevent accidents and to protect the work throughout the construction stages until completion of the work.
- B. Make necessary arrangements to reroute traffic.
- C. Regulatory devices provided by the Contractor shall be suitable for nighttime operation.
- D. Take effective measures necessary to protect other portions of the work during construction and until completion.
- E. Provide and maintain necessary barriers, cones, barricade lights, construction signs, guards, temporary crossovers, and flaggers.
- F. Maintain emergency exiting from homes and businesses within and immediately adjacent to construction site.
- G. Maintain vehicular traffic at all locations to the greatest extent possible and reduce and reroute traffic only for the shortest time possible consistent with effective construction operations.
- H. Travel lanes shall not be blocked by the Contractor's activities, including trucks delivering materials.
- I. Material deliveries and other related trucking activities shall occur in the Contractor's protected work or staging areas.
- J. Upon completion of a segment of work in streets, traffic shall be restored to normal flow as soon as possible.
- K. Existing directional operation of street systems shall be maintained as much as possible.
- L. When pavement markings are obliterated due to construction, temporary pressure sensitive or permanent pavement marking tape, traffic buttons, or delineators shall be installed in accordance with the IDOT Standard Specifications.
- M. Temporary pavement features shall be removed only upon installation of permanent traffic channelization, as required by the appropriate jurisdictional agency.
- N. Maintain access by emergency vehicles at all times in all roadways.
- O. Use temporary covers over cuts to accommodate traffic.
- P. When providing facilities for pedestrians, include provisions for the safe movement of mobility and sight-impaired individuals. This shall include temporary ramps.

3.2 LOCAL ACCESS REQUIREMENTS

- A. Unless otherwise indicated, provide local access at all times.

- B. Maintain access to private properties and businesses at all times including the work area.
- C. If access is required in the immediate work area, make provisions in the Contractor operations to provide requested access.
- D. Where, during some urgent stages of construction, temporary closure of an access to a property is unavoidable, coordinate the closure with the property owner and provide alternative access as instructed by the MWRD.
- E. Existing access to designated properties shall not be closed until the replacement access is available for property owner's use.

3.3 SIDEWALK CONTROL REQUIREMENTS

- A. Sidewalks adjacent to project site shall be maintained and all appropriate standards and practices during construction.
- B. Sidewalks adjacent to project site shall remain open during construction, unless otherwise noted.
- C. Take appropriate safety measures to ensure pedestrian safety when construction traffic is entering and leaving the Site.

3.4 MASS TRANSIT REQUIREMENTS

- A. Coordinate with transit authorities as required.

3.5 TRAFFIC SAFETY REQUIREMENTS

- A. Use adequate safeguards, safety devices and protective equipment and take other needed actions to protect life, health and safety and to protect property in connection with the performance of the work.
- B. Use flaggers, signs, and other devices, and erect and maintain barricades, guards, signs, warning signs, and detour signs, as are necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations.
- C. Where flaggers are employed, the flaggers' equipment and training shall be in accordance with local laws and regulations.
- D. Flaggers shall use all required equipment while flagging traffic.
- E. Provide and maintain temporary and permanent pavement markings including traffic markers, delineators, thermoplastic stop bars, and crosswalks to meet the current standards.
- F. When required by the MWRD:
 - 1. Provide flaggers immediately.
 - 2. Provide, erect, maintain, and remove barricades and lights.
 - 3. Erect, maintain, and remove standard signs.

- G. In the event traffic signal is made inoperative by or at the request of the Contractor, provide an off-duty police officer in accordance with local laws and regulations, or provide suitable traffic control devices for control and movement of traffic during the time that the signal or beacon is inoperative.
- H. Provide traffic control during the hours of construction and in a safe, prudent, operating manner.
- I. During the hours of non-construction, maintain all existing traffic lanes safe for vehicular traffic, unless otherwise noted.
- J. Leave all unfinished work in a safe, non-hazardous condition to the public.

3.6 TRAFFIC SIGNAGE MAINTENANCE

- A. Check each item daily, including weekends and holidays.
- B. Replace signs that are missing, vandalized, damaged, or not functioning properly within 24 hours of such act.
- C. Non-applicable signs shall be removed or covered during periods when they are not needed.
- D. Provide standard signs as well as other appropriate signs required by the MWRD as applicable and necessary for the work.
- E. Erect signs on posts and supports and maintain them in a neat and presentable condition until the necessity for them has ceased.
- F. When the need for a sign has ceased, and upon approval by the MWRD, take down such sign.
- G. Traffic control signs shall have a flashing beacon and a flag attached. Verify beacons are working after each work day.
- H. Control signs necessary for night-time traffic control, or remaining in place during the night, shall have a flashing beacon with a flag attached and be reflective.
- I. Safeguard and direct traffic after the existing signs have been removed.
- J. Preservation and maintenance of traffic control and street name signs shall be the sole responsibility of the Contractor.

3.7 CONSTRUCTION AND MAINTENANCE OF DETOURS

- A. Construct, maintain in a safe condition, and keep open to traffic detours that will accommodate traffic diverted from the roadway during construction.
- B. Provide for all on-site or off-site detours required or necessitated by the work, including side street crossings and temporary bridges over excavation or freshly placed pavement.

C. Keep roadways clean to assure the safe passage of pedestrians and vehicles.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
 - 1. Protect existing trees designated to remain by tree protection fencing; ensure that no heavy wheeled traffic invades root zone as defined by canopies; provide root zone protection as and/if required to ensure compliance with the above.

1.3 RELATED SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 02 41 13 – Site Demolition
 - 2. Section 31 20 00 – Earthwork
 - 3. Section 31 25 00 – Erosion Control
 - 4. Section 32 92 00 – Turf and Grasses
 - 5. Section 32 93 00 – Planting and Fine Grading
 - 6. Section 32 96 00 - Transplanting

1.4 DEFINITIONS

- A. The following related items are included herein and shall mean:
 - 1. AAN: American Association of Nurserymen.
 - 2. ASTM: American Society of Testing Materials.

1.5 PROJECT CONDITIONS

- A. Disposal: Dispose of cleared, grubbed, and removed material off the site. Burning of materials on the job site will not be permitted. Stockpile salvaged material in a secured location, designated by the Engineer.
- B. Protection of Existing Landscaping to Remain: Prior to beginning any work of the Contract on site, take effective action to protect all existing landscaping indicated to remain. Refer to requirements specified herein. Chemicals deleterious to plant growth may not be used on subgrades of areas that will be sodded, seeded, or planted.
- C. Dust and Noise Control: Take effective measures to prevent windblown dust and to control noise to avoid creating a nuisance. Obtain Engineer's approval of means, methods and techniques used to control dust and noise. Avoid creating ice hazards in freezing weather.
- D. Existing Landscaping to be Transplanted: Prior to beginning any work of the Contract on site, Contractor is to provide on-site location for existing landscaping to be transplanted and stored in acceptable conditions. Contractor is to submit a plan showing location for transplanted landscape for review and acceptance by the Engineer prior to beginning any work of the Contract on site.

1.6 EXAMINATION OF CONDITIONS

- A. The Contractor shall carefully study the Contract Documents and shall fully inform him/herself of existing conditions of the site before submitting his/ her bid and before starting work. The Contractor shall at once report to the MWRD any errors, inconsistencies or omissions he/ she may discover. The Contractor shall be fully liable to the MWRD for any damage resulting from such errors, inconsistencies or omissions in the Contract Documents.
- B. The Contractor shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in actual work. Plans, surveys, measurements and dimensions under which the work is performed are believed to be correct to the best of the MWRD's knowledge, but the Contractor shall have examined them for him/herself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.
- C. On all Project Drawings, figures take precedence over measurements by scale. The MWRD shall decide on questions that may arise regarding the meaning and intent of the Project Drawings and Project Specifications. If any Project Drawings or figures that are necessary to a clear understanding of the Work are omitted, or if any error appears in either Project Drawings or Specifications, or if discrepancies are found between the Project Drawings and Project Specifications, it shall be the duty of the Contractor to notify the MWRD of such omissions, errors or discrepancies, and in no case proceed in uncertainty. If any mistakes

arise in consequence of such neglect on the part of the Contractor to notify the MWRD, the Contractor must correct the work at his/ her own expense.

- D. The Contractor shall perform no portion of the Work at any time without the Contract Documents or, where required, approved Shop Drawings, Product Data, Samples or other Submittals for such portion of the Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the General Conditions.

1.7 PROTECTION

- A. All local rules and regulations governing the works shall be observed by the Contractor in executing all work under this section.
- B. All work shall be executed in a manner to prevent any damage to existing buildings, streets, pavings, vegetation designated to remain, service utility lines, structures, existing improvements, adjoining property and existing improvements on adjoining property. Protect from damage all utilities that are to remain.
- C. Items to remain and existing improvements that are damaged shall be restored to their original condition that is acceptable to the MWRD and parties having jurisdiction. Restoration work shall be at no cost to the MWRD and parties having jurisdiction.
- D. All work shall be executed in a manner that takes all precautions to assure safe work operations.
- E. All sedimentation control measures shall be in place and approved by the MWRD and Engineer prior to construction. Place strawbales and / or approved siltation fences around the existing drainage system. Review siltation and strawbale protection limits with the Engineer and the MWRD prior to beginning construction.
- F. All tree protection devices shall be in place and approved by the Engineer prior to beginning work.

PART 2 PRODUCTS

2.1 GENERAL

- A. Provide all materials, equipment and supplies as required to completely perform the protection work specified herein and as shown on the Drawings.

2.2 LAYOUT EQUIPMENT

- A. Stakes and batterboards shall be of size and quality necessary to execute work. The Contractor shall use wire, non-stretching cord, or laser equipment to establish reference lines.

2.3 PROTECTIVE FENCES

- A. Protective fences shall be chain link fence components including posts, rails, fabric, and miscellaneous accessories. Dimensions shall be as shown on the Drawings. All fence components shall be galvanized. Secondhand fence components may be used if in good condition.
- B. Contractor shall obtain Engineer and the MWRD's approval of all fence components before obtaining fence system.
- C. Protective fences shall include Construction Perimeter Fence (temporary and long term) and Tree Protection Fence.
- D. Protective chain link fence components shall include 3" square posts, and 12.5 gauge 2" x 2" chain link fence fabric. Posts shall be set in free-standing pedestals. Posts shall be located at a maximum distance of 8'-0" on center, or as required to maintain the fence in a securely upright condition. Contractor shall examine tree protection and site preparation plans to determine extent of posts required to accommodate required fence layout. Contractor shall provide any necessary grounding components.
- E. Moveable Construction Fence shall be maintained and kept in safe condition while in place.

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall review all fence limits with the Engineer and the MWRD before erecting fences or beginning work.
- B. Minor adjustments to the fence layout, which are not represented on the Drawings, will be required to facilitate the work. Minor adjustments shall be made at no additional cost to the project.
- C. All tree protection fences shall be in place before demolition commences.
- D. Fences shall remain in place until removal is approved by the Engineer and the MWRD's Representative.

3.2 PROTECTION OF EXISTING PLANTS TO REMAIN

- A. The Contractor will be responsible for maintaining the existing plants to remain during construction, including watering, fertilizing and pruning. The MWRD and Engineer shall be given access to all vegetation and soil protection zones.

- B. General:
 - 1. The Contractor shall be responsible for protecting existing trees and other vegetation to remain in place against burning, unnecessary cutting, breaking or skinning of roots and branches, skinning and bruising of bark, loss of water due to pumping, smothering of trees by stockpiling construction materials and/or excavation materials within drip line of the tree, excess foot or vehicular traffic, parking of vehicles within the drip line or excavating within the drip line. Do not use plants and trees for anchors, stays, cranes, or other construction activities. No wires, nails or other materials may be attached to the protected trees.
 - (a) Do not permit water to stand around the base of plants within the drip line during construction operations, except during a period of inundating flooding which would, in its natural course, cover the base of trees.

- C. Vegetation Protection Fence:
 - 1. The Contractor shall review the fence limits in the Approved Submittal with the Engineer in the field before erecting fences or beginning work.
 - 2. No work shall begin where the tree protection fence has not been installed and approved.
 - 3. Erect the fence so that it is securely in place and resistant to ordinary seasonal climatic forces, adjacent pedestrian movement, and work operations.
 - 4. Temporary access within plant protection areas is permitted to perform construction operations as shown on the Drawings. All work within the fence shall be performed by hand or with small equipment that will not damage or threaten damage to trees or soil.
 - (a) No equipment, vehicles, debris or materials either salvaged or new shall be parked or stored within the fence.
 - 5. If the Contractor's actions threaten the protection of the existing vegetation areas, the Contractor shall provide additional or more secure tree protection devices at no expense to the MWRD. The Engineer will be the sole determinant of whether more secure fencing is required.
 - 6. Adjustments to the fence layout shall be required to facilitate the work, and these adjustments shall be made at no additional expense to the MWRD.
 - 7. Contractor shall inspect fencing frequently. Maintain and repair fence and gates as required to keep in good condition. Replace fence components that are damaged and threaten protection of trees.
 - (a) Fences shall remain in place until Substantial Completion.
 - (b) All fences shall be inspected, restored and secured at the end of each day's operation.

- (c) The Contractor shall continue to inspect fencing regularly during periods of construction stoppages, including, but not limited to, delays and over-wintering,
- (d) Utilities: Route utilities away from existing trees even if shown otherwise. Review re-routing with Engineer prior to performing work and obtain written permission to re-route utilities.
 - i) If excavation within the drip lines of existing trees cannot be avoid, all excavation shall be done by hand or with pneumatic systems. This includes trenches for utilities. Directional micro-tunneling and boring may be permitted within the limits of the vegetation and soil protection zone subject to approval by the Engineer.

D. Repair, Replacement and Damages to Existing Trees:

1. Repair:

- (a) The Engineer will select a qualified arborist to inspect the damaged trees and to make a determination on damage, sustainability and remediation procedures.
- (b) The Contractor shall strictly adhere to the arborist's recommendations.
- (c) The total cost of tree repair, including the cost of the arborist, shall be borne by the Contractor.

2. Replacement and Damages: If the arborist determines that the damaged tree cannot be repaired and restored to full-growth status, the Contractor shall replace the damaged tree(s) and pay liquidated damages as noted below.

- (a) The Contractor shall purchase a new tree to replace the damaged tree. The size of the tree replacement shall equal ½" caliper for every 1" caliper inch of the damaged tree - measured Diameter at Breast Height (DBH.) The species and source of the replacement tree shall be determined by the MWRD.
- (b) In addition to providing a new tree replacement, the Contractor shall pay the MWRD \$500.00 for every caliper inch of the damaged tree (measured at DBH.)
- (c) An example of the conditions stated above: A 20" caliper tree was damaged and determined to need replacement. To remedy this situation, the Contractor would purchase and install a 10" caliper tree(s) as selected by the Engineer and pay the MWRD \$5,000.
- (d) The total cost of tree replacement, including the cost of long-term maintenance and the arborist, shall be borne by the Contractor.

3.3 DISPOSAL OF WASTE MATERIAL

- A. Burning will not be permitted on the MWRD's property.
- B. The Contractor shall remove waste materials and unsuitable materials from the MWRD's property and legally dispose of off-site unless otherwise noted.

- C. The Contractor shall submit the dumpsite owner's name and location of dumpsite to the MWRD for approval prior to waste removal from project site.
- D. The use of explosives for disposal will not be permitted.

3.4 POST CONSTRUCTION CLEAN-UP

- A. The Contractor shall completely remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction. Disturbed areas shall be graded and filled with approved soil to a depth of 18" lower than the original contour or new contour as shown on the Drawings.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Products.
2. Product delivery requirements.
3. Product storage and handling requirements.
4. Product options.
5. Equipment electrical characteristics and components.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specification, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT STORAGE AND HANDLING REQUIREMENTS FOR EQUIPMENT, PRODUCTS AND MATERIALS SCHEDULED FOR RE-INSTALLATION

- A. Store and protect products removed prior to demolition activities and scheduled for re-installation in accordance with manufacturers' instructions or in accordance with regulated industry standards.
- B. Store with seals and identification labels intact and legible. Provide product, material or equipment type on label.
- C. Store sensitive products in weather tight, climate controlled enclosures in an environment favorable to product, material or equipment type.
- D. For exterior storage of removed fabricated products, place on sloped supports above ground, covered with waterproof material, vented at ends and secured.
- E. Cover products subject to deterioration with waterproof covering. Provide ventilation to prevent condensation and degradation of products.
- F. Store loose harvested granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable reusable condition.

1.6 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named. Approval subject to MWRD's review.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 70 00

CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closeout procedures.
2. Final cleaning.
3. Protecting installed construction.
4. Product warranties and product bonds.
5. Maintenance service.

B. Related Documents:

1. Applicable provisions of General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 SUBMITTALS

A. The following submittals shall be provided to MWRD prior to the Contractor submitting their final application for payment:

1. Product warranties, as specified in this Section.
2. Product bonds, as specified by this Section.
3. Project Record Documents, as specified in Section 01 78 39, including:
 - a. Project Record Drawings including:
 - 1) As-Built Drawings.
 - 2) Change Order Sketches.
 - 3) As-Built Field Data and Drawings.
 - b. Project Record Specifications, including:
 - 1) Product substitution and Change Order data sheets for actual equipment, products, and materials used in construction.
 - c. Project Record Data.
 - d. Other required project record information identified in other Sections.

1.3 CLOSEOUT PROCEDURES

A. The attention of the Contractor is particularly called to the time allowed for the completion of the work included under this Contract. To avoid delay in the completion of

work hereunder, he shall submit the names of all subcontractors and suppliers of material and equipment within 10 days after the date of approval of his bond and shall place all orders for material and equipment within 5 days after approval by the District.

- B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for MWRD's review.
- C. Provide submittals to MWRD required by authorities having jurisdiction.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- E. MWRD may occupy all or some portions of project site as specified in the Detailed Specifications or as indicated on Drawings.
- F. Inspection and Workmanship:
 - 1. It is the intent, under this Contract, to secure high class workmanship in all respects.
 - 2. Any imperfect work that may be discovered before the final acceptance of the work shall be corrected immediately. The inspection of any work shall not relieve that Contractor of any of his obligations to perform proper and satisfactory work, as herein specified, and all work, which, during its progress may become damaged from any cause, or fails for any reason to satisfy the requirements of the Specifications shall be removed and replaced by good and satisfactory work without extra charge therefore.
 - 3. The Contractor shall perform all tests which are specified under the various items of the Contract. Any changes or repairs necessary to put all work and equipment in satisfactory adjustment and operating condition, shall be done at no additional expense to the Metropolitan Water Reclamation District.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean debris from project site.
- C. Clean site; sweep paved areas and boardwalks, groom trails, clean landscaped areas.
- D. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.5 PROTECTING INSTALLED CONSTRUCTION

- A. The Contractor shall furnish such protection as may be necessary against damage in any way to the work and, material included under this Contract before and after the same have been installed (including all necessary protection for structures that may be damaged by winter conditions), and shall be fully responsible for such work until its final acceptance.

- B. Protect installed Work and provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Prohibit traffic from landscaped areas.

1.6 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in three side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with MWRD's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for specified period.
- B. Examine system components at frequency consistent with reliable operation. Adjust and repair as required.
- C. Include systematic examination, adjustment, and repair of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of MWRD.

1.4 ADMINISTRATION OF ONE-YEAR GUARANTEE

- A. For purposes of this contract, Article 36 Guarantees, of the General Conditions, will be administered.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 78 36

PLANT MAINTENANCE BOND

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

Surety's Chief Claims Officer:

Metropolitan Water Reclamation District of
Greater Chicago
100 East Erie Street,
Chicago, Illinois 60611-2893

CONTRACT

Effective Date of Agreement:
Amount:
Description (*Name and Location*):
Flood Control Project on Midlothian Creek in
Robbins, IL, CSA
Robbins, IL
Contract Number: 14-253-5F

BOND

Bond Number:
Date (*Not earlier than Substantial Completion*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Maintenance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

(Seal)
Contractor's Name and Corporate Seal

(Seal)
Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to MWRDGC to:
 - 1.1 Monitor, manage, and maintain planted/constructed natural areas in a live functioning state and replace any material that appears to have died for the period of three (3) years for native landscape in accordance with Specification 32 92 00 – Turfs and Grasses, Specification 32 92 19 – Seeding, Specification 32 93 00 – Planting and Fine Grading, and as shown on the contract plans; held and firmly bound unto the Metropolitan Water Reclamation District of Greater Chicago in the penal sum (must equal three percent (3%) of the amount of the planting and seeding portion of this Contract) Dollars (\$ _____), lawful money of the United States of America, for the payment whereof well and truly to be made, we and each of us, jointly and severally, bind ourselves, our and each of our heirs, executors, administrators successors and assign, firmly by these presents.
2. With respect to MWRDGC:
 - 2.1 This obligation shall be null and void if the MWRDGC commits an overt act that changes the character of the project site or causes the death of the plant life;
 - 2.2 When a defect or failure on maintenance occurs, and it is not an emergency, the MWRDGC shall make timely notice to the Contractor and Surety to remedy the defect or failure.
 - 2.3 In an emergency, the MWRDGC may remedy the defect or failure and receive compensation from the Surety;
 - 2.4 When the Contractor has received notice of a maintenance issue and does not resolve it within a reasonable time the MWRDGC may proceed to remedy the maintenance issue and receive compensation the same as an emergency.
3. The Contractor shall promptly respond when MWRDGC makes a maintenance claim to investigate, consult with third parties, and determine the course of action needed to remedy the defect or failure. The Contractor shall inform the MWRDGC within 5 working days of the course of action to be taken and time table for the action(s).
4. The Surety shall have no obligation under this Bond until one of the following:
 - 4.1 The Contractor has not responded to a maintenance claim as required in paragraph 3 above or;
 - 4.2 The Contractor has not performed the course of action provided in paragraph 3 above or;
 - 4.3 The MWRDGC has made a maintenance repair or demand in accordance with Paragraph 2 above.
5. The Surety shall remedy the maintenance issue either by performance or payment of damages.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous Record Submittals.
5. Recording and Maintenance.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 REFERENCES

- A. MWRD CAD Standards and Design Conventions Manual.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. As-Built Record Drawings: Comply with following:

1. MWRD approval is required for all submittals.
2. The following information shall be submitted in compliance with the MWRD CAD Standards and Design Conventions Manual:
 - a. As-built field data shall be submitted to the MWRD Resident Engineer for review and approval a minimum of 20 calendar days prior to the date of final inspection.
 - b. If review of the preliminary as-built drawings reveals errors or omissions, the Drawings shall be returned to the Contractor for corrections.
 - c. Contractor shall make all corrections and return the drawings to the MWRD Resident Engineer within 10 calendar days of receipt.

C. Final As-Built Drawings:

1. Final As-Built Record Drawings, including reproducible copies and electronic copies,

shall be completed and returned together with the approved preliminary As-Built Drawings to the MWRD within 30 calendar days of final inspection.

2. Number of Copies: Submit Record Drawings electronically to MWRD.
- D. Record Specifications: Submit one (1) copy of Project Specifications, including addenda and contract modifications.
 - E. Record Product Data: Submit one (1) copy of each Product Data submittal.
 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

1.4 CONTRACT DOCUMENTS FURNISHED BY MWRD

- A. Upon execution of the Contract Documents and approval of the Contractor's Bond, the MWRD will furnish to the Contractor, free of charge, five (5) complete hard copy sets of Contract drawings.
- B. Contract Record drawings may be provided in a non-editable electronic format (DWF) at Contractor's request.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. When CAD drawings are available in electronic format they shall be delivered on electronic or optical media in a format readable by the MWRD's current CAD system.
- B. All CAD drawings created from other CAD applications must be translated and delivered into AutoCAD, DWG format.
- C. Original reproducible set of Contract Drawings is the Record Set and must be preserved in its entirety.
- D. As-Built Record Drawings shall be a Contractor prepared record of the construction as installed and completed.
- E. They shall include all of the information shown on the contract set of drawings and a record of all deviations, modifications, or changes made from those drawings which were incorporated into the final work.

2.2 CHANGE ORDER SKETCHES

- A. Sketch types ASK, CSK, SSK, PSK, MSK and ESK, used for Change Order Post Award Work shall be provided in a non-editable electronic DWF format only upon Contractor's request.

2.3 AS-BUILT DRAWINGS

- A. Upon completion of this Contract, the Contractor shall furnish to the MWRD a complete set of As-Built Drawings in accordance with the requirements of the General Conditions.
- B. In addition to the hard copy set of As-Built drawings, the Contractor shall furnish an electronic copy of all the As-Built drawings in the form of AutoCAD-DWG files in accordance to the MWRD CAD Standards and Design Conventions Manual.
- C. MWRD will supply the Contractor with an electronic copy of the contract drawings in the form of AutoCAD-DWG files, upon request.
- D. The cost of producing the As-Built Drawings shall be considered as part of the Contractor's bid price.
- E. Contractor shall keep and maintain at project site one (1) complete set of full size plans of the contract drawings for recording as-built conditions.
- F. This site As-Built set of record drawings shall be kept up to date and available for the MWRD's use.
- G. During the progression of the project the As-Built Drawings shall be marked or noted with all field information, properly dated, recorded as-built conditions to show all deviations in actual work from the issued contract Drawings.
- H. The site As-Built drawings shall be utilized to prepare the final Record Drawings as specified in this Section.
- I. Contractor shall include in the appropriate pay items of this Contract, all engineering and drafting costs required to produce these As-Built Record Drawings.

2.4 AS-BUILT RECORD DRAWINGS CONTENT

A. Record Drawings:

- 1. Preparation:
 - a. Mark Record Drawings to show actual installation where installation varies from that shown originally.
 - b. Require individual or entity who obtained record data, whether individual or entity is installer, Subcontractor, or similar entity, to prepare marked-up Record Prints.
 - c. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - d. Accurately record information in an understandable drawing technique.
 - e. Record data as soon as possible after obtaining it.
 - f. Record and check mark-up before enclosing concealed installations.
- 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.

- f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following MWRD's written orders.
 - l. Details not on original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on Work that is shown only schematically.
3. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, add cross-reference to Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.5 AS-BUILT FIELD DATA AND DRAWINGS:

- A. As-Built Field Data and Drawings shall show the following information:
 1. Changes in details of design or additional information obtained from working drawings specified to be prepared and furnished by the Contractor including, but not limited to, fabrication erection, installation, and placing details.
 2. All changes or modifications from original design and from final inspection.
 3. Where the contract drawings or specifications allow different options, only the option actually used in the work shall be shown on the as-built drawings.
 4. The option not used shall be deleted.
- B. Additional Data and Drawing Requirements:
 1. These deviations shall be shown in the same general detail utilized in the contract drawings.
 2. Marking of the drawings shall be done continuously during construction to keep them up to date.
 3. In addition, Contractor shall maintain full size marked-up drawings, survey notes, and sketches.
 4. This information shall be maintained in a current condition at all times until completion of the work.

2.6 AS-BUILT RECORD DRAWINGS:

- A. Modifications to Contract drawings will be made using CAD with the following limitations:
 1. Data structure for layer assignments.
 2. Symbology of the drawing files.
 3. AutoCAD drawing format (dwg)
 4. Structure and format shall comply with MWRD CAD Standards and Design Conventions Manual.

- B. A copy of the Contract CAD files will be made available to the Contractor by MWRD.
- C. Contractor shall make necessary additions and corrections to the CAD Files to show the As-Built conditions.
- D. MWRD will furnish upon request a CD-ROM containing blocks, font libraries and the standard border and title block.
- E. Drawings translated from other CAD formats to AutoCAD shall include layer assignments and follow the MWRD CAD Standards and Design Conventions Manual.
- F. As-Built information shall be placed on a separate CAD layer so as not to mix information with original design or design revision information.
- G. CAD files shall be checked by the Contractor for proper translation.
- H. Drawings on single layer will not be acceptable.
- I. The information contained on the final plotted drawings and CAD files shall be identical.
- J. Drawing sheets that have been modified shall have a modification cloud bubble placed around the area or item that has been modified.
- K. Numbered revision triangles will be placed in paper space and near the clouded areas.
- L. Revision triangle with number, BUILT AS SHOWN, initials and date shall be provided in the issue revision description block.
- M. If supplementary drawings are necessary, they must be produced using CAD, added to the set, given a new number in sequence and have a modification cloud bubble placed around the sheet number.
- N. MWRD CAD Standards and Design Conventions manual shall be adhered to.
- O. List of Contract Drawing sheets shall be adjusted to reflect any changes or additions to CAD files used to create As-Built Record drawing files.
- P. Drawing sheets that have been changed or added to the set shall have a modification cloud bubble placed around the listed sheet number, page number and title description to show what sheet and page numbers were added or changed.
- Q. Upon approval by MWRD Resident Engineer, the Contractor shall submit a CD-ROM disk of the AutoCAD As-Built Record drawing sheets that have been changed or added to the set by MWRD Resident Engineer.
- R. MWRD will use the Contractors submitted CD-ROM disk to plot copies of the As-Built Record drawings to check for conformance to MWRD CAD and drafting standards.

- S. AutoCAD drawing files shall be returned to the Contractor if corrections are necessary.
- T. Contractor shall make all corrections and return the AutoCAD drawings to MWRD Resident Engineer within 10 calendar days of receipt.

2.7 FINAL PERMANENT TRACINGS AND CAD FILES

- A. MWRD will use the Contractors submitted CD-ROM disk to plot copies of the As-Built Record drawing set for review by MWRD Resident Engineer.
- B. If significant problems are encountered with the Contractor's submitted CD-ROM disk, the disk will be returned to the Contractor for corrections.
- C. Contractor shall make all correction and re-submit the CD-ROM of the AutoCAD As-Built Record drawings, the first iteration of printing and review is considered part of the contract.
- D. Subsequent printings and review costs will be backcharged to the project contract.
- E. Each drawing file changed or unchanged including supplementary drawings added to set shall be plotted or printed to full size, (36 inches x 24 inches) on reproducible minimum 20 lb. vellum.
- F. Once the Contractors CD-ROM of the As-Built Record drawings has been successfully plotted and approved, a final review meeting will be held for joint signing of plotted As-Built Record drawings.
- G. Each drawing sheet shall bear the decal "BUILT AS SHOWN" furnished by MWRD and placed near the LOWER RIGHT hand side of title block or in the space provided on drawing sheet.
- H. Each As-Built Record drawing shall be dated and signed as to its correctness by the Contractor and MWRD Resident Engineer.
- I. AutoCAD As-Built Record drawings CD-ROM, accompanied with proper form, must be received and verified by the CAD Administrator and Drafting Unit prior to final payment to Contractor.
- J. Full-size plotted Vellum As-Built Record drawings, accompanied with proper form, must be received and verified by the Engineering Archives Unit prior to final payment to Contractor.

2.8 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with proprietary name, model number and serial number of products,

- materials, and equipment furnished, including substitutions and product options selected.
3. Record name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.9 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.10 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording:
 1. Maintain (1) one copy of each submittal during construction period for Project Record Document purposes.
 2. Post changes and modifications to Project Record Documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples:
 1. Store Record Documents and Samples in field office apart from Contract Documents used for construction.
 2. Do not use Project Record Documents for construction purposes.
 3. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.
 4. Provide access to Project Record Documents for MWRD's reference during normal working hours.

END OF SECTION

SECTION 02 22 20

REMOVAL AND DISPOSAL OF SURPLUS SOIL AND CONSTRUCTION OR DEMOLITION DEBRIS

PART 1 - GENERAL

1.1 SUMMARY

- A. This work includes, but is not limited to the following:
1. Legal off-site disposal of uncontaminated surplus soil generated from the work from this contract as indicated in the contract documents in accordance with all local, state and federal laws and regulations. Provide disposal documentation daily.
 2. Legal off-site disposal of Clean Construction or Demolition Debris (CCDD) generated from the work from this contract as indicated in the contract documents in accordance with all local, state and federal laws and regulations. Provide disposal documentation daily.
 3. Legal off-site disposal of General Construction or Demolition Debris generated from the work from this contract as indicated in the contract documents in accordance with all local, state and federal laws and regulations. Provide disposal documentation daily.
- B. Related Documents:
1. Drawings and general provisions of the Contract, including MWRDGC General Conditions, General Specifications, and Division 1 Specification Sections shall govern work of this specification section.
 2. Geotechnical and Environmental Reports presented in Volume 3.
 3. Sheet C-010 of the Drawings titled Clean Construction or Demolition Debris Exclusion Areas.
 4. Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation (Illinois Environmental Protection Agency Form LPC-663), included in Volume 3.
- C. Related Sections:
1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
 2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
 3. Section 02 41 13 – Site Demolition
 4. Section 02 41 15 – Utility Removal
 5. Section 02 61 13 – Removal and Disposal of Contaminated Material
 6. Section 31 05 13 – Soils for Earthwork
 7. Section 31 11 00 – Site Clearing and Grubbing
 8. Section 31 20 00 – Earthwork
 9. Section 31 23 15 – Excavation, Backfill, and Compaction for Buildings and Structures
 10. Section 31 23 16 – Trench Excavation, Backfill and Compaction
 11. In the event of a conflict between this section and any of the General Specifications,

General Specifications – Concrete, and General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

- A. Illinois Environmental Protection Act (415 ILCS 5/)
- B. Illinois Public Act 096-1416, amendment regarding construction or demolition debris
- C. Illinois Public Act 097-0137, amendment regarding construction or demolition debris
- D. State of Illinois Form LPC 663, Uncontaminated Soil Certification
- E. USEPA Publication SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
- F. Ill. Adm. Code 1100 and other applicable Illinois Pollution Control Board environmental regulations.

1.3 DEFINITIONS

- A. Surplus soil: Excavated soil not required in the Work or not meeting the requirements for fill or backfill material as described in Section 31 05 13 – Soils for Earthwork.
- B. Contaminated Soil: Soil determined to contain contaminants of concern in exceedance of Maximum Allowable Concentrations. Known contaminated soil areas are shown as CCDD exclusion areas on Sheet C-010 of the Drawings.
- C. Uncontaminated Soil: Areas determined not to contain contaminants of concern in exceedance of Maximum Allowable Concentrations.
- D. Clean Construction or Demolition Debris (CCDD): Clean construction or demolition debris (CCDD) is uncontaminated broken concrete without protruding metal bars, bricks, rock, stone, or reclaimed asphalt pavement generated from construction or demolition activities. When uncontaminated soil is mixed with any of these materials, the uncontaminated soil is also considered CCDD. Uncontaminated soil that is not mixed with other CCDD materials is not CCDD.
- E. General Construction or Demolition Debris (GCDD): General construction or demolition debris is construction or demolition debris not meeting the definition of CCDD, and which may include non-hazardous, uncontaminated materials resulting from the construction, remodeling, repair, and demolition of utilities, structures, and roads, limited to the following: bricks, concrete, and other masonry materials; soil; rock; wood, including non-hazardous painted, treated, and coated wood and wood products; wall coverings; plaster; drywall; plumbing fixtures; non-asbestos insulation; asphalt roofing shingles and other roof coverings; reclaimed or other asphalt pavement; glass; plastics that are not sealed in a manner that conceals waste; electrical wiring and components containing no hazardous substances; and corrugated cardboard, piping or metals incidental to any of those materials. Refer to Section 01 13 50 – Waste Management.

- F. MWRDGC Environmental Representative: Includes the MWRDGC Resident Engineer or any authorized representative of MWRDGC for purposes of overseeing soil and waste management.

1.4 PROJECT CONDITIONS

- A. The Contractor shall make a site visit to become familiar with the current conditions. Contractor shall also determine the accessibility and assess safety measures that will be necessary to perform the contract work.
- B. Material Sampling and Analysis:
 - 1. A report documenting the analysis of soil/material samples collected from the project site is included in the specifications, identified in Part 1.1. This data is provided for information purposes only, and the District assumes no responsibility whatsoever for the accuracy and validity of the information provided.

1.5 REGULATORY REQUIREMENTS

- A. The Contractor shall comply with all applicable local, state and federal laws and regulations with regard to material removal, handling and disposal, and shall pay all assessed costs and fees.
- B. The Contractor shall comply with the Illinois Environmental Protection Act, as amended by Public Act 096-1416 that was signed in to law on July 30, 2010 and Public Act 097-0137 that was signed in to law on July 14, 2011.

1.6 DESCRIPTION OF WORK

- A. CCDD and GCDD Removal and Disposal:
 - 1. Removal, handling and legal off-site disposal of all CCDD and GCDD generated from all demolition and site clearing work.
 - 2. On-site drying of the material as required, so that the material will pass the paint-filter test as per Method 9095B in USEPA's publication SW-846, prior to transportation.
 - 3. Obtaining acceptance letter from an Illinois Environmental Protection Agency (IEPA) registered CCDD facility, setting forth its agreement and authorization to accept the identified material using the existing sampling data and signed form LPC-663. A signed form LPC-663 for uncontaminated soils mixed with other CCDD material provided in Volume 3 for uncontaminated soil areas as defined in Part 1.3. No additional soil disposal characterization and profile sampling is allowed without written approval from the MWRD.
 - 4. MWRD's goal is to salvage and recycle as much non-hazardous demolition and construction waste as possible.

5. All profits from recycling of demolition and construction waste shall be granted to the Contractor.

B. Uncontaminated Surplus Soils Removal and Disposal:

1. Removal, handling and legal off-site disposal of uncontaminated surplus soil generated from all contract work. Surplus soil shall be disposed of at an approved CCDD site, Uncontaminated Soil Fill Operation (USFO) site, or site approved by MWRD.
2. On-site drying of the material as required, so that the material will pass the paint-filter test as per Method 9095B in USEPA's publication SW-846, prior to transportation.
3. Obtaining acceptance letter from an Illinois Environmental Protection Agency (IEPA) registered CCDD facility, setting forth its agreement and authorization to accept the identified material using the existing sampling data and signed form LPC-663. A signed form LPC-663 is provided in Volume 3 for uncontaminated soil areas as defined in Part 1.3. No additional soil disposal characterization and profile sampling is allowed without written approval from the MWRD.

C. Reporting:

1. Contractor to provide tickets for disposal as proof on a daily basis.
2. Provide daily and cumulative totals to the MWRD Engineer of the number of trucks, the quantity (measured both in tons and in cubic yards) and type of material (uncontaminated soil, CCDD, or GCDD) loaded on to the trucks for off-site disposal.

1.7 SUBMITTALS

A. Contractor shall submit a CCDD, GCDD, and Uncontaminated Surplus Soil Removal and Disposal Plan to MWRD for approval. Submit the following as a minimum:

1. A list of all GCDD anticipated to be generated requiring off-site disposal.
2. The anticipated quantity (both in tons and in cubic yards) of GCDD to be landfilled, and identification of facility including address and contact information.
3. The anticipated quantity (both in tons and in cubic yards) of CCDD to be transported off-site to a licensed facility, and identification of facility including address and contact information.
4. The anticipated quantity (both in tons and in cubic yards) of surplus soil to be transported off-site to a licensed facility or other approved location, and identification of facility/location including address and contact information.

B. CCDD, GCDD, and Uncontaminated Surplus Soil Removal and Disposal Plan Progress Reports: Submit concurrent with each Application for Payment. Include the following

information:

1. Quantity of GCDD disposed and facility disposal records
 2. Quantity of CCDD disposed and facility disposal records
 3. Quantity of uncontaminated surplus soil disposed and facility disposal records
 4. Copy of all certifications required and generated for the facility disposals
- C. CCDD, GCDD and Uncontaminated Surplus Soil Disposal Final Report: Before request for substantial completion, submit a final report documenting cumulative totals of CCDD, GCDD and uncontaminated surplus soil disposed at each facility utilized for this contract.
- D. Contractor's Site Specific Health and Safety Plan for all workers engaged in excavation, stockpiling, loading, hauling, removal, and disposal of any soils (including certified non-special waste soils and non-hazardous special waste soils), CCDD, and GCDD from the site. The plan shall comply with all OSHA requirements utilizing information attained in existing environmental soil evaluation reports. The work shall be performed under the direct supervision of a trained and experienced site supervisor. The plan should at a minimum include the following:
1. Name of key personnel and alternates responsible for site safety
 2. Describe the risks associated with each operation conducted.
 3. Describe chemical contaminants to be encountered by employees on work site and specific hazards if any to the workers as required by OSHA.
 4. Type of personnel training and responsibilities and to handle the specific hazardous situations they may encounter.
 5. Describe the protective clothing and equipment to be worn by personnel during various site operations.
 6. Describe any site-specific medical surveillance requirements.
 7. Describe the program for the periodic air monitoring, personnel monitoring, and environmental sampling if needed.
 8. Describe the actions to be taken to mitigate existing hazards to make the work environment less hazardous.
 9. Define site control measures including a site map.
 10. Establish procedures for personnel and equipment and transporting trucks to ensure that Contaminated Soils are not tracked off site onto non-impacted areas of the site.
 11. Set forth the site Standard Operating Procedures (SOPs). SOPs are those activities that can be standardized (i.e., decontamination procedures and respirator fit testing).

12. Set forth a Contingency Plan for the safe and effective response to emergencies.

E. Facility Information

1. Name, address and telephone number of the facilities where CCDD, GCDD, and uncontaminated surplus soil are to be transported. This submittal must be approved prior to removal of any materials from the site. Once this submittal is approved, the Contractor cannot change the facilities without written authorization from MWRD. This information should include, at a minimum, the following:
 - a. Facility name and address and telephone number;
 - b. Site contact information, including contact person and phone number;
 - c. Facility Identification number assigned by the IEPA;
 - d. Acceptance letter from the facility, setting forth its agreement and authorization to accept the identified material.
2. Name of Haulers to be used for the transportation of CCDD, GCDD, and uncontaminated surplus soil. This submittal must be approved prior to removal of any materials from the site. This information shall include, at a minimum, the following:
 - a. Hauler name, address, contact information, including name and telephone number of authorized representative.
 - b. Any relevant transportation license numbers.
3. Once this submittal is approved, the Contractor cannot change facilities without written authorization from MWRD.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING SITE AND STRUCTURES

- A. No excavation shall be performed until site utilities have been field located.
- B. Contractor shall take all necessary precautions to protect the existing structures, pavements etc. during the material removal operation. Any damage to these elements shall be repaired at no additional cost to MWRD.
- C. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from MWRD.

3.2 MATERIAL CHARACTERIZATION FOR OFF-SITE DISPOSAL

- A. See the Phase II Environmental Site Assessment Report in Volume 3 for existing material characterization data. A signed form LPC-663 is provided in Volume 3 for uncontaminated soil areas as defined in Part 1.3. No additional soil disposal

characterization and profile sampling is allowed without written approval from the MWRD.

- B. Costs for any and all additional sampling, laboratory analysis or any other document required by the recipient of the material (disposal site) to establish that the material is uncontaminated, shall be borne by the Contractor at no additional expense to MWRD. MWRD must provide approval to perform the additional items.

3.3 ON-SITE STORAGE

- A. If any onsite storage is required to ensure that material is dry enough for transportation and disposal, the locations of such temporary storage areas shall be only as approved by MWRDGC. Contractor shall also obtain MWRDGC's approval for the plan dimensions and maximum height of the proposed storage piles.
- B. Material must pass the paint-filter test as per Method 9095B in USEPA's publication SW-846, prior to being transported for offsite disposal. Contractor shall be responsible for all costs associated with performing the additional paint-filter test.
- C. When storing material on-site prior to off-site disposal, Contractor shall grade and shape stockpiles to drain surface water.
- D. Contractor shall take appropriate measures to control blowing of the material due to wind, and washing away of the material due to rain.

3.4 COMMINGLING OF MATERIALS

- A. Contaminated Soil shall not be commingled with Uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. General Construction or Demolition Debris shall not be comingled with Uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. Any avoidable, additional cost resulting from or associated with commingling of materials shall be considered Contractor's expense.

3.5 CONTAMINATED MATERIALS

- A. Any material that is determined to be contaminated (hazardous waste or certified non-hazardous non-special/special waste) shall be removed, handled and disposed off-site by the Contractor, as specified under Section 02 61 13 – Removal and Disposal of Contaminated Material.

3.6 ON-SITE DISPOSAL

- A. Onsite disposal of any surplus soil and construction or demolition debris is not permitted, unless so approved in writing by MWRD.

3.7 MATERIAL REMOVAL

- A. Excavation:

1. Areas shall be excavated to the depth and extent shown on the Drawings.
2. Boundaries as shown on Sheet C-007 shall be staked in the field, with staking periodically replaced as excavation progresses and as stakes are lost, to ensure that excavation materials are handled in accordance with contract documents.
3. Excavation shall be performed in a manner that will limit the potential for comingling of materials as described in Part 3.4.
4. Excavation logs shall be prepared in accordance with ASTM D5434.
5. The Contractor shall immediately notify MWRD and the Resident Engineer if any materials, (solid or liquid) requiring special handling (i.e., contaminated soil, soil with odors, or liquids) are encountered during excavation. Such materials shall be separately stockpiled. Any such stockpile shall be constructed to isolate these materials from the environment and shall not be loaded into hauling trucks without a written authorization from MWRD.
6. During excavation, the Contractor shall not allow non-CCDD waste to be included in loads to be hauled to a CCDD facility or to a USFO, as may be applicable.
7. The Contractor understands and is required to perform surgical excavation, hand or machine sorting of materials as necessary to ensure non-CCDD wastes are not present in excavation loads destined for placement as fill at a CCDD or USFO facility, as may be applicable.
8. The Contractor shall be responsible for maintaining the structural integrity of all surrounding streets, underground utilities, buildings, and structures (walkways, sidewalks, underground tunnels, etc.).
9. Uncontaminated soil shall be disposed of at CCDD facility, USFO, or site approved by MWRD. Contaminated soil may be disposed of at a Subtitle D landfill. Payment for uncontaminated soils unnecessarily disposed of at a Subtitle D landfill shall be only at the CCDD rate and not the Subtitle D Premium rate.
10. If soil load is rejected at CCDD facility for visible contamination (trash) resulting from mismanagement of waste and comingling of materials, then Contractor shall be responsible for transportation cost to Subtitle D landfill and disposal cost at Subtitle D landfill.

B. Shoring:

1. If workers must enter the excavation, it shall be evaluated, shored, sloped or braced as required by EM 385-1-1 and 29 CFR 1926 Section 650.

C. Dewatering:

1. Surface water shall be diverted to prevent entry into the excavation.
2. Dewatering shall be limited to that necessary to assure adequate access, a safe

excavation, and to ensure that compaction requirements can be met.

3. No dewatering shall be performed without prior approval of MWRD.

3.8 STOCKPILING

- A. The Contractor may stockpile excavated materials on site as shown on the Drawings and as set forth in the Contractor's CCDD, GCDD, and Uncontaminated Surplus Soil Removal and Disposal Plan, or otherwise approved by MWRD. The location of the stockpile area shall be approved by MWRD. The maximum height of the stockpile shall be provided by MWRD.
- B. The Contractor shall be responsible for avoiding comingling of materials as described in Part 3.4. If Contaminated Soils, Special Waste or Hazardous Waste come in contact with CCDD, Uncontaminated Soils, or GCDD, the resulting material will now be considered contaminated, and the Contractor shall dispose of the newly designated material as Contaminated Soils at its own expense in accordance with Section 02 61 13.

3.9 LOADING

- A. The Resident Engineer and the Contractor each understand that any material not specifically included within the definition of CCDD and/or Uncontaminated Soil is grounds for load rejection by the applicable CCDD or USFO facility and that the Contractor may be required to implement measures as described in Part 3.7 and as described below in order to ensure acceptance of loads. Refer to Part 1.3 for applicable definitions.
- B. The MWRD Environmental Representative shall periodically be on-site to confirm excavations and conditions are in accordance with the project Soil Management Plan. It is the Contractor's responsibility to ensure that loads of CCDD material or uncontaminated soil does not contain non-CCDD waste and are not rejected by the CCDD facility and/or USFO facility as applicable.
- C. The MWRD Environmental Representative will be spot checking loads. If the MWRD Environmental Representative determines that comingling has occurred (per Part 3.4) he/she may direct the Contractor to segregate the materials or take the material to a Subtitle D Landfill. Any avoidable costs associated with segregating comingled materials or disposal of comingled materials to a Subtitle D Landfill shall be borne by the Contractor. The MWRD Environmental Representative reserves the right to have non-CCDD waste removed from loads by hand or have loads dumped and hand/machine sorted to remove the non-CCDD waste.
- D. Prior to loading, the Contractor shall prepare and provide hauler with appropriately marked disposal receipts, for acceptance and confirmation at the receiving site.
- E. The Contractor shall load excavated materials directly from the site or from temporary stockpiles into hauling trucks equipped with tarp for direct transportation to the approved facility.
- F. The Contractor shall conduct operations in a manner that minimizes interference with

roads, streets, walks and other adjacent occupied and used facilities. The Contractor shall not close or obstruct streets, walks or other occupied or used facilities without permission from the applicable governing agency and the Resident Engineer. If required by the appropriate governmental entity, the Contractor shall provide alternate routes around closed or obstructed traffic ways.

- G. The Contractor shall ensure compliance with all State and local road/street weight limits.

3.10 TRANSPORTATION

- A. All trucks shall be properly covered prior to leaving the site.
- B. All CCDD and Uncontaminated Soil shall be transported directly to the approved CCDD filling site, Uncontaminated Soil Fill Operation (USFO) or recycling facility on a daily basis. No off-site temporary storage is allowed. All materials not transported to the approved CCDD filling site, USFO or recycling facility shall be returned to the site for overnight storage.
- C. The Contractor shall immediately notify the Resident Engineer if any CCDD or uncontaminated soil loads are rejected by the CCDD fill operation or USFO. If a load is rejected at a CCDD facility or USFO, the rejected load will be hauled to a Subtitle D Landfill.
- D. The MWRD Environmental Representative is responsible for signing all waste certification/transportation documents including non-hazardous waste manifests.
- E. The Contractor shall provide completed copies of disposal/recycling tracking receipts to the Resident Engineer on daily basis.
- F. Drivers shall hold, and present upon request, a current valid Commercial Driver's License (CDL).

3.11 PID SCREENING

- A. For material excavated from 0-5 feet below existing grade in sensitive areas such as the previous and current structure demolition sites, the contractor shall be responsible for screening every load destined for a CCDD facility or USFO with a photoionization detector (PID) to detect the presence of any volatile organic compounds (VOCs).
- B. If the PID screening results in a reading of more than 10 meter units, or parts per million, above background, the Contractor will notify the Resident Engineer immediately, and the load will be directed to a Subtitle D Landfill.

END OF SECTION

SECTION 02 41 13

SITE DEMOLITION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project site conditions.
2. Site demolition requirements.
3. Hazardous materials.
4. Notification for excavation.
5. Preparation.
6. Demolition and removal.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 01 13 50 – Waste Management.
4. Section 02 41 14 – Utility Abandonment.
5. Section 02 41 15 – Utility Removal
6. Section 02 61 13 – Excavation and Handling of Contaminated Material
7. Section 31 05 13 – Soils for Earthwork.
8. Section 31 05 16 – Aggregates for Earthwork.
9. Section 31 11 00 – Site Clearing and Grubbing.
10. Section 31 23 19 – Dewatering and Control of Water.
11. Section 31 25 00 – Erosion Control.
12. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, and General Specifications – Sewers, this section shall prevail.

1.2 SUBMITTALS

- A. Required submittals shall be made in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit demolition removal procedures and schedule.
- C. Submit a copy of the demolition permit and other related permits.
- D. Submit the following documents required by and described in other sections prior to the commencement of demolition activities:

1. Waste Management Plan under provisions of Section 01 13 50 – Waste Management.
 2. Copy of Contractor's Pre-Demolition Inspection Report, including a detailed inventory of all items to be demolished, waste characterization, and disposal. Identify disposal locations including but not limited to recycling, CCDD, municipal landfill, or other permitted facilities.
 3. Include demolition waste management and disposal in contractor's Waste Management Plan as described in Section 01 13 50.
 4. Storm Water Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) under provisions of Section 31 25 00 – Erosion Control.
 5. Provide an in-stream work plan.
- C. Submit project record documents under provisions of Section 01 78 39 – Project Record Documents.
1. Record drawings should accurately identify location of utilities capped off, abandoned in place, or relocated as part of the Work; location of foundations or appurtenances abandoned and covered; or items remaining that would affect future work on site.

1.3 REGULATORY REQUIREMENTS

- A. Comply with local, state, and federal codes, rules and regulations applicable to demolition work including but not limited to erosion control, air pollution, noise pollution, and waste disposal.
- B. Contractor shall obtain and pay for permits required for demolition work.

1.4 PROJECT SITE CONDITIONS

- A. Conduct demolition to minimize interference with adjacent property, structures and buildings.
- B. Maintain protected egress and access to project site at all times.
- C. Provide, erect, and maintain temporary barriers, fences and security devices.
- D. Conduct operations with minimum interference to public or private thoroughfares.
- E. Do not close or obstruct roadways and sidewalks without permits.

1.5 SITE DEMOLITION REQUIREMENTS

- A. Traffic Control Signs:
 1. Erect traffic control and safety measures on streets, trails, and other areas prior to commencement of work.
 2. Anchor barricades in a manner to prevent displacement by wind.
- B. Items to Remain in Place:
 1. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain property of the Owner.
 2. Repair or replace damaged items as approved by the MWRD Engineer.
 3. Construct and maintain shoring, bracing, and supports as required.

4. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed.
5. Do not overload pavements to remain.
6. Provide new supports and reinforcement materials for existing utility construction weakened by site demolition and removal work.
7. Repairs, reinforcement, or structural replacement require approval by the MWRD prior to performing such work.

C. Existing Conditions:

1. Before beginning any demolition work, survey project site and examine drawings and specifications to determine extent of demolition work.
2. Protect trees within project site which might be damaged during demolition, and which are indicated to be left in place. Replace any tree designated to remain that is damaged during the work under this contract with like and kind or as approved by MWRD Engineer at no additional cost to MWRD.
3. Maintain existing utilities indicated to stay in service and protect against damage during demolition operations.
4. Coordinate utility removals with utility owner. Complete removals as required for the work at utility owner's direction, or if utility owner elects to self-perform removal work, Contractor shall bear costs for removal by utility owner.

1.6 HAZARDOUS MATERIALS

- A. If Contractor encounters a hazardous material during demolition process, they shall cease operations immediately and notify the MWRD of their findings.
- B. Contractor shall not reinstate demolition operations until areas have been cleared for continuation of demolition work by the MWRD.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 NOTIFICATION

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
- B. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 PREPARATION

- A. Prevent movement or settlement of adjacent structures scheduled to remain.
- B. Provide bracing and shoring of adjacent structures scheduled to remain.
- C. Protect existing landscaping materials, appurtenances and structures which are not to be demolished.
- D. Disconnect, cap, and remove designated utility lines, including sewer and water services within demolition areas in accordance with Section 02 41 14 – Utility Abandonment.
- E. Cooperate and work with local utility company to provide removal and disconnection of designated utilities.
- F. Mark location of disconnected or relocated utilities. Identify utilities and indicate locations, including capping locations, on project record documents in accordance with Section 01 78 39 – Project Record Documents.
- G. Erect and maintain additional temporary partitions and closures to protect the public during demolition.

3.3 DEMOLITION AND REMOVAL

- A. Reference the Detailed Specifications or Drawings for identification of items to be demolished or removed.
- B. Except where specified in other sections, all materials removed, and not scheduled for reuse or salvage by MWRD, shall become property of the Contractor and removed promptly from site.
- C. Demolish designated site structures, sheds, pavements, fences, signage and related appurtenances as indicated on Drawings and in accordance with approved removal procedure and schedule.
- D. Cease operations and notify the MWRD immediately if adjacent structures or landscape features appear to be endangered.
- E. Do not resume operations until corrective measures have been taken.
- F. Immediately remove demolished material from site unless approved demolition procedure and schedule submitted in accordance with this section provides otherwise.
- G. Relics, antiques, and similar objects remain property of the Owner at their request.
- H. Notify the MWRD prior to removal and obtain acceptance regarding method of removal.
- I. Remove designated materials to be re-installed or retained in manner to prevent damage.
 - 1. Remove, store, and protect for re-installation, products, materials and equipment as

- identified on Drawings.
2. Remove products, materials and equipment to be retained by MWRD and deliver as identified on Drawings.
- L. Remove products, materials and equipment, and dispose of off-site as identified on Drawings.
- M. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.
- M. Do not burn or bury materials on site, except as specifically described in the contract documents.
- N. Remove site structure and shed foundations and footings completely.
- O. Demolish and remove designated concrete items completely which includes:
1. Sidewalks.
 2. Curb and Gutter.
 3. Medians.
 4. Driveways.
 5. Parking stops.
 6. Bridge abutments and footings.
 7. All other concrete items designated for demolition and removal on the Drawings.
- P. Demolish and remove designated asphalt pavement completely which includes:
1. Sidewalks.
 2. Curb and gutter.
 3. Driveways.
 4. Parking lots.
 5. All other asphalt pavement items designated for demolition and removal on the Drawings.
- Q. Neatly saw cut all pavement edges at right angle to surface to complete depth of pavement prior to shattering or mechanical removal. Concrete and asphalt pavement removals shall be saw cut at the location shown on the drawings or removed to the nearest joint.
- R. Keep work sprinkled with water to minimize dust. Provide hoses and water main or hydrant connections for this purpose. Obtain permits and pay for water usage as required by Local Water Utility.
- S. Backfill areas excavated, open pits, and holes caused as a result of demolition with subsoil types specified in Section 31 05 13 – Soils for Earthwork or Type A8 fill specified in 31 05 16 – Aggregates for Earthwork as designated on the Drawings.
- T. Rough grade and compact areas affected by site demolition to maintain and blend site grades and contours as indicated on Drawings.
- U. Utilize erosion and sediment control best management practices to control erosion from areas affected by site demolition.

END OF SECTION

SECTION 02 41 14

UTILITY ABANDONMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Materials for utility abandonment in place.
2. Notification for excavation.
3. Sanitary and storm sewer abandonment.
4. Utility structure abandonment.
5. Water main abandonment.
6. Water service line abandonment.
7. Backfill and compaction.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 - General Requirements shall govern all work under this Section.
2. MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 02 41 13 – Site Demolition.
4. Section 02 41 15 – Utility Removal.
5. Section 31 05 13 – Soils for Earthwork.
6. Section 31 05 16 – Aggregates for Earthwork.
7. Section 31 23 19 – Dewatering and Control of Water.
8. Section 31 23 33 – Trench Excavation, Backfill, and Compaction.
9. Section 31 25 00 – Erosion Control
10. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. Illinois Society of Professional Engineers (ISPE):

1. Standard Specifications for Water & Sewer Main Construction in Illinois, Current Edition.

B. State of Illinois Environmental Protection Agency (IEPA):

1. Illinois Pollution Control Board – Water Quality Standards; Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; Part 302 – Water Quality Standards.

C. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

1.3 SUBMITTALS AT COMPLETION OF WORK

- A. Section 01 70 00 –Closeout Requirements: Requirements for closeout submittals.
- B. Section 01 78 39 – Project Record Documents:
 1. Record horizontal and vertical depth locations of pipe runs, connections, and utility structures abandoned.
 2. Identify, indicate, and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 REGULATORY REQUIREMENTS

- A. Conform to following codes as applicable to abandonment Work of this Project:
 1. State of Illinois Environmental Protection Agency (IEPA):
 - a. Illinois Pollution Control Board – Water Quality Standards; Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board Standards.
- B. Contractor shall comply with local, State, and federal regulations applicable to Work of this Section.
- C. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- D. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS FOR UTILITY ABANDONMENT IN PLACE

- A. Reference Plans and Detailed Specifications for fill type scheduled to be used for abandonment of utility piping and structures.
- B. Cellular Concrete Fill (Pipe Interior):
 1. Blend of preformed foam with cement-sand grout slurry to produce a concrete having fresh weight per cubic foot of not less than 75 pounds.
 2. Cement-sand slurry shall be proportioned to contain 8 bags of Type 1A Portland cement or ASTM C595 blended hydraulic cement Type 1L, 1P, or 1S per cubic yard.
 3. Foam shall be Elastizell manufactured by Elastizell Corporation of America, Ann Arbor, MI., or an approved equal.
- C. Concrete Backfill (Trench):
 1. Proportioned with 2.25 bags Type IA Portland cement or ASTM C595 blended hydraulic cement Type 1L, 1P, or 1S.
 2. 6-cubic feet sand.

3. 12-cubic feet well graded aggregate with maximum size of 1-inch aggregate.

D. Bulkhead Concrete:

1. 3000 psi at 28 days.
2. 3/4-inch maximum aggregate size.
3. 4-inch maximum slump.
4. 423 pounds Portland Cement Type IA or ASTM C595 blended hydraulic cement Type 1L, 1P, or 1S per cubic yard.

E. Crushed Gravel: Free of friable material and debris; Type A2; as specified in Section 31 05 16 – Aggregates for Earthwork.

F. Site Excavated (Spoil) or Imported Material: Type S1 or S2 as specified in Section 31 05 13 – Soils for Earthwork;

1. Consisting of loam, clay, gravel, sands or mixtures, for use as non-structural fill, within non-paved and non-foundation areas of project.
2. Fill requires prior approval from the MWRD upon written request from Contractor.
3. Fill shall be free of pavement fragments larger than three (3) inches, bituminous or concrete materials, vegetable or organic matter, all types of refuse and frozen material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Maintain utility services until abandonment work is authorized by the MWRD and utility owner.
- B. Contact utility owner to identify and locate point of connection of utility lateral to site service line.
- C. Verify utility owner requirements for disconnection and abandonment of utility service at property line. Obtain necessary permits.
- D. Abandon existing site utility service lines and appurtenances as indicated on Drawings.
- E. Abandon utility structures including, but not limited to, manholes, cleanouts, inlets, catch basins, and similar appurtenances to depth indicated on Drawings, but not less than 2 feet below finished grade.

3.2 NOTIFICATION

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
- B. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior

to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.3 SANITARY AND STORM SEWER ABANDONMENT

- A. Locate and identify alignment of sanitary sewer and storm sewer lines on site and their connection to Public Utility at property line.
- B. Contractor shall uncover connection of utility at location indicated on drawings.
- C. Securely plug existing connection where sanitary sewer and storm sewer terminate in manhole or pipe to prevent entry of construction water and debris into municipal active system.
- D. Contractor shall be responsible to verify that plug(s) are in place at end of each workday.
- E. Contractor shall remove any water or debris from terminal manhole as required by the MWRD, but not less than once a week.
- F. Insert a Municipal Utility approved plug in end of utility lateral. Place a concrete bulkhead against end of plug and pipe.
- G. Procedure for abandonment of sanitary sewer and storm sewer site lines and appurtenances:
 - 1. Excavate, completely remove, and dispose of properly off site, existing manholes and similar appurtenances from site service lines.
 - 2. Fill completely, abandoned reaches of pipe lines, with cellular concrete as indicated on Drawings or Detailed Specifications.
 - 3. Plug both ends of each reach of pipe with a watertight concrete bulkhead.
 - 4. Backfill and compact excavations as specified.

3.4 STRUCTURE ABANDONMENT

- A. Structures shall include manholes, inlets, catch basins, and clean-outs.
- B. Maintain service in existing sewers until the MWRD orders bulkheads placed.
- C. Bulkhead and abandon existing sewers that are no longer in use.
- D. Remove abandoned manholes to 2 feet below finished grade unless otherwise indicated on the Plans.
- E. Break existing manhole bases to facilitate drainage of groundwater and fill remaining structure with compacted sand fill.
- F. Contractor shall salvage castings or abandoned portions of manhole structures and deliver to MWRD as directed by the MWRD Resident Engineer.

3.5 WATER MAIN ABANDONMENT

- A. Locate and identify alignment of water mains on site and valved connections to Public Utility System.
- B. Close valve and curb stop at property line and saw-cut water main at location indicated on the Plans.
- C. Verify that curb stops are tightly closed without any leaks.
- D. For Water Main pipe 12 inches and less, completely fill abandoned reaches of water main, with cellular concrete.
- E. Seal water main larger than 12 inches watertight, place concrete bulkhead, and abandon.

3.6 WATER SERVICE LINE ABANDONMENT

- A. Locate and identify alignment of water service lines on site and connection to Public Utility at property line.
- B. Uncover connection of utility at property line unless manhole or valve box exists.
- C. Close valve and curb stop at property line and saw cut water service line 12-inches beyond valve.
- D. Verify that valve and curb stop are tightly closed without any leaks.
- E. Insert a plug, approved by Municipal Utility, in end of utility lateral valve or curb stop. Place a concrete bulkhead against end of plug and pipe.

3.7 BACKFILL AND COMPACTION

- A. Place and compact backfill in accordance with Section 31 23 16 – Trench Excavation, Backfill, and Compaction.

3.8 FIELD QUALITY CONTROL

- A. Request inspection from MWRD Engineer prior to and during placing backfill in utility abandonment trenches.

END OF SECTION

SECTION 02 41 15

UTILITY REMOVAL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Materials for utility removal.
2. Notification for excavation.
3. Sanitary and storm sewer removal.
4. Manhole removal.
5. Water main removal.
6. Backfill and compaction.

B. Related Documents:

1. Applicable provisions of Volume 1 (Signature Book) shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 02 41 13 – Site Demolition.
4. Section 02 41 14 – Utility Abandonment.
5. Section 31 05 13 – Soils for Earthwork.
6. Section 31 05 16 – Aggregates for Earthwork.
7. Section 31 23 16 – Trench Excavation, Backfill, and Compaction.
8. Section 31 23 19 – Dewatering and Control of Water.
9. Section 31 25 00 – Erosion Control.
10. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, General Specifications – Sewers, or General Specifications – Landscape, this section shall prevail.

1.2 REFERENCES

A. Illinois Society of Professional Engineers (ISPE):

1. Standard Specifications for Water & Sewer Main Construction in Illinois, Current Edition.

B. State of Illinois Environmental Protection Agency (IEPA):

1. Illinois Pollution Control Board – Water Quality Standards; Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; Part 302 – Water Quality Standards.

C. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

1.3 SUBMITTALS AT COMPLETION OF WORK

- A. Section 01 70 00 – Closeout Requirements: Requirements for closeout submittals.
- B. Section 01 78 39 – Project Record Documents:
 - 1. Record horizontal and vertical depth locations of pipe and structures removed.
 - 2. Identify, indicate, and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 REGULATORY REQUIREMENTS

- A. Conform to following codes as applicable to removal Work of this Project:
 - 1. State of Illinois Environmental Protection Agency (IEPA):
 - a. Illinois Pollution Control Board – Water Quality Standards; Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board Standards.
- B. Contractor shall comply with local, state, and federal regulations applicable to Work of this Section.
- C. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- D. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 – PRODUCTS

2.1 MATERIALS FOR UTILITY REMOVAL

- A. Reference Drawings or Detailed Specifications for fill type scheduled to be used for removal of utility piping and structures.
- B. Crushed Gravel: Free of friable material and debris; Type A2; as specified in Section 31 05 16 – Aggregates for Earthwork.
- C. Site Excavated (Spoil) or Imported Material: Type S1 or S2 as specified in Section 31 05 13 – Soils for Earthwork:
 - 1. Consisting of loam, clay, gravel, sands or mixtures, for use as non-structural fill, within non-paved and non-foundation areas of project.
 - 2. Fill shall be free of pavement fragments larger than three (3) inches, bituminous or concrete materials, vegetable or organic matter, all types of refuse and frozen material.
- D. Sand Fill: Aggregate Type A11, as specified in Section 31 05 16 – Aggregates for Earthwork.
- E. Bulkhead Concrete:
 - 1. 3000 psi at 28 days.

2. 3/4-inch maximum aggregate size.
3. 4-inch slump.
4. 423 pounds Portland Cement Type IA per cubic yard.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Utility services shall be maintained until removal as authorized by the MWRD.
- B. Contact Municipal Utility to identify and locate point of connection of utility lateral to site service line.
- C. Verify Municipal Utility requirements for disconnection of utility service at property line. Obtain necessary permits.
- D. Existing site utility service lines shall be removed in their entirety as identified on Drawings.
- E. Utility structures including but not limited to manholes, cleanouts, inlet basins, and similar appurtenances shall be removed in their entirety including any concrete footings.

3.2 NOTIFICATION

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to, have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
- B. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.3 SANITARY AND STORM SEWER REMOVAL

- A. Locate and identify alignment of sanitary sewer and storm sewer utility mains and laterals on site and their connection to Public Utility as indicated on Drawings.
- B. Contractor shall uncover connection of utility at property line.
- C. Existing connections where sanitary sewer and storm sewer terminate in a manhole or pipe, shall be securely plugged to prevent entry of construction water and debris into municipal active system.
- D. Contractor shall be responsible to verify that plug(s) are in place at end of each

workday.

- E. Contractor shall remove any water or debris from terminal manhole as required by the MWRD, but not less than once a week.
- F. Remove a length of site pipe from joint at utility lateral at property line or at point in right of way required by Municipal Utility. Saw cut clean vertical joint in pipe if joint is not present at property line.
- G. Insert a Municipal Utility approved plug in end of utility lateral. Place a concrete bulkhead against end of plug and pipe.
- H. Procedure for removal of sanitary sewer and storm sewer site mains, laterals and appurtenances.
 - 1. Excavate, and dispose of properly off site, existing piping, manholes, and similar appurtenances.
 - 2. Stockpile approved excavated material for reuse on site. Haul and dispose of non-approved excavated material off site, unless directed otherwise by the MWRD.
 - 3. Backfill excavations to contours and elevations shown on Drawings. If no contours and elevations are shown on Drawings, backfill to existing grade.
 - 4. Backfill and compact excavations in accordance with Article 3.6 of this Section.

3.4 MANHOLE REMOVAL

- A. Service shall be maintained in existing sewers until the MWRD orders bulkheads placed.
- B. Bulkhead existing sewers that are no longer in use and scheduled for abandonment as indicated on Drawings.
- C. Remove manholes full depth including concrete base.
- D. Contractor shall salvage castings and portions of manhole structures and deliver to MWRD as directed by the MWRD Resident Engineer.

3.5 WATER MAIN REMOVAL

- A. Locate and identify alignment of water main and laterals on site and connection to Public Utility at property line.
- B. Uncover connection of utility at property line unless manhole or valve box exists.
- C. Close valve and curb stop at property line and sawcut water service line 12-inches beyond valve.
- D. Verify that valve and curb stop are tightly closed without any apparent leaks.
- E. Insert a plug approved by Municipal Utility in end of utility lateral valve or curb stop. Place a concrete bulkhead against end of plug and pipe.

3.6 BACKFILL AND COMPACTION

- A. Complete backfill and compaction operations in accordance with Section 31 23 15 – Excavation, Backfill, and Compaction for Buildings and Structures for manhole or other utility structure removal.
- B. Complete backfill and compaction operations in accordance with Section 31 23 16 – Trench Excavation, Backfill, and Compaction for sanitary, storm, or water line piping removal.
- C. Excavated Material to be used for backfill in unpaved areas shall be compacted to a density equal to adjacent undisturbed trench wall, or as indicated on the drawings.

3.7 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 40 00 – Quality Requirements.
- B. Request inspection prior to placing backfill.
- D. Perform density and moisture content testing in accordance with Section 31 23 15 – Excavation, Backfill, and Compaction for Buildings and Structures for manhole or other utility structure removal.
- C. Perform density and moisture content testing in accordance with Section 31 23 16 – Trench Excavation, Backfill, and Compaction for sanitary, storm, or water line piping removal.
- D. If tests indicate work does not meet specified requirements, remove Work, replace and retest at no cost to MWRD.

END OF SECTION

SECTION 02 61 13

REMOVAL AND DISPOSAL OF CONTAMINATED MATERIAL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal and off-site disposal of material known to be contaminated (hazardous waste or certified non-hazardous non-special/special waste).
2. Confirmation sampling and analysis following removal of contaminated material.
3. Temporary storage of contaminated material.
4. Removal and off-site disposal of material known to be contaminated by a spill or release of a hazardous substance.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.
2. Reports contained in Volume 3.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
3. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 02 22 00 – Removal and Disposal of Surplus Soil and Construction or Demolition Debris
4. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, and General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. ASTM INTERNATIONAL (ASTM):

1. ASTM D1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.)).
3. ASTM D2167 – Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2487 – Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D2922 – Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D422 – Particle-Size Analysis of Soils.
7. ASTM D5434 – Field Logging of Subsurface Explorations of Soil and Rock.

B. State of Illinois Environmental Protection Agency (IEPA)

1. Illinois Pollution Control Board – Waste Disposal; Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board

1.3 DEFINITIONS

- A. Contaminated Soil: Areas determined to contain contaminants of concern in exceedance of Maximum Allowable Concentrations (MACs). Confirmed areas of contaminated soil are shown as Clean Construction or Demolition Debris (CCDD) exclusion areas on Sheet C-010 of the Drawings.
- B. Uncontaminated Soil: Areas determined not to contain contaminants of concern in exceedance of Maximum Allowable Concentrations (MACs).
- C. Clean Construction or Demolition Debris (CCDD): Clean construction or demolition debris (CCDD) is uncontaminated broken concrete without protruding metal bars, bricks, rock, stone, or reclaimed asphalt pavement generated from construction or demolition activities. When uncontaminated soil is mixed with any of these materials, the uncontaminated soil is also considered CCDD. Uncontaminated soil that is not mixed with other CCDD materials is not CCDD.
- D. General Construction or Demolition Debris (GCDD): General construction or demolition debris is construction or demolition debris not meeting the definition of CCDD, and which may include non-hazardous, uncontaminated materials resulting from the construction, remodeling, repair, and demolition of utilities, structures, and roads, limited to the following: bricks, concrete, and other masonry materials; soil; rock; wood, including non-hazardous painted, treated, and coated wood and wood products; wall coverings; plaster; drywall; plumbing fixtures; non-asbestos insulation; asphalt roofing shingles and other roof coverings; reclaimed or other asphalt pavement; glass; plastics that are not sealed in a manner that conceals waste; electrical wiring and components containing no hazardous substances; and corrugated cardboard, piping or metals incidental to any of those materials.
- E. MWRDGC Environmental Representative: Includes the MWRDGC Resident Engineer or any authorized representative of MWRDGC for purposes of overseeing soil and waste management.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings: Surveys – Provide cross-sections of each contaminated soil removal area before and after excavation and after backfilling, if backfilling is required.
- C. Contaminated Soil Removal and Disposal Work Plan:
 - 1. Submit work plan within 30 calendar days after notice to proceed.
 - 2. No work at the site, with the exception of site inspections and surveys, shall be performed until the work plan is approved.
 - 3. Contractor shall allow 30 calendar days in the schedule for the MWRD Engineer's review.
 - 4. No adjustment for time or money will be made if re-submittals of the work plan are

required due to deficiencies in the plan.

5. At a minimum, the work plan shall include:
 - a. Schedule of activities.
 - b. Method of excavation and equipment to be used.
 - c. Shoring or side-wall slopes proposed.
 - d. Dewatering plan.
 - e. Storage methods and locations for liquid and solid contaminated material.
 - f. Haul routes.
 - g. Decontamination procedures.
 - h. Identification of disposal facility including address and contact information.
- D. Contaminated Soil Removal and Disposal Plan Progress Reports Submit concurrent with each Application for Payment. Include the following information:
 1. Quantity of contaminated soil disposed and facility disposal records
 2. Copy of all certifications required and generated for the facility disposals
- E. Contaminated Soil Removal and Disposal Final Report: Before request for substantial completion, submit a final report documenting cumulative totals of contaminated soil disposed at each facility utilized for this contract.
- F. Contractor's Site Specific Health and Safety Plan for all workers engaged in excavation, stockpiling, loading, hauling, removal, and disposal of any soils: submit in accordance with Section 02 22 00 – Removal and Disposal of Surplus Soil and Construction or Demolition Debris.

1.4 PROJECT CONDITIONS

- A. Approximate locations of known contaminated material are shown on the Drawings.
- B. Characterization data on the nature and extent of the known contaminated material is shown in the Environmental Assessment Report contained in Volume 3.
- C. Groundwater levels are indicated in Geotechnical Report contained in Volume 3.

1.5 REGULATORY REQUIREMENTS

- A. The Contractor shall comply with all applicable local, state and federal laws and regulations with regard to contaminated material removal, handling and disposal, and shall pay all assessed costs and fees.
- B. The Contractor shall comply with the Illinois Environmental Protection Act, as amended by Public Act 096-1416 that was signed in to law on July 30, 2010 and Public Act 097-0137 that was signed in to law on July 14, 2011.

PART 2 – PRODUCTS

2.1 BACKFILL MATERIAL

- A. Backfill material shall consist of material obtained on site, from areas outside of the CCDD

exclusion areas as indicated on the Drawings, subject to approval by MWRD.

2.2 SPILL RESPONSE MATERIALS

- A. Contractor shall provide appropriate spill response materials including, but not limited to the following:
 - 1. Shovels.
 - 2. Personal protective equipment.
 - 3. Spill response materials shall be available at all times when contaminated materials/wastes are being handled or transported.
 - 4. Spill response materials shall be compatible with the type of materials and contaminants being handled.

PART 3 – EXECUTION

3.1 SURVEYS

- A. Surveys shall be performed immediately prior to and after excavation of contaminated material to determine the volume of contaminated material removed.
- B. Surveys shall also be performed immediately after backfill of each excavation, if backfilling is required.
- C. Cross-sections shall be taken at 25-foot intervals and at break points for all excavated areas.
- D. Volume of contaminated material removed will be computed using the average end-area method.
- E. Locations of confirmation samples shall also be surveyed and shown on the drawings.

3.2 EXISTING STRUCTURES AND UTILITIES

- A. No excavation shall be performed until site utilities have been field located.
- B. Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities.
- C. Damage to existing structures and utilities resulting from the Contractor's operations shall be repaired at no additional cost to MWRD.
- D. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from the Engineer.

3.3 CONTAMINATED MATERIAL REMOVAL

- A. Excavation:
 - 1. Areas of contamination shall be excavated to the depth and extent shown on the drawings and not more than 0.2 feet beyond the depth and extent shown on the

drawings unless directed by the Engineer.

2. Excavation shall be performed in a manner that will limit spills and the potential for contaminated material to be mixed with uncontaminated material.
3. An excavation log describing visible signs of contamination encountered shall be maintained for each area of excavation.
4. Soil containing contaminants of concern above the Maximum Allowable Concentration standards for clean soil is, in most cases, not visibly different from clean soil. The MWRD shall be notified within 24 hours, and before excavation, if grossly contaminated material is discovered that has not been previously identified or if other discrepancies between data provided and actual field conditions are discovered.

B. Shoring:

1. If workers must enter the excavation, it shall be evaluated, shored, sloped or braced as required by EM 385-1-1 and 29 CFR 1926 Section 650.

C. Dewatering:

1. Surface water shall be diverted to prevent entry into the excavation.
2. Dewatering shall be limited to that necessary to assure adequate access, a safe excavation, prevent the spread of contamination, and to ensure that compaction requirements can be met.
3. No dewatering shall be performed without prior approval of MWRD.

3.4 CONFIRMATION SAMPLING AND ANALYSIS

- A. MWRD must be present to inspect the removal of contaminated material from each site.
- B. Excavation shall be limited to the horizontal and vertical extents indicated on the drawings and approved by MWRD.
- C. Excavation of additional material shall be as directed by MWRD.
- D. No additional sampling shall be conducted without the approval of the Engineer and without the Engineer, or their designated representative, being present to observe the sample collection.
- E. Locations of samples shall be marked in the field and documented on the as-built drawings by the Contractor.

3.5 CONTAMINATED MATERIAL STORAGE

- A. Material requiring off-site disposal as contaminated materials shall be loaded directly into trucks and transported to the disposal facility.
- B. If temporary stockpiling of material becomes necessary, it shall be performed in accordance with Part 3.5.C below.
- C. Stockpiles:
 1. Stockpiles shall be constructed to isolate stored contaminated material from the environment.

2. Maximum stockpile size shall be based on site access considerations and shall be approved by the Engineer.
3. Stockpiles shall be constructed to include:
 - a. A chemically resistant plastic liner (geomembrane) free of holes and other damage with a minimum thickness of 5 mils to be placed as a liner beneath the stockpiles and to be used as a cover over the stockpiles.
 - b. Ground surface on which the waterproof plastic liner is to be placed shall be free of rocks greater than 0.5 inch in diameter and any other object which could damage the liner.
 - c. Waterproof geomembrane cover shall be free of holes or other damage to prevent precipitation from entering the stockpile.
 - d. Cover material shall be extended over berms and anchored or ballasted to prevent it from being removed or damaged by wind.
4. If additional analytical data is needed for disposal profiling of soil, samples of stored material designated for off-site disposal shall be performed by MWRD.

3.6 BACKFILLING AND COMPACTION

A. Backfilling:

1. MWRD approval required prior to placement of backfill.
2. Excavations shall be backfilled immediately after all contaminated materials have been removed and approval from MWRD to proceed with backfilling operations has been obtained.
3. Backfill shall be placed and compacted to the lines and grades shown on Drawings.

B. Compaction:

1. Approved backfill shall be placed in lifts with a maximum loose thickness of 8 inches.
2. Soil shall be compacted to densities specified in project specifications for various areas or structural features.

3.7 SPILLS

- A. In the event of a spill or release of a hazardous substance as designated in 40 CFR 302, pollutant, contaminant, or oil as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq., the Contractor shall notify the MWRD immediately.
- B. If spill exceeds the reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting and containment.
- C. Immediate containment actions shall be taken to minimize the effect of any spill or leak.
- D. Cleanup shall be in accordance with applicable federal, state, and local regulations.
- E. As directed by the MWRD, additional sampling and testing shall be performed to verify spills have been cleaned up.
- F. For spills resulting from Contractor negligence, the cleanup, sampling, and testing shall be completed promptly and at no additional cost to the MWRD. In any other situation, the Contractor is expected to promptly clean up the spill and seek cost accommodations under

the terms of the contract.

3.8 COMMINGLING OF MATERIALS

- A. Contaminated Soil shall not be commingled with Uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. General Construction or Demolition Debris shall not be comingled with Uncontaminated Soil or CCDD during on-site storage, transportation and off-site disposal. Any avoidable, additional cost resulting from or associated with commingling of materials shall be considered Contractor's expense.

3.9 DISPOSAL REQUIREMENTS

- A. Offsite disposal of contaminated material shall be in accordance with local, state or federal regulations and in accordance with the approved Waste Disposal Plan.
- B. Contractor to provide tickets for disposal as proof on a daily basis.
- C. Contractor to provide daily and cumulative totals to the MWRD Engineer of the number of trucks, the quantity (measured both in tons and in cubic yards) loaded on to the trucks for off-site disposal.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood form materials.
2. Pre-fabricated forms.
3. Formwork accessories.
4. Formwork-General.
5. Formwork requirements.
6. Formwork types.
7. Form ties and rods.
8. Installation – Inserts, embedded parts and openings.
9. Formwork alignment.
10. Application – Form release agent.
11. Temporary openings and ports.
12. Form cleaning.
13. Form removal.
14. Erection tolerances.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern all work under this Section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. MWRD General and Detailed Technical Specifications utilized for this project.

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and
2. Materials.
3. ACI 301 - Specifications for Structural Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete.
5. ACI 347 - Guide to Formwork for Concrete.

B. American Wood Council (AWC):

1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association (EWA):

1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

- D. American Society of Mechanical Engineers (ASME):
 - 1. ASME A17.1 - Safety Code for Elevators and Escalators.
- E. ASTM International (ASTM):
 - 1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
 - 2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- F. West Coast Lumber Inspection Bureau (WCLIB):
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Contractor shall submit intended design of steel and wood forms to MWRDGC for approval, prior to commencing concrete work.
- C. Shop Drawings: Signed and sealed by Structural Engineer licensed in the State of Illinois.
 - 1. Submit formwork, shoring, and re-shoring shop drawings.
 - 2. Indicate the following:
 - a. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
 - b. Means of leakage prevention for concrete exposed to view in finished construction.
 - c. Sequence and timing of erection and stripping assumed compressive strength at time of stripping, height of lift and height of drop during placement.
 - d. Vertical, horizontal and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, when applicable.
 - e. Notes to formwork erector showing size and location of conduits and piping embedded in concrete in accordance with ACI 318, Section 6.3.
 - f. Procedure and schedule for removal of shores and installation and removal of re-shores.
- D. Product Data: Submit data on void form materials and installation requirements.
- E. Design Data: Design data provided by Contractor shall be sealed and signed by a Structural Engineer licensed in the State of Illinois.
 - 1. Indicate design data for formwork, shoring and re-shores.
 - 2. Indicate loads transferred to structure during process of concreting, shoring and reshoring.

3. Include structural calculations to support design.
- F. Before approval of designed formwork, MWRD may direct Contractor to erect a section of proposed steel forms either in the facility where forms are fabricated or on project site for inspection.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 318 and ACI 347.
- B. For wood products furnished for work of this Section, comply with AF&PA.

1.6 QUALIFICATIONS

- A. Design formwork under direct supervision of Structural Engineer experienced in design of this Work and licensed in State of Illinois.

1.7 MOCK-UP REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Requirements for mockups.
- B. Construct mockup, as required by MWRD, including formwork, form liners and form accessories.
- C. Locate where directed by MWRD.
- D. Incorporate accepted mockup as part of Work.
- E. Remove unacceptable mockup when directed by MWRD.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product delivery, storage, and handling requirements.
- B. Deliver void forms and installation instructions in manufacturer's packaging.
- C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.9 COORDINATION

- A. Section 01 13 10 – Coordination and Meetings: Coordination of work for this Section.
- B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 – PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Softwood Plywood: APA/EWA PS 1, C Grade, Group 2.
- B. Lumber Forms:
 - 1. Application: Use for edge forms and unexposed finish concrete.
 - 2. Boards: 6 inches or 8 inches in width, shiplapped or tongue and groove, “Standard” Grade Douglas Fir, conforming to WCLIB Standard Grading Rules for West Coast Lumber. Surface boards on four sides.
- C. Plywood Forms:
 - 1. Application: Use for exposed finish concrete.
 - 2. Forms: Conform to PS 1; full size 4 foot x 8 foot panels; each panel labeled with grade trademark of APA/EWA.
 - 3. Plywood for Surfaces to Receive Membrane Waterproofing: Minimum of 5/8 inch thick; APA/EWA “B-B Plyform Structural I Exterior” grade.
 - 4. Plywood where “Smooth Finish” is required, as indicated on Drawings: APA/EWA “HD Overlay Plyform Structural I Exterior” grade, minimum of 3/4 inch thick.

2.2 PRE-FABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- C. Pan Type: Steel or glass fiber of size and profile required.
- D. Tubular Column Type: Round, spirally wound laminated fiber or glass fiber material, surface treated with release agent, non-reusable, sizes as indicated on Drawings.
- E. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; thickness required to retain fresh concrete in correct position.
- F. Steel Forms: Sheet steel, suitably reinforced, and designed for particular use indicated on Drawings.
- G. Form Liners: Smooth, durable, grainless and non-staining hardboard, unless otherwise indicated on Drawings.
- H. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, minimum one (1) inch back break dimension, free of defects capable of leaving holes larger than 1-1/4 inch in concrete surface.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within one (1) inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:
 - 1. Do not use anchors and hangers exposed concrete leaving exposed metal at concrete surface.
 - 2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
 - 3. Penetration of structural steel members is not permitted.
- D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- E. Corners: Chamfered, rigid plastic or wood strip type; maximum possible lengths. All corners of concrete members shall chamfered at a minimum of a 3/4-inch.
- F. Bituminous Joint Filler: ASTM D1751.
- G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.
- H. Waterstops: As specified in Section 03 30 00 – Cast-in-Place Concrete.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Section 01 13 10 – Coordination and Meetings: Coordination and project conditions.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

3.2 FORMWORK – GENERAL

- A. Formwork shall be designed and constructed to fit the requirements of the particular type of work for which formwork is intended.
- B. Formwork design and construction, as well as formwork use and reuse shall be subject to the approval of MWRD at all times.
- C. Forms shall not be disturbed until concrete has adequately hardened and has developed sufficient strength, as determined by test cylinders made of same concrete.

- D. Test cylinders shall be cured under approximately the same conditions of temperature and moisture of placed concrete as specified in Section 03 30 00 – Cast-in-Place Concrete.
- E. Concrete not subject to appreciable bending or direct stress, not dependent on forms for vertical support, not liable to injury from forms for vertical support, not liable to injury from form removal operations or other construction activities shall have a minimum compressive strength of 500 PSI prior to form removal.
- F. Concrete subject to appreciable bending or direct stress and partially dependent on forms for vertical support shall have a minimum compressive strength of 1,000 PSI when subject to dead loads only and 2,000 PSI when subject to dead and live loads prior to form removal.
- G. Structural strength classifications shall in all cases be as determined by MWRD.
- H. The above statement related to test cylinders is not intended to imply that test cylinders be cast with every pour of concrete.
- I. However, a sufficient number of test cylinders shall be made and tested to adequately represent the range of concrete quality under curing conditions prevailing for the work.
- J. Contractor shall be fully responsible for concrete at all times, and any damage to the work, including any caused by early removal of formwork, shall be repaired or replaced by the Contractor, to the satisfaction of MWRD without any cost to MWRD.
- K. Structural members subject to additional loads during construction shall be adequately shored to support both the members and construction loads in such a manner as to protect structural members from damage by imposed loads.
- L. Shoring shall not be removed until structural member has acquired sufficient strength to safely support its weight and any imposed load.

3.3 FORMWORK REQUIREMENTS

- A. Contractor shall provide suitable forms of either steel, plywood or lumber or other material approved by MWRD, which shall conform to the shapes, lines, and dimensions of the concrete design intent as indicated on Drawings.
- B. Contractor shall provide the desired quality of surface finish to formed concrete work as specified in Section 03 30 00 – Cast-in-Place Concrete.
- C. Formwork for monolithic concrete sewers and tunnel lining shall be made of steel.
- D. Steel forms shall be neatly and accurately made with similar parts in each longitudinal section of form interchangeable with other sections.
- E. Bent plates required to fit into formwork shall be rolled and fabricated to their intended shape prior to assembling formwork sections.

- F. Steel forms shall be provided with inspection holes, sized and located as approved by MWRD.
- G. Lumber used in formwork for exposed surfaces shall be prepared to a smooth uniform thickness and width.
- H. Lumber formwork shall be free from loose knots or other surface defects. Joints in forms shall be horizontal or vertical.
- I. Lumber previously used for formwork shall be free from warps and defects, shall have nails or screws completely withdrawn prior to reuse.
- J. Lumber surfaces to be in contact with concrete shall be smooth and thoroughly cleaned.
- K. No lumber, whole or sections, shall be allowed to remain in finished concrete.
- L. Forms shall be substantial, unyielding, and sufficiently tight to prevent leakage of cementitious mortar.
- M. Forms shall be braced and tied together to maintain position and shape while concrete is being poured.
- N. If adequate bracing foundation for shores cannot be secured, trussed supports shall be provided.
- O. Form tie holes shall be patched if not used to prevent leakage of concrete.

3.4 FORMWORK TYPES

A. Earth Forms:

1. Earth forms may not be permitted for specific projects, verify with MWRD prior to commencement of construction activities.
2. Trench earth forms neatly, accurately, and at least two (2) inches wider than footing widths indicated on Drawings.
3. Trim sides and bottom of earth forms.
4. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
5. Form sides of footings where earth sloughs.
6. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.

B. Forms for Smooth Finish Concrete:

1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.

6. Use care in forming and stripping wood forms to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- C. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- D. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
 2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
 3. Construct beam soffits of material minimum of two (2) inches thick.
 4. Distribute bracing loads over base area on which bracing is erected.
 5. When placed on ground, protect against undermining, settlement or accidental impact.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 and ACI 318.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Obtain MWRD's approval before framing openings in structural members not indicated on Drawings.
- H. Install fillet and chamfer strips on external corners of beams, joists and columns as indicated on Drawings.
- I. Install void forms in accordance with manufacturer's recommendations.
- J. Do not reuse wood formwork more than two (2) times for concrete surfaces to be exposed to view. Do not patch formwork.

3.5 FORM TIES AND RODS

- A. Bolts and rods shall be used for internal ties, designed and placed so that when the formwork is removed no metal parts shall be within one (1) inch of finished concrete surface.
- B. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 2. Place ties at least one (1) inch away from finished surface of concrete.
 3. Leave inner rods in concrete when forms are stripped.
 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise indicated on Drawings.
- C. Holes left by form ties shall be filled with patching mortar as specified in Section 03 3000 – Cast-in-Place Concrete.

- D. Wire or band ties shall not be permitted, except where their use is approved by MWRD.
- E. Wire or band ties shall be chipped back, after removal of formwork, to not less than one (1) inch from finished concrete surface and tie holes are filled with patching mortar as specified in Section 03 30 00 – Cast-in-Place Concrete.
- F. Wooden spreaders shall not be used.

3.6 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- F. Construction Joints:
 - 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
 - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
 - 4. Arrange joints in continuous line straight, true and sharp.
- G. Embedded Items:
 - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 - 2. Do not embed wood or uncoated aluminum in concrete.
 - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
 - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.
- H. Openings for Items Passing Through Concrete:
 - 1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - 2. Coordinate work to avoid cutting and patching of concrete after placement.

3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

I. Screeds:

1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

J. Screenshot Supports:

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not permitted.

3.7 FORMWORK ALIGNMENT

A. Formwork shall be set to line and grade and constructed, fastened, and braced to produce and maintain true horizontal and vertical alignment.

B. If necessary, measuring devices or reference lines shall be provided by the Contractor.

C. Any bulging of finished concrete surface or distortion from true alignment shall be corrected by Contractor as MWRD shall direct without additional cost to MWRD.

D. Lines, grades and dimensions of finished concrete work shall be within the tolerances provided in ACI Standard "Recommended Practice for Concrete Formwork" (ACI 347), except as specified below.

1. Tolerances for concrete tunnel lining and cast-in-place conduits:

- a. Departure from established alignment or from established grade at major connecting structures and existing facilities: 1/2 inches.
- b. Departure from established grade: 2 inches.
- c. Departure from established alignment: 0.3 inches.
- d. Variation from minimum thickness at any point: None
- e. Variation from inside dimensions: 1/2 of 1 percent

E. After departure from established alignment and grade, the return shall be at a rate not greater than 3 inches for each 100 feet of tunnel or cast-in-place sewer.

F. Finished surface of topping concrete for bottoms of settling tanks shall not vary more than 1/4-inch from the theoretical surface for circular tanks and not more than 1/8-inch for rectangular tanks.

G. Suitable moldings or bevels shall be placed in the angles of forms to round or bevel corners or edges of the concrete, unless otherwise indicated on Drawings or directed by MWRD.

- H. Form surfaces in contact with exposed concrete surfaces shall be smooth and free from any imperfections which would cause objectionable roughness on finished surface of concrete.
- I. Forms shall be thoroughly cleaned and repaired before reusing.

3.8 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Before each concrete pour, inside surface of formwork shall be coated with paraffin, non-staining mineral oil, or other approved material, or thoroughly saturated with water, except in freezing weather conditions.
- C. When greasy or oily material is used as form release agent, material shall be applied in such a way to avoid contact with reinforcement steel or other embedded components required to bond with concrete.
- D. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coatings that are affected by agent.
- E. For surfaces scheduled for special finishes or applied coatings, soak inside surfaces of untreated forms with clean water. Keep surfaces saturated prior to placement of concrete.
- F. Reuse and Coating of Forms:
 - 1. Thoroughly clean forms and re-apply form coating before each reuse.
 - 2. For exposed work, do not reuse forms with damaged faces or edges.
 - 3. Apply form coating to forms in accordance with manufacturer's specifications.
 - 4. Do not coat forms for concrete indicated to receive "scored finish".
 - 5. Apply form coatings before placing reinforcing steel.

3.9 TEMPORARY OPENINGS AND PORTS

- A. Temporary openings shall be provided in formwork to facilitate cleaning and inspection prior to placing of concrete.
- B. Locate openings at bottom of forms to allow flushing water to drain prior to placing concrete.
- C. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- D. Temporary openings or portholes in wall and column forms may be used to limit the free-fall of the concrete to less than four (4) feet, and shall be located to facilitate placing and consolidation of fresh concrete.
- E. Port holes shall be spaced no more than six (6) feet to eight (8) feet apart to limit horizontal flow of concrete and to avoid segregation.

3.10 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. Cold Weather Form Cleaning:
 - 1. During cold weather, remove ice and snow from within forms.
 - 2. Do not use de-icing salts.
 - 3. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure.
 - 4. Use compressed air or other means to remove foreign matter.

3.11 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by MWRD.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.12 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301 and ACI 318.
- B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.
- C. Camber slabs and beams 1/4 inch for every 10 feet in accordance with ACI 301 and ACI 318.

3.13 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Section 01 17 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

- C. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- D. Notify MWRD after placement of reinforcing steel in forms, but prior to placing concrete.
- E. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Notification of concrete pours.
2. MWRD concrete mix classes.
3. Concrete mixtures.
4. Concrete slump requirements.
5. Cement requirements.
6. Fly ash requirements.
7. Water requirements.
8. Admixtures.
9. Fine and coarse aggregates.
10. Waterstops.
11. Concrete mixing.
12. Placing concrete.
13. Pumping and conveying equipment.
14. Consolidating concrete.
15. Formwork and reinforcement inspections.
16. Sewer and tunnel concrete requirements.
17. Construction joints.
18. Components placed in concrete.
19. Surface finishing – general.
21. Surface finishing – walls, walkways, channels and inverts.
23. Surface finishing – stairs.
24. Surface finishing – roadways.
25. Curing requirements.
26. Concrete compression test cylinders.
27. Defective work and patching.
28. Damaged work.
29. Cold weather concreting.
30. Hot weather concreting.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern all work under this Section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section

shall prevail.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T26 – Quality of Water to Be Used in Concrete.

- B. American Concrete Institute (ACI):
 - 1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 – Specifications for Structural Concrete.
 - 3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
 - 4. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - 5. ACI 304.2R – Placing Concrete by Pumping Methods.
 - 6. ACI 305R – Hot Weather Concreting.
 - 7. ACI 306.1 – Specification for Cold Weather Concreting.
 - 8. ACI 308.1 – Specification for Curing Concrete.
 - 9. ACI 309R – Guide for the Consolidation of Concrete.
 - 10. ACI 315 – Details and Detailing of Concrete Reinforcement.
 - 11. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
 - 12. ACI SP-66 – ACI Detailing Manual.

- C. ASTM International (ASTM):
 - 1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33 – Standard Specification for Concrete Aggregates.
 - 3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
 - 5. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - 6. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 7. ASTM C150 – Standard Specification for Portland Cement.
 - 8. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
 - 9. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
 - 10. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 11. ASTM C260 – Standard Specification for Air Entraining Admixtures for Concrete.
 - 12. ASTM C309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
 - 13. ASTM C311 – Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete.
 - 14. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
 - 15. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.
 - 16. ASTM D297 – Standard Test Methods for Rubber Products Chemical Analysis.
 - 17. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
 - 18. ASTM D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.

19. ASTM D747 – Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
20. ASTM D2240 – Standard Test Method for Rubber Property—Durometer Hardness.

D. U.S. Army Corps of Engineers (COE):

1. COE CRD-C513 – Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops.
2. COE CRD-C572 – Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstops.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.

B. Submit proposed mix design of each class of concrete not later than ten (10) days after Notice to Proceed or fifteen (15) days prior to the first concrete placement, whichever comes first.

C. Shop drawings shall be prepared under supervision of a Structural Engineer registered in the State of Illinois and shall bear seal and signature of supervising design engineer.

D. Submit shop drawings of reinforcing steel under provisions of Section 01 33 00 – Submittal Procedures.

1. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
2. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, and wire reinforcement, bending and cutting schedules, splicing, supporting and spacing devices.
3. Reinforcement placement shop drawings for foundations and walls shall conform to ACI SP-66 providing full wall elevations.

E. Material Certificates: Provide for each of the following materials and signed by material manufacturers:

1. Cementitious materials and admixtures.
2. Waterstops.
3. Curing compounds.
4. Bonding agents.
5. Vapor retarders.

F. Material Test Reports: Provide for the following material, from a qualified testing agency, indicating compliance with project concreting requirements:

1. Aggregates.

1.4 QUALITY ASSURANCE

A. Contractor is responsible to provide a “Quality Control Field Laboratory” at each concrete materials yard or concrete batching plant.

B. Quality control field laboratory must be heated, air conditioned, lighted and reasonably

free from noise.

C. Water and sanitary facilities shall be provided.

D. Quality control field laboratory shall be equipped with the following items:

1. Telephone, desk and chair.
2. Complete set of 8-inch sieves for fine aggregate, sizes 3/8-inch to No. 200.
3. Motorized shaker for fine aggregate sieves.
4. Complete set of large sieves for coarse aggregate, sized 1-1/2 inches to No. 4.
5. Motorized shaker for large sieves.
6. Triple beam balance, 200 gm capacity.
7. Sample Splitter.
8. Hot plate.
9. Platform scale, 100 lb capacity.
10. ASTM C143 slump cone, base and rod.
11. Long nose shovel and cleaning brush.
12. Assorted pans and pails.
13. ASTM C231 Air Meter.

E. Contractor shall provide experienced quality control personnel, who are subject to the approval of the MWRD, at materials yard, ready mix plant or batch plant.

1.5 NOTIFICATION OF CONCRETE POURS

A. Contractor shall notify MWRD Project Control office by 12 Noon of the day preceding Saturday or holiday concrete pours and by 3:00 P.M. of the day preceding all other concrete pours.

B. MWRD Project Control office must be notified immediately of all concrete pour cancellations or other changes in concrete pour schedules.

PART 2 – PRODUCTS

2.1 MWRD CONCRETE MIX CLASSES

A. The following nine (9) classes of concrete shall be used in construction of sewage treatment plant structures, sewers, pavements, bridges, tunnels and miscellaneous structures:

1. Class RA - Dense, watertight, durable concrete for structures in contact with sewage, sewage gas or vapor with the addition of an ASTM C494, MWRD approved water reducing admixture.
2. Class RAP - Similar to Class RA except modified for placement by pumping.
3. Class PA - Dense, watertight, durable concrete for use where specified for pavement, walkways and architectural concrete work not in contact with sewage or sewage gas and when a uniform appearance (color) is desired with the addition of an ASTM C494 MWRD approved water reducing admixture.
4. Class S - To be used where a high strength concrete is required.
5. Class TA - Concrete with reduced size aggregate for use where specified for topping or other special types of concrete work with the addition of an ASTM C494 MWRD

- approved water reducing admixture.
6. Class GB - Non-structural grout.
 7. Class GS - Structural grout.
 8. Class GSA - Similar to Class GS except with the addition of an ASTM C494 MWRD approved water reducing admixture.
 9. Class F - Concrete used as fill concrete and mud coat where specified.
- B. Class of concrete to be used for any particular location shall be as identified on Drawings or specified in Supplemental Technical Specifications.
- C. When classes of concrete are not specified, concrete shall be Class RA.

2.2 CONCRETE MIXTURES

- A. Contractor shall use proportions or weights of ingredients specified in Table 1 for each given class of concrete used.
- B. If for a special purpose, Contractor proposes to use a concrete mix different than designs listed in Table 1, they must submit proposed mix design for approval.
- C. Contractor shall make trial batches and have necessary tests performed as directed by the MWRD at no cost to MWRD.
- D. Testing shall be repeated as required until proposed mix is approved by the MWRD.
- E. Concrete mixes shall, at all times, be subject to modification by the MWRD on basis of the character of work in which concrete mix is to be used, variation in aggregates, subsequent tests, and inspection of concrete work performed.
- F. Where mix designs necessitate increased water requirements to accommodate higher slumps, increased percent of sand or special aggregates, cement contents shall be increased proportionately for any increase in water.
- G. For concrete of a given class, the cementitious materials and fine and coarse aggregate shall be so proportioned and mixed as to produce homogeneous concrete of such consistency that it may be readily placed under conditions of use, completely filling formwork or spaces into which concrete is placed, without voids and without separation of concrete mix ingredients.
- H. Ingredients of concrete shall be weighed and not measured by bulk, except that full bags of Portland cement, weighing 94 pounds per bag, and full bags of fly ash of proper weight to produce concrete blend specified in Table 1 may be taken into batch without further weighing.

TABLE 1-CONCRETE MIX DESIGNS

Class of Concrete	Class "F"		Class "GB"		Class "GS"		Class "GSA"		Class "PA"	
	Gravel	Crushed Stone	Limestone Screenings	Sand	Sand	Sand	Sand	Sand	Gravel	Crushed Stone
Top Size of Aggregate (in.)	1	1	-	-	-	-	-	-	1	1
Cement Sacks/cu. Yd.	2.55	2.87	4.50	4.50	12.0	11.1	11.0	10.2	6.5	6.5
Cement lbs./cu. yd.	240	270	423	423	1128	1045	1034	959	611	611
Fly ash lbs./cu. yd.	40	45	100	100	-	125	-	125	-	-
Coarse Agg. lbs./cu. yd.	1900	1780	2750	-	-	-	-	-	1900	1750
Fine Agg. lbs./cu. Yd.	1500	1520	-	2700	2020	1955	2020	1955	1150	1290
Water lbs./cu. yd. max.	260	260	487	487	508	526	465	488	257	257
Air Entrainment Percent of Volume	4 to 6	4 to 6	+	+	8 to 10	8 to 10	8 to 10	8 to 10	4 to 6	4 to 6
Water Reducing	-	-	*	*	-	-	*		*	*
Admixture oz./sack										
Crushing Strength psi Minimum	7 Days	-	-	-	2800					
	28 Days	1200	1500	4000	4000					

Class of Concrete		Class "RA"		Class "RAP"		Class "S"		Class "TA"
Type of Aggregate		Gravel	Crushed Stone	Gravel	Crushed Stone	Gravel	Crushed Stone	Gravel
Top Size of Aggregate		1"	1"	1"	1"	1"	1"	3/8"
Cement Sacks/cu. Yd.		5.75	5.75	6.28	6.28	7.5	7.5	7.0
Cement lbs./cu. yd.		540	540	590	590	705	705	658
Fly ash lbs./cu. yd.		100	100	100	100	100	100	100
Coarse Agg. lbs./cu. yd.		1900	1800	1750	1650	1955	1780	1260
Fine Agg. lbs./cu. Yd.		1200	1250	1310	1360	1190	1215	1350
Water lbs./cu. yd. max.		269	269	290	290	338	338	325
Air Entr. % of Vol.		4 to 6	4 to 6	4 to 6	4 to 6	+	+	6.5 to 8.5
Water Reducing Admixture oz./sack		*	*	*	*	*	*	*
Crushing Strength psi Minimum	7 Days	2800				4200		2800
	28 Days	4000				6000		4000

Notes: (*) - Varies with product used
 (+) - Residual air only; add no air entraining admixture

2.3 CONCRETE SLUMP REQUIREMENTS

A. Slump of concrete utilized shall be as directed by the MWRDGC, however, in no case shall slump of concrete exceed five inches (5") at point of placement if specified time limits and water content in Table 1 are not exceeded.

B. Typical slump ranges for various types of construction are shown in Table 2.

TABLE 2-SLUMP LIMITS

Types of Construction	Slumps, Inches	
	Max.	Min.
Reinforced foundation walls and footings	4	2
Unreinforced footings, caissons and substructure walls	3	1
Reinforced slabs, beams walls and columns	4	2
Pavements	4	2
Sidewalks, driveways and slabs on ground	4	2
Heavy mass construction	2	1
Concrete conveyed pneumatically or by pumping	5	3
Tunnel Lining and Sewers	4	2

2.4 CEMENT REQUIREMENTS

- A. Cement shall be ASTM C150, Type 1 Portland cement unless otherwise specified in the Supplemental Specifications or approved by the MWRD.
- B. ASTM C595 blended hydraulic cement Type 1L, 1P, or 1S may be used in replacement of ASTM C150 Type 1 Portland cement.

2.5 FLY ASH REQUIREMENTS

- A. Fly Ash shall conform to ASTM C618, Types C, F or N except that carbon content shall not be more than three (3) percent by weight and loss on ignition shall not be more than six (6) percent by weight.
- B. Fly Ash shall be sampled in accordance with ASTM C311.

2.6 WATER REQUIREMENTS

- A. Water used with cement in concrete, mortar, and water used for curing concrete, shall be clean, clear, free from sugar, and shall not contain acid, alkali, salts or organic matter in excess of the following amounts when tested in accordance with AASHTO T 26:
 - 1. Acidity and Alkalinity
 - 2. Acidity-0.1 Normal NaOH 2 ml. Maximum
 - 3. Alkalinity-0.1 Normal HCl 10 ml. Maximum
 - * To neutralize 200 ml. sample.
 - a. Total Solids

- 1) Organic - 0.02 percent maximum.
 - 2) Inorganic - 0.30 percent maximum.
 - 3) Sulphuric anhydride (SO₃) - 0.04 percent maximum.
 - 4) Alkali chloride as sodium chloride (NaCl) 0.10 percent maximum.
- B. When standard 1:3 mortar briquettes made with cement, sand and water from the sample are compared with briquettes made with the same cement and sand and distilled water, there shall be no indication of unsoundness, marked change in time of set, or variation of more than 10 percent in strength.
- C. Water which has been approved by the Illinois Department of Public Health for drinking or ordinary household use may be accepted without being tested. All other water sources shall be approved by the MWRD.
- D. Contractor shall not use water from shallow, muddy, or marshy surfaces.
- E. Intake of pipe line shall be enclosed to exclude silt, mud, grass, and other solid materials, and there shall be a minimum depth of two feet (2') of water below intake at all times.

2.7 ADMIXTURES

- A. Admixtures shall be dispensed volumetrically at concrete batch plant.
- B. When requested by the MWRD, Contractor shall furnish the services of a manufacturer's qualified field representative to assure proper use of specified admixture.
- C. Maximum water soluble chloride content of admixture shall be such that, when added to concrete, total water soluble chloride content shall not exceed 0.1 percent by weight of cement.
- D. Air-entraining admixtures shall be approved by MWRD and conform to ASTM C260.
- E. Amount of air-entraining admixture used shall be adjusted to accommodate whatever variation there may be in the character of concrete to provide required air content.
- F. Chemical admixtures added for the purposes of water reduction, acceleration, retardation or combinations of, shall conform to ASTM C494.
- G. Contractor shall submit, when requested by the MWRD, appropriate tests, such as infrared spectrophotometry, pH value and solids content, for establishing the equivalence of the materials to materials which have passed MWRD's Admixture Test Program.
- H. Water-reducing admixture shall be used as determined by manufacturer's recommended quantities for each hundred pounds of weight of Type 1 cement.
- I. No ASTM C494 Type admixture shall be allowed unless it has successfully completed MWRD's Concrete Admixture Test Program and has been accepted for use by MWRD.
- J. Amount of water-reducing admixture and quantities of other ingredients for each cubic

yard of concrete are indicated in Table 1, Class of Concrete-Class RA, GB, RAP, S, PA and TA.

- K. No other admixture shall be allowed unless otherwise provided for in the Supplemental Technical Specifications or approved by the MWRD.

2.8 FINE AND COURSE AGGREGATES

- A. Aggregates shall conform to ASTM C33, except that gradations shown in Table 3 shall apply as follows:

TABLE 3

SAND

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	94-100
No. 16	45- 85
No. 50	10-30
No. 100	0-5

3/8-INCH COARSE AGGREGATE

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2-inch	100
3/8-inch	85-100
No. 4	10- 30
No. 8	0-10
No.16	0-5

1-INCH COARSE AGGREGATE

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2-inch	100
1-inch	90-100
1/2-inch	30- 60
No. 4	0-10

- B. Fine aggregate shall consist of washed sand.
- C. Stone sand will be permitted for Portland cement concrete provided it is blended with natural sand in proportions satisfactory to the MWRD.
- D. In no case shall stone sand exceed 60 percent by weight of total sand.

- E. Coarse aggregate shall be natural crushed stone or crushed gravel. No blast furnace slag shall be used.
- F. Aggregates shall be chemically compatible with each other and with other components of concrete mix.
- G. Chert, limonite and shale in aggregates shall not exceed two (2) percent by weight.
- H. Deleterious chert shall be defined as the light-weight fraction separated in a 2.35 specific gravity heavy media separation.
- I. Aggregate shall have no more than 0.2 percent of other deleterious materials or substances whose disintegrating is accomplished by an increase in volume which may cause spalling of concrete surfaces.
- J. If visual inspection indicates that quality of any load or run of aggregate is outside limits of the specifications, the MWRDGC may suspend use of that load or run of material until laboratory tests verify aggregate quality as acceptable or unacceptable.

2.9 WATERSTOPS

- A. When waterstops are required, they shall be extruded from a thermoplastic compound, the basic resin of which shall be polyvinylchloride (PVC), and any additional ingredient materials required to provide a satisfactory waterstop.
- B. Cross section of waterstop shall be such as to insure anchorage into concrete by means of enlarged ends or fins.
- C. Intersections of waterstop consisting of Vertical-L, Vertical-T, and Horizontal-T shall be performed in the factory by waterstop manufacturer.
- D. Only fusion welded butt-joint splices shall be permitted between preformed intersections and straight runs of waterstop.
- E. Waterstops shall be provided with tie holes along inside of edge ribs for tying the waterstop to reinforcing steel.
- F. In all cases, Contractor shall provide a sample section of the proposed waterstop to the MWRD for approval.
- G. Completed waterstops shall comply with U.S. Army Corps of Engineers Specification CRD C-572.
- H. Completed waterstops shall have an ultimate tensile strength of 1,950 psi and an ultimate elongation of 350 percent in accordance with ASTM D412.
- I. Waterstop material shall have a high resistance to acids and alkalis and exhibit little deterioration under accelerated aging tests.

- J. Additional waterstop physical properties shall be in compliance with the following requirements:
 - 1. Stiffness in Flexure ASTM D747, 750 psi minimum.
 - 2. Low Temperature Brittleness ASTM 746, 35 degrees F.
 - 3. Durometer Hardness, 15 Sec., Shore A ASTM D2240, 70 plus 5.
 - 4. Specific Gravity ASTM D297, 1.38 maximum.
 - 5. Water Absorption (48 hrs.) ASTM D570, 0.5 percent.
- K. Synthetic rubber may be allowed as an alternative to PVC for waterstop material with approval of the MWRD.
- L. When used, synthetic rubber waterstops shall be formulated from styrene-butadiene synthetic rubber and shall comply with the U.S. Army Corps of Engineers specification CRD-C513.

PART 3 – EXECUTION

3.1 CONCRETE MIXING

- A. Concrete mixed at project site shall be mixed in a batch mixer approved by the MWRD.
- B. Contractor shall provide a modern and dependable concrete mixing plant of sufficient capacity to produce maximum output of concrete required to complete work within specified time frame without reducing minimum mixing time specified.
- C. Concrete mixers shall be of rotary batch type, so made and operated as to insure a uniform distribution throughout mixture mass, so that resulting mixture is homogeneous, uniform in color and coarse aggregate is completely covered with cement.
- D. Where cement is delivered in bags, no mixer shall be used that requires less than one bag of cement for each batch of concrete.
- E. Concrete mixer shall be equipped with batching equipment to meet the following requirements:
 - 1. Amounts of cement and of each individual size of aggregate entering into each batch of concrete shall be measured by direct weighing equipment satisfactory to the MWRD.
 - 2. Weighing equipment shall be readily adjustable for compensating for moisture content of aggregate or for changing proportionate batch weights, and shall include a visible dial or equally suitable device which will accurately register scale load from zero to full capacity.
 - 3. Accuracy of weighing equipment shall conform to the requirements of the United States Bureau of Standards.
 - 4. Cement must be weighed and batched separately from fine and coarse aggregate and shall be discharged directly from cement batcher into charging hopper, conveying car or mixing drum of each unit.
 - 5. Bulk cement weighing hoppers shall be equipped with vibrators to operate automatically and continuously while weighing hoppers are being dumped to assure a clean dump of cement each time into mixer.

6. Bulk cement shall not be allowed to contact damp sand at any time for more than one (1) hour, and in winter time when sand is hot, for more than thirty (30) minutes before batch is discharged into mixer.
 7. If winter operations are to continue with heating of aggregate at the batch plant and batched material is to be held for long periods of time in delivery trucks, due either to length of haul or occasional breakdowns at mixer plant, then Contractor shall use bagged cement entirely instead of using bulk cement until heating of aggregate is no longer necessary and there is no longer danger of pre-hydration of cement before it is used.
 8. In no case shall temperature of concrete be allowed to exceed ninety (90) degrees F.
 9. The amount of water entering each batch of concrete shall be measured either by weight or volume.
 10. Equipment shall be capable of measuring water within a tolerance of one (1) percent plus or minus and shall be equipped with an accurate gauge or dial, reading clearly at all times, either in pounds or gallons.
 11. Water measuring device shall be kept locked and amounts of water to be used shall be varied only under direction of the MWRD.
 12. During concrete mixing, water shall be admitted to batch mixer only through the water measuring device and then only at time of charging.
 13. Each mixer shall be equipped with a suitable clock or timing device, capable of being locked, for visibly indicating time of mixing after all materials, including water, are in batch mixer.
 14. Time of mixing shall be dependent upon results obtained but in no case shall the time, after all materials, including water are in mixer, be less than 1-1/4 minutes for one (1) cubic yard and fifteen (15) seconds additional for each additional cubic yard.
 15. Entire contents of mixing drum shall be discharged before re-charging.
 16. Volume of mixed material for each batch shall not exceed manufacturer's rated capacity of batch mixer.
- F. Continuous mixing must be approved by the MWRD. When employed, continuous mixing must be in accordance with ASTM C685.
- G. Mixing equipment specifications and performance data must be submitted to the MWRD for approval. The MWRD may then order such tests as necessary to verify submitted data.
- H. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94.
- I. Ready-mix plant and their facilities shall be approved by the MWRD.
- J. Ready-mixed plant facilities include mixing apparatus, proportioning apparatus, storage facilities and provisions for heating and cooling materials.
- K. Ready-mixed plant facilities shall have current "State of the Art" plant technology and shall include a printing device to record actual batch quantities.
- L. Also subject to approval by the MWRD are the concrete delivery trucks serving ready-mixed plant.

- M. When agitation is accomplished in delivery truck, delivery truck shall be equipped with a revolution counter.
- N. When delivery truck is equipped with a water reservoir, a water level sight gage shall be provided.
- O. Mixed concrete shall have an initial air and slump content which will insure that limits indicated in Tables 1 and 2 are met at point of placement within the following time constraints;
 - 1. Maximum delivery and placement times shall be as follows:
 - a. Air Temperatures seventy-five (75) degrees F and above 60 min.
 - b. Air Temperatures below seventy-five (75) degrees F 90 min.
- P. Above indicated temperatures are ambient air temperatures at point at which concrete is being batched.
- Q. Indicated time limits are maximum times between concrete batching and concrete placement and shall not be exceeded without approval of the MWRD.
- R. The MWRD may approve longer time intervals when an MWRD-approved retarding admixture is added to concrete mix.
- S. Producer of ready-mixed concrete shall furnish a ticket stamped by an approved time clock with departure time from ready-mix plant clearly identified on ticket.
- T. Time shall be the starting time for maximum delivery and placement time indicated above.
- U. Time tickets shall accompany truck delivering concrete and shall be given to the MWRD upon arrival at project site.
- V. No concrete delivery truck shall be loaded in excess of truck's rated load capacity.
- W. No materials, including water and admixtures, shall be added to concrete mixture after leaving ready-mix plant except with approval of the MWRD.

3.2 PLACING CONCRETE

- A. Concrete shall be deposited as close as possible to its final position to avoid re-handling and in case of formed walls, in such a manner as to maintain concrete surface approximately horizontal.
- B. Once started, placing of concrete in any unit shall be a continuous operation.
- C. Should any unavoidable break in concreting operation occur before completion of a unit, a construction joint shall be formed at proper location, either by bulkheading or, in the case of a vertical wall, by leveling off to a horizontal plane.
- D. Construction joint shall be properly keyed and, if required, additional reinforcement bars

shall be placed as dowels, as directed by the MWRD, without additional cost to MWRD.

- E. Upon resuming work, procedure specified for construction joints shall be followed.
- F. When placing concrete, care shall be taken to prevent segregation of concrete materials.
- G. If chuting is employed, chute shall be arranged so as to insure a continuous flow without requiring an increase of water over amount specified.
- H. Point of delivery of chute, conveyor, tube, or other device, shall not be more than eight (8) feet distant horizontally from point of final placement of concrete.
- I. Concrete placed on sloping surfaces shall be poured from toe of slope to top.
- J. Concrete shall be placed in approximately equal horizontal layers of 18 to 24 inches and shall not be allowed to drop freely more than four (4) feet, or through a cage of reinforcing steel.
- K. Bottom-dump buckets may be used to transport mixed concrete to desired location. Particular care shall be taken to avoid jarring or bumping which may cause segregation.

3.3 PUMPING AND CONVEYING EQUIPMENT

- A. Elephant trunks or tremies shall be used in wall and column concreting to prevent freefall of concrete and to allow concrete to be placed through cage of reinforcing steel.
- B. Trunks or tremies shall be moved at short intervals to prevent vertical stacking of freshly placed concrete.
- C. Pumping equipment shall be a suitable type with adequate pumping capacity. Loss of slump in pumping shall not exceed 1-1/2 inches.
- D. Concrete conveying equipment shall be designated specifically to place concrete.
- E. Conveyor systems shall not impair strength, slump or air content of concrete being placed.
- F. Conveyor placement system shall be capable of delivering concrete over entire placement area without delays or equipment re-location.
- G. Alternate placing equipment shall be immediately available for use in event that primary placing equipment fails during a placement.
- H. Alternate equipment shall be able to commence placing operations within thirty (30) minutes notice to avoid cold joints in structural element being placed.
- I. Contractor shall submit alternate methods or procedures to the MWRD prior to placement of concrete.

- J. Before commencing operations, surfaces upon which or against which concrete is to be placed shall be cleaned of mud and debris.
- K. At construction joints special care shall be taken as specified.
- L. No concrete shall be deposited in water except with permission of the MWRD and then only with such precautions as the MWRD may require.
- M. In no case shall concrete be deposited in running water, or shall water be permitted to flow over freshly deposited concrete.
- N. Sections of walls between joints shall be placed continuously to produce a monolithic unit. At least forty-eight (48) hours must elapse between casing of adjoining units.
- O. Placing of concrete in beams or slabs, shall not begin until concrete previously placed in walls or columns has attained specified strength.

3.4 CONSOLIDATING CONCRETE

- A. As soon as possible after placement, concrete shall be tamped, spaded, or vibrated by use of internal vibrators until fresh concrete is thoroughly vibrated, resulting in a dense, watertight structure, free from voids and with smooth surfaces.
- B. Vibrate concrete around reinforcement and inserts and to prevent formation of voids. Forms will contain no pockets which will cause formation of trapped air.
- C. Formed concrete shall be vibrated by the use of internal vibrators.
- D. Internal vibrators shall not be allowed to remain in one position in concrete mix and shall be continuously inserted and withdrawn in a brisk manner.
- E. Each horizontal layer of freshly placed concrete shall be consolidated before another layer is placed.
- F. When internal vibrators are used, internal vibrator shall extend into underlying layer to bond the two layers together.
- G. To avoid excessive pressure on formwork, internal vibrator shall penetrate no more than two feet (2') into underlying layer.
- H. In no case will internal vibrators be used to move freshly placed concrete from one spot to another in lieu of shoveling or other accepted methods of moving concrete.
- I. Concrete in walls shall be placed and vibrated in such a way that will not cause an accumulation of water at top of walls or drive water ahead of pouring toward an end of a wall.
- J. Mechanical high frequency vibrators with a minimum frequency of 7000 revolutions per minute are preferred for consolidation of concrete within formwork.

- K. Concrete shall not be vibrated to cause segregation of aggregates.
- L. Bottom formwork for beams, girders and floor slabs shall be covered with a structural grout surface before concrete is placed.

3.5 FORMWORK AND REINFORCEMENT INSPECTIONS

- A. Contractor shall notify the MWRD in sufficient time before commencing concreting of any formed unit to permit a thorough inspection of formwork and reinforcement steel within three (3) working hours unless otherwise authorized by the MWRD.
- B. No concrete shall be poured until such inspection has been made and approval given, and then only in presence of the MWRD or their representative.
- C. Formed units concreted prior to inspection and approval shall be rejected. Removal and replacement of rejected area of concrete shall be done by Contractor at no additional costs to MWRD.

3.6 SEWER AND TUNNEL CONCRETE REQUIREMENTS

- A. In construction of sewers and conduits, Contractor shall place concrete sections as soon as it is practicable after excavation has been made.
- B. If, in the opinion of the MWRD, distance between face of heading and end of concreted section is excessive or unsafe, the MWRD reserves right to require Contractor to stop all tunnel work or open cut excavation and to concrete sections to such an extent as the MWRD directs.
- C. Distance between face of heading and end of concreted section shall be subject to approval of the MWRD at all times.
- D. In tunnel construction, concrete shall not be placed by pouring through pipes from surface of ground directly into formwork.
- E. Pneumatic or mechanical concrete placing equipment shall be used in placing concrete into formwork in tunnel construction.
- F. Bentonite slurry used in conjunction with jacking method shall be pumped from inside the pipe.
- G. When using circular or horse shoe forms in tunnel construction, concrete shall not be discharged directly over the arch. Each side shall be filled alternately and uniformly before arch concrete is placed.

3.7 CONSTRUCTION JOINTS

- A. Construction joints shall be made only where indicated on Drawings or approved by the MWRD.

- B. If Contractor desires to change location of construction joints or add additional construction joints other than where indicated on Drawings, they shall notify the MWRD in advance so that, if change is approved, reinforcement steel may be properly detailed.
- C. Top and end surface of concrete first poured shall be grooved or stepped as indicated on Drawings or as directed by the MWRD.
- D. Prior to commencing concreting of an adjoining unit, adjoining surfaces shall be thoroughly cleaned of laitance, dirt and debris.
- E. If in opinion of the MWRD, the old surface of adjoining concrete shall be cut back until sound, clean concrete is exposed.
- F. On horizontal or near horizontal joints, a coating of GS or GSA gout shall be spread over entire joint surface to such a depth as the MWRD may require, not to exceed three inches (3"), before placing fresh concrete.
- G. At vertical joints, special care shall be taken to work freshly placed concrete to obtain an excess of fine aggregate and cement at form joint.
- H. Construction joints shall be thoroughly saturated with clean potable water prior to placing fresh concrete.
- I. Floor slabs, beams and girders shall be constructed integral with each other and with as few construction joints as practicable.
- J. Where construction joints are necessary, joints will be permitted only near middle of the span of slabs, beams or girders unless a beam intersects a girder at this point, in which case joint in girder shall be set over a distance equal to twice the width of beam.
- K. Maximum distance between joints in slabs and walls shall be no greater than 50 feet.
- L. Adequate provisions shall be made for shear at joints by use of inclined reinforcement or stirrups as determined by the MWRD.
- M. Sewer arches shall be placed in one continuous operation and longitudinal construction joints shall not be used in sewer arch.
- N. Invert of sewer may be poured separately from arch subject to approval of the MWRD.
- O. In sewer construction, construction joints between separate pours shall be formed as a substantial continuous tongue and groove joint around ring of the sewer, and full length of horizontal joints.

3.8 COMPONENTS PLACED IN CONCRETE

- A. Contractor shall place reinforcing steel, pipes, castings, manhole steps, necessary pipe sleeves, wall castings, anchor bolts, frames, expansion joints, and other component inserts and shall form openings in walls or floors as indicated on Drawings, or that may be required to accommodate piping work or equipment prior to pouring concrete unless otherwise specified.
- B. No aluminum shall be embedded in concrete unless coated with a protective coating which has been approved by the MWRD.
- C. When practical, wall castings incorporating orifice or gate assemblies shall be placed as a unit in order to insure proper vertical plumb and alignment.
- D. Sizes and locations of component inserts or openings shall be the responsibility of Contractor and shall be as determined by manufacturer's equipment shop drawings and as required by the work.
- E. Component inserts shall be included for payment under appropriate items of contract except when otherwise noted.

3.9 SURFACE FINISHING – GENERAL

- A. Surfaces for sliding joints to be coated, shall be accurately screeded and steel trowelled to a smooth plane surface.
- B. Top surfaces, which will not be exposed in the finished work, shall be carefully screeded to required elevation.
- C. Where expansion joints occur in horizontal surfaces, concrete shall be neatly edged on both sides of expansion joint and the exposed cork or other type joint material must be free from any concrete paste.
- D. Addition of dry cement or a mixture of dry cement and sand to take up excess moisture during the finishing process shall not be permitted.
- E. Sprinkling water over concrete surfaces during the finishing process shall not be permitted.
- F. On all faces of concrete, smooth dense surfaces shall be required, free from honeycomb, stone pockets or roughness. The edges of all walls and beams shall be neatly beveled or rounded. It is the intention to secure smooth, plane surfaces free from roughness.
- G. After removal of formwork, all fins and protrusions shall be removed flush with finished surface.

3.11 SURFACE FINISHING - WALLS, WALKWAYS, CHANNELS AND INVERTS

- A. Top surfaces of walls, beams and walkways shall be accurately screeded, and the remaining surface given a plane, hard, magnesium or wood float finish.
- B. Corners of walls, beams and walkway concrete members shall be chamfered 3/4-inch.
- C. Bottoms of sewage channels and conduits shall be screeded, floated, and steel trowelled to a smooth hard finish.
- D. Water shall not be allowed to flow over or stand on the invert of the channels or conduits until twenty-four (24) hours after placement of concrete.
- E. Finished inverts of sewers built in open cut or tunnel construction shall be protected during entire progress of the work and thoroughly cleaned before final acceptance.

3.13 SURFACE FINISHING – STAIRS

- A. Treads and landings of concrete stairs shall be made non-slippery by applying 0.25 pound of Anti-Slip Grade Silicon Carbide Size 8-16 grit aggregate on each square foot of surface.
- B. After the concrete surface of treads and landings is screeded level, it shall be permitted to stand, until firm enough to bear the weight of workman, standing on formwork and prior to initial set.
- C. During this process the non-slip aggregate, previously soaked about 10 minutes in clean potable water, shall be sprinkled by hand on the concrete surface of treads and landings and be immediately floated into cement finish.
- D. Grit shall not be required on stair treads when non-skid nosings are provided or where a separate topping is applied.

3.14 SURFACE FINISHING - ROADWAYS

- A. Concrete roadways shall be floated and straightedge to a true surface as called for on Drawings.
- B. If contraction joints are to be sawed into hardened roadway surfaces, sawing operations shall be accomplished within twenty-four (24) hours.
- C. Finishing operations shall be such as to require a minimum of manipulation from initial placing to finished surface.
- D. Final surface finish may be accomplished by belting, brooming, or burlap drag as directed by the MWRD.

3.15 CURING REQUIREMENTS

- A. Provision shall be made for maintaining concrete in a moist condition for a period of at least five (5) days after placement.
- B. Spray-on liquid type membrane shall conform to specifications for Liquid Membrane-Forming Compounds for Curing Concrete in accordance with ASTM C309, Type 2, for exterior concrete surfaces.
- C. Spray-on liquid type membrane shall not be used on construction joints, other surfaces where bond is required nor where surface repairs are to be made.
- D. Spray-on membrane shall be pigmented white in accordance with ASTM C309, Type 2, for exterior surfaces.
- E. Reusable-blanket type curing membrane shall be “Waterproof Curing Paper” conforming to specifications for Waterproof Paper for Curing Concrete in accordance with ASTM C171 or Plastic Polyethylene Sheets.
- F. Blanket or plastic sheet covering shall be held securely in place and shall have vaporproof laps sealed with pressure adhesive tape between adjoining sheets and at edges.
- G. On unformed surfaces, blanket or plastic sheet covering shall be applied immediately after concrete has obtained final set.
- H. On formed surfaces, blanket or plastic sheet covering shall be applied immediately after the formwork has been removed and formed surfaces inspected by the MWRD.
- I. Where surface repairs are to be made, as specified, surfaces may be uncovered only for the time necessary to make required repairs.
- J. Whenever necessary in the opinion of the MWRD, exposed surfaces of concrete shall be constantly kept moist by sprinkling with water at short intervals or by covering with moistened burlap or by such other means as may be approved, until permanent covering is in place or until, in the opinion of the MWRD, concrete is sufficiently hardened.
- K. No exposed concrete shall be placed during periods of hard rain.
- L. Freshly placed concrete shall be protected by canvas during hard rain events, or as directed by the MWRD. Sufficient canvas covering shall be provided and kept ready for this purpose.
- M. Contractor shall have necessary equipment for curing in readiness before any concrete is poured and curing provisions shall be applied within one (1) hour from initial set.

3.16 CONCRETE COMPRESSION TEST CYLINDERS

- A. MWRD will monitor the quality of the concrete by performing the following tests:
 - 1. ASTM C39 test for compressive strength cylindrical concrete specimens.
 - 2. ASTM C231 test for air content of freshly mixed concrete by the pressure method.

3. ASTM C143 test for slump of Portland cement concrete.
 4. ASTM C138 test for unit weight and yield of concrete.
- B. MWRDGC personnel shall make four (4) cylindrical test specimens for each concrete pour or for each 150 cubic yards of concrete if concrete pour is larger than 150 cubic yards.
 - C. Test specimens shall be made and cured in accordance with ASTM C31. Two (2) specimens of each set of four (4) shall be tested at seven (7) days and the other two (2) specimens at twenty-eight (28) days.
 - D. Field storage and curing facilities for concrete compressive test specimens shall be provided by Contractor as the MWRD will direct, and shall maintain a temperature not less than 60 degrees F and a moist air condition at all times.
 - E. If test specimens do not acquire strength as specified within this specification, Contractor shall make such changes in materials, proportioning or methods of mixing as may be necessary to attain specified strengths.

3.17 DEFECTIVE WORK AND PATCHING

- A. It is an express condition of this contract that if any concrete placed during project is found defective regarding quality of materials, or in mixing or placing of concrete, or due to any other cause, so that concrete is structurally unsound, or not substantially watertight, as determined by the MWRD, selected portions of concrete shall be cut out and removed by Contractor together with such adjacent sound concrete as the MWRD may determine is necessary in order to obtain a safe, structurally sound and watertight structure.
- B. Such concrete removed shall be replaced with new concrete of quality specified within this section, which shall be deposited and compacted and joined to remainder of concrete in a manner acceptable to the MWRD.
- C. Where the MWRD grants permission to patch defective area, patching shall be done in accordance with the following procedure:
 1. Permission to patch any such area shall not be considered a waiver of the MWRD's right to require complete removal of defective work if patching does not, in the MWRD's opinion, satisfactorily restore the quality and appearance of finished surface.
- D. After removing forms, concrete surfaces shall be inspected.
- E. Any non-conforming joints, voids, stone pockets or other defective areas requiring patching as determined by the MWRD shall be patched. Formwork holes shall also be patched.
- F. Where necessary, defective areas shall be chipped away to a depth of not less than one inch (1") with edges perpendicular to finished surface.

- G. Area to be patched and a space at least six inches (6") wide entirely surrounding it shall be wetted to prevent absorption of water from patching mortar.
- H. Provide grout of equal parts of Portland cement and sand, with sufficient water to produce a paste consistency, shall then be well brushed into prepared surface, followed immediately by patching mortar.
- I. Patch shall be made of same material and of approximately same proportions as used for concrete except that coarse aggregate shall be omitted.
- J. Patching mortar shall not be richer than one (1) part cement to three (3) parts sand.
- K. White Portland cement shall be substituted for a part of the gray Portland cement to match color of surrounding concrete, where directed by the MWRD.
- L. Proportions of white and gray cements shall be determined by making a trial patch.
- M. Amount of mixing water used for patching shall be as little as possible while being consistent with the requirement of handling and placing.
- N. Patching mortar shall be re-tempered without addition of water by allowing it to stand for a period of one (1) hour during which time patching mortar shall be mixed occasionally with a shovel or trowel to prevent setting.
- O. Patching mortar shall be thoroughly compacted into place and screeded off, leaving patch material slightly higher than surrounding surface.
- P. Patch area shall then be left undisturbed for a period of one (1) to two (2) hours to permit initial shrinkage before being finally finishing.
- Q. Patch area shall be finished in such a manner as to match adjoining surface.
- R. On exposed surfaces where unlined forms have been used, final finish shall be obtained by striking off surface with a straight-edge spanning patch area and held parallel to the direction of form marks. Patches shall be cured in accordance with this specification.
- S. Form tie holes left by withdrawal of rods or holes left by removal of ends of form ties shall be filled solid with mortar after first being thoroughly saturated with clean potable water.
- T. For holes passing entirely through the wall, a plunger type grout gun shall be used to force patching mortar through wall starting at back face of wall.
- U. A piece of burlap or canvas shall be held over hole on the outside and when hole is completely filled, excess mortar shall be struck off with burlap flush with adjacent surfaces.
- V. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall

shall be struck off flush with a cloth.

- W. Where repair is more extensive and requires concrete, concrete mix shall be Class RA unless otherwise directed by the MWRD.
- X. No payment will be made to Contractor for the additional work of cutting out or removing defective concrete or correcting defective work as specified, or for furnishing and placing new mortar or concrete where surface of older concrete is removed for purposes specified in this specification.

3.18 DAMAGED WORK

- A. Before final acceptance of concrete work, all defective concrete work and all damaged surfaces, whether such damage has resulted from action of the elements or from injury from any cause whatsoever, shall be neatly repaired without extra charge to the MWRD.
- B. Any honeycombed surfaces or damaged places where surface repairs are permitted, shall be brought to a smooth, dense, watertight condition to the satisfaction of the MWRD.
- C. Broken corners, edges, and tops of walls shall be repaired by first chiseling or bush-hammering to allow a thickness of at least two inches (2") of new material free from thin joining edges, and in such a manner as to anchor and key the new concrete to existing concrete.
- D. Surface of existing concrete shall then be carefully washed with clean water and cement, suitable forms placed, and specified concrete deposited to conform to the lines of the structure and finished as specified.

3.19 COLD WEATHER CONCRETING

- A. Unless ambient air temperature is at least 40 degrees F and rising, water and or aggregates shall be heated so that temperature of concrete, when placed, is not less than 55 degrees F.
- B. Water shall not be heated above 175 degrees F and sand may be heated to a maximum temperature of only 150 degrees F.
- C. Provisions shall be made for maintaining concrete at a minimum temperature of not less than 50 degrees F for a period of at least seven (7) days.
- D. Form removal shall be governed by the attainment of adequate strength in accordance with strength requirements specified in this specification.
- E. No concrete shall be placed on or against frozen earth, in frosted forms, or on or against concrete or rock containing frost.

3.20 HOT WEATHER CONCRETING

- A. When ambient temperature is 90 degrees F or above, special precautions shall be taken

during mixing, placing, and curing to maintain quality of the concrete.

- B. Aggregate and cement shall be kept cool. A set-retarding admixture may be used in accordance with this specification.
- C. When necessary to cool mixing water, the use of nitrogen, refrigeration, or replacing part of the water with shaved or crushed ice will be allowed.
- D. Curing of concrete shall be started as soon as finishing has been completed.

END OF SECTION

SECTION 03 40 00

PRECAST CONCRETE BRIDGE SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This work shall consist of designing and constructing a precast concrete arch culvert, headwall, wingwalls, and footing in accordance with these Specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans.

1.2 SUBMITTALS

- A. See Division One – Administrative Requirements, for submittal procedures.
- B. Product Data: Submit complete shop drawings of pre-engineered precast concrete arch bridge system assemblies, foundations and abutments signed and sealed by a Structural Engineer registered in the State of Illinois.
- C. Manufacturer's Certificate: Certify that the material inspections and tests have been made and meet or exceed the applicable ANSI/ASTM Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Precast Concrete Arch structure shall be a CONTECH Construction Products, Inc. Precast Concrete Arch structure or equivalent as shown in the plans. These are buried, soil-interaction structures that rely on the soil, including a critical backfill zone of material, for their performance.
- B. The formwork utilized in the manufacturing of the Precast Concrete Arch units must be owned and regularly maintained by the Precast Arch provider.
- C. Because of the nature of these soil-interaction structures, the Precast Concrete Arch provider must provide one of the following:
 - 1. At least two (2) independently verified full scale load tests that confirm the proposed design methodology of the three sided arch topped structure, or
 - 2. Provide third party documentation verifying analysis and design methodology agrees with the results of current full scale load tests, unless the finite element program CANDE developed by FHWA is used.

- D. The Precast Concrete Arch bridge culverts must be provided by a supplier that has a minimum of two (2) registered structural engineers on staff that are dedicated to the design of these types of structures. Supplier must provide these names, S.E. license numbers, and dates of hire.
- E. The Precast Concrete Arch provider must provide evidence of five (5) precast arch bridges of similar span and rise installed in the state of Illinois in the last three years including at least one (1) IDOT funded project. Provided information must include Span, Rise, Length of structure, Design Loading and Date of installation.
- F. The Precast Concrete Arch provider must have a minimum of five year's experience casting concrete ARCH bridge structures.
- G. All visible corners and edges to have a minimum of $\frac{3}{4}$ " x $\frac{3}{4}$ " Chamfer. All interior and exterior surfaces of precast concrete structure to have a steel form finish. The minimum wall thickness of the precast arch segment shall be less than that shown on the plans. The interior surfaces of the structure joints shall be in alignment with a tolerance of plus or minus $\frac{3}{8}$ ". The joint width shall be a maximum of $\frac{3}{4}$ " wide. Tolerances shall be checked and approved by the project engineer as the structure units are placed. The top exterior surface shall have positive drainage with a minimum slope of 3% from the centerline of the span to the exterior corner of the structure. All units, headwalls and wingwalls must be manufactured in an indoor facility.
- H. The fabricator shall submit a Load Rating calculations package (Inventory and Operating Conditions) for the supplied structure and stated design parameters. The calculations shall be signed and sealed by the fabricator's Structural Engineer and be submitted with the fabrication drawings and design computations.
- I. A flattop Structure will not be allowed.

2.2 CONCRETE

- A. The concrete for the culvert shall be air-entrained, composed of Portland cement, fine and coarse aggregates, admixtures and water. Concrete shall contain 6 +/- 2 percent air. The air-entraining admixture shall conform to AASHTO M154.
 - 1. Portland cement – shall conform to the requirements of ASTM Specifications C150-Type 1, Type II, or Type III cement.
 - 2. Coarse Aggregate – shall consist of stone having a maximum size of 1 inch. Aggregate shall meet requirements for ASTM C33.
 - 3. Water Reducing Admixture – The manufacturer may submit for approval by the Engineer, a water-reducing admixture for purpose of increase workability and reducing the water requirement for the concrete.

4. Calcium Chloride – The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.

2.3 STEEL REINFORCEMENT AND HARDWARE

- A. All reinforcing steel for the culverts and footing shall be fabricated and placed in accordance with AASHTO LRFD Bridge Design Specifications, IDOT standard specifications, and ACI 315, latest edition.
- B. Steel reinforcement shall consist of welded wire fabric conforming to ASTM Specification A1064 or A497, or deformed billet steel bars conforming to ASTM Specification A615, Grade 60. Longitudinal reinforcement may consist of welded wire fabric or deformed billet steel bars.

2.4 FABRICATION

- A. Mixture – The aggregates, cement and water shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete meeting the strength requirements of this specification. The proportion of Portland cement in the mixture shall not be less than 564 pounds (6 sacks) per cubic yard of concrete.
- B. Curing – The precast concrete culvert units shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof shall be used:
 1. Steam Curing – The culverts may be low pressure, steam-cured by a system that will maintain a moist atmosphere.
 2. Water Curing – The culverts may be water-cured by any method that will keep the sections moist.
 3. Membrane Curing – A sealing membrane conforming to the requirements of ASTM Specification C309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within +10 degrees F of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.
- C. Forms – The forms used in manufacture shall be sufficiently rigid and accurate to maintain the culvert dimensions within the permissible variations given in these specifications. All casting surfaces shall be of a smooth material.
- D. Handling – Handling devices or holes shall be permitted in each culvert for the purpose of handling and setting.

- E. Storage – The culverts shall be stored in such a manner to prevent cracking or damage. The units shall not be stored in an upright position until the compressive strength is a minimum of 4,000 psi.
- F. Facility – All precast elements shall be cast in an indoor controlled environment. A minimum 50 degrees shall be maintained in the facility during pouring, curing and moving of the precast elements.

2.5 DESIGN

- A. The culvert dimension and reinforcement details shall be as prescribed in the plans and the shop drawings subject to the provisions of this specification. The minimum concrete compressive strength shall be 4,000 psi. The minimum steel yield strength shall be 60,000 psi.
- B. The culverts shall be designed in accordance with the “Standard Specifications for Highway Bridges” adopted by the American Association of State Highway and Transportation Officials, 1996. Minimum design load shall be whichever between AASHTO HS-25 or HL-93 loading has the greatest demand on the structure. A minimum of one foot of cover above the crown of the culvert is required in the installed condition (unless noted otherwise and designed accordingly).
- C. Placement of Reinforcement – The cover of concrete over the outside circumferential reinforcement shall be 2 inches minimum. The cover of concrete over the inside circumferential reinforcement shall be 1 ½ inches minimum. The clear distance of the end circumferential wires shall not be less than one inch nor more than two inches from the ends of the culvert. Reinforcement shall be assembled utilizing single or multiple layers of welded wire fabric, or utilizing single layer or deformed billet-steel bars. The welded wire fabric shall be composed of circumferential and longitudinal wires and shall contain sufficient longitudinal wires extending through the culvert to maintain the shape and position of the reinforcement. Longitudinal distribution reinforcement shall be welded wire fabric or deformed billet-steel bars. The ends of the longitudinal distribution reinforcement shall not be more than 3 inches from the ends of the culvert.
- D. Bending of Reinforcement – The outside and inside circumferential reinforcing steel for the corners of the culvert shall be bent to such an angle that is approximately equal to the configuration of the culvert outside corner.
- E. Laps, Welds, and Spacing – Tension splices in the circumferential reinforcement shall be made by lapping. Laps may be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of ACI 12.8 and 12.19. For deformed

welded wire fabric, the overlap shall meet the requirements of ACI 12.7 and 12.18. For deformed billet-steel bars, the overlap shall meet the requirements of ACI 12.2. For splices other than tension splices, the overlap shall be a minimum of 12" for welded wire fabric or deformed billet-steel bars. The spacing center to center of the circumferential wires in a wire fabric sheet shall be not less than 2 inches or more than 4 inches. For the wire fabric, the spacing center to center of the longitudinal wires shall not be more than 8 inches. The spacing center to center of longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 16 inches.

2.6 PERMISSIBLE VARIATIONS

- A. Internal Dimensions – The internal dimension shall vary not more than 1% from the design dimensions or more than 1½ inches, whichever is less. The haunch dimensions shall vary not more than ¾ inch from the design dimension.
- B. Slab and Wall Thickness – The slab and wall thickness shall not be less than that shown in the design by more than ¼ inch. A thickness more than that required in the design shall not be cause for rejection.
- C. Length of Opposite Surfaces – Variations in laying lengths of two opposite surfaces of the culvert shall not be more than 5/8 inch in any culvert section, except where beveled ends for laying of curves are specified by the purchaser.
- D. Length of Section – The underrun in length of a section shall not be more than ½ inch in any culvert.
- E. Position of Reinforcement – The maximum variation in position of the reinforcement shall be ½ +/- inch. In no case shall the cover over the reinforcement be less than 1½ inches for the outside circumferential steel or be less than 1 inch for the inside circumferential steel as measured to the external or internal surface of the culvert. These tolerances or cover requirements do not apply to mating surfaces of the joints.
- F. Area of Reinforcement – The areas of steel reinforcement shall be the design steel areas as shown in the shop drawings. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the ASTM Specification for the type of reinforcement.

2.7 TESTING AND INSPECTION

- A. Type of Test Specimen – Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing, a minimum of 4 cylinders shall be taken during each production run. For core testing, one core shall be cut from the culvert

section selected at random from each group of 15 culverts or less of a particular size and production run. For each continuous production run, each group of 15 culverts of a single size or fraction thereof shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than 3 consecutive days.

- B. Compression Testing – Cylinders shall be made and tested as prescribed by the ASTM C- 39 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the ASTM C-497 Specifications.
- C. Acceptability of Cylinder Tests – Failure of any of the 28 day test cylinders to meet 90 percent of the minimum compressive strength requirement can be cause for rejection.
- D. Acceptability of Core Tests – The compressive strength of the concrete in each group of culverts as defined in these Specifications is acceptable when the core test strength is equal to or greater than the design concrete strength. When the compressive strength of the core tested is less than the design concrete strength, the culvert from which that core was taken may be re-cored. When the compressive strength of the re-core is equal to or greater than the design core strength, the compressive strength of the concrete in the group of culverts is acceptable.
 - 1. When the compressive strength of any re-core is less than the design concrete strength, the culvert from which that core was taken shall be rejected. Two culverts from the remainder of the group shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of remainder of that group of culverts is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group of culverts shall be rejected or, at the option of the manufacturer, each culvert of the remainder of the group shall be cored and accepted individually, and any of these culverts that have cores with less than the design concrete strength shall be rejected.
 - 2. Plugging Core Holes – The core holes shall be plugged and sealed by the manufacturer in a manner such that the culvert will meet all of the test requirements of this specification. Culverts so sealed shall be considered satisfactory for use.
 - 3. Test Equipment – Supplier shall furnish all facilities and personnel necessary to carryout the test required.

2.8 JOINTS

- A. The culverts shall be produced with flat butt ends. The ends of the culvert shall be such that when the sections are laid together they will make a continuous line of culverts with a smooth interior free of appreciable irregularities, all compatible with the permissible variations of these specifications. The joint width shall not exceed $\frac{3}{4}$ inches.

2.9 WORKMANSHIP AND FINISH

- A. The culverts shall be substantially free of fractures. The ends of the culverts shall be normal to the walls and centerline of the culvert section, within the limits of the variations given in the specifications, except where beveled ends are specified. The surface of the culverts shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth steel form finish.

2.10 REPAIRS

- A. Culverts may be repaired, if necessary, because of imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the purchaser, repairs are sound, properly finished and cured, and the repaired section conforms to the requirements of these specifications.

2.11 INSPECTION

- A. The quality of materials, the process of manufacturer, and the finished culverts shall be subject to inspection by the purchaser.

2.12 REJECTION

- A. Culverts shall be subject to rejection on account of any of the specification requirements. Individual culverts may be rejected because of any of the following:
 1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half of the thickness of the wall.
 2. Defects which indicate proportioning, mixing, and molding not in compliance with these specifications.
 3. Honeycombed or open texture.
 4. Damaged ends, where such damage would prevent making a satisfactory joint.

2.13 MARKING

- A. Each culvert shall be clearly marked by waterproof paint. The following shall be shown on the inside of the vertical leg of the culvert section:

Culvert Section Span x Culvert Rise
Date of Manufacturer
Name or trademark of the manufacturer

PART 3 - EXECUTION

3.1 FOOTINGS

- B. The culverts shall be installed on either precast or cast-in-place concrete footings. The footing shall be continuous from end to end. The width and thickness of the footings shall be as calculated by the manufacturer. A three-inch deep keyway shall be formed in the top surface of the footing three inches clear of the inside and outside faces of the culvert, unless specified otherwise on the plans. The footings shall be given a smooth float finish and shall reach a compressive strength of 2,000 psi before placement of the culvert sections. The completed footing surface shall be constructed in accordance with grades shown on the plans. When tested with a 10-foot straight edge, the surface shall not vary more than ¼ inch in 10 feet. If a precast concrete footing is used, the Contractor shall prepare a 4-inch thick layer of compacted granular material the full width of the footing prior to placing the precast footing.

3.2 PLACEMENT OF CULVERTS

- A. The culvert shall be placed as shown on the plans. Special care shall be taken in setting the culverts to the true line and grade. The culverts shall be set on 6"X6" masonite or stainless steel shims. A minimum of ½ inch gap shall be provided between the footing and the bottom of the culvert vertical legs. The gap shall be filled with cement grout (Portland cement and water or cement mortar composed of one part Portland cement and three parts of sand, by volume, and water).

3.3 BACKFILL

- A. Backfill shall be considered as all replaced excavation and new embankment adjacent to the bridge units and wingwalls. Specification Section 02200 shall apply except as modified in this section.
- B. No backfill shall be placed against any structural elements until they have been approved by the Engineer.

- C. Backfill against a waterproofed surface shall be placed carefully to avoid damage to the waterproofing material.
- D. Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the culvert and over the top of the culvert until it is covered to a minimum depth of one foot. The backfill within four feet of each side of the culvert shall be placed in lifts of eight inches or less (loose depth). Heavy compaction equipment shall not be operated in this area or over the culvert until it is covered to a depth of one foot.
- E. Lightweight dozers and graders may be operated over culverts having one foot of compacted cover, but heavy earth-moving equipment (larger than a D-4 Dozer weighing in excess of 12 tons and having track pressures of 8 psi or greater) shall require two feet of cover unless the design cover is less than two feet. In no case shall equipment operating in excess of the design load (HS20 or HS 25) be permitted over the culvert.
- F. Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost.
- G. As a precaution against introducing unbalanced stresses in the culvert and wingwalls, when placing backfill at no time shall the difference between the heights of fill on opposite sides of the culvert exceed 24".
- H. Backfill in front of wingwalls shall be carried to lines shown in the plans.

3.4 EXTERNAL PROTECTION OF JOINTS

- A. The butt joint made by two adjoining culverts shall be covered with a 7/8" X 1-3/8" (1 1/4" round equivalent) piece of butyl rope and a minimum of a 9-inch wide joint wrap. The surface shall be free of dirt before applying the joint material. A primer compatible with the joint wrap to be used shall be applied for a minimum width of nine inches on each side of the joint. The external wrap shall be either EZ-Wrap rubber Press-Seal Gasket Corp., or Seal-Wrap by Mar Mac Manufacturing Corp., or approved equal. The joint shall be covered continuously from the bottom of one culvert section leg, across the top of the arch and to the opposite culvert section leg. Any laps that result in the joint wrap shall be a minimum of six inches long with the overlap running downhill.
- B. In addition to the joints between units, the joint between the end unit and the headwall shall also be sealed. At precast wingwalls, the joint between the end bridge unit and the wingwall shall be sealed with this type of wrap or at the discretion of the Engineer, filter fabric shall be substituted.

- C. During backfilling operation, care shall be taken to keep the joint wrap in its proper location over the joint.
- D. Protection board shall be installed over joint waterproofing membrane prior to backfilling.

END OF SECTION

SECTION 05 50 20

SITE METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

- A. General: Provide all labor, materials, equipment and services, and perform all operations in connection with the furnishing and installing of metal fabrications complete, in accordance with the Drawings and Specifications, and including but not limited to, the following:
 - 1. Metal Guardrail (Culvert & Bridge)
 - 2. All anchors, fixings, attachments, and reinforcements required for a complete installation, except those specifically indicated as being provided by others.
- B. Related Sections include but are not limited to the following:
 - 1. Section 03 30 00 – Cast-in-Place Concrete.
 - 2. Section 03 40 00 – Precast Concrete Bridge Systems.
 - 3. Section 32 20 00 – Earthwork.

1.03 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. The following standards are cited in this Section. They govern the Work of this Section only to the extent specified in each citation. Use the latest edition of each standard.
 - 1. AISC: American Institute of Steel Construction.

2. ANSI: American National Standards Institute.
3. ASCE: American Society of Civil Engineers.
4. ASTM: American Society for Testing and Materials.
5. AWS: American Welding Society. Comply with all recommendations and practices for the materials and methods.
6. NAAMM: National Association of Architectural Metal Manufacturers.
7. RCSC: Research Council on Structural Connections Specifications.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittals Procedures: Requirements for Submittals.
- B. Product Data: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with or exceeds specific requirements. Work includes but is not limited to:
 1. Metal Guardrail
 2. Mill Test Reports: Submit mill test reports signed by manufacturers certifying that their products comply with all requirements. Mill test reports shall be submitted for the following:
 - a. Structural steel, including chemical and physical properties.
 - b. Bolts, nuts and washers, including mechanical and chemical analysis.
- C. Shop Drawings: Show fabrication and installation details for metal fabrications.
 1. Shop Drawings shall be certified and stamped by a Structural Engineer registered in the State of Illinois.
 2. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Show layout, sizes, dimensions, details, and installation of all components.
 3. Shop Drawings shall show true profiles, methods of anchoring hardware, unit member sizes, weight/wall thickness, shape, kinds and locations of shop and field connections, fittings and accessories, support and anchorage, relation to adjacent structures and other data necessary to fabricate, erect and coordinate work of affected trades. Take accurate field measurements before preparation of shop drawings and specifications. Welding Symbols per AWS A2.4.
 4. Provide templates for anchors and bolts specified for installation under other Sections.
 5. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Shop Drawings shall be certified and stamped by a structural engineer registered in the state of Illinois. Products include in this section include:
 - a. Metal Handrails (Site Stairs)

- b. Metal Guardrail (Culvert & Bridge)
- D. Qualification Data: For structural engineer registered in the state of Illinois.
- E. Samples: After acceptance of Product Data and prior to ordering the below listed materials, submit representative samples of material to the Engineer for selection and approval as follows. Do not order materials until Engineer's approval has been obtained. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work.
 - 1. Metal components for all Work: Rail and post tube sections, 12" length min.
 - 2. Attachment hardware and fittings, 1 each.
- F. Sample Panels and Mockups: Upon approval of all materials and Shop Drawings, the Contractor shall construct sample panels and mockups on site in the minimum size indicated below. Each sample panel shall be large enough to display typical characteristics of each item and type of work. The Engineer must approve the visual characteristics, quality of workmanship, and installation methods before final work are started. If the original sample is not approved, the Contractor shall provide additional samples, as required, at no cost to the Owner until an approved sample is obtained. The approved sample shall become the standard for the entire job. Sample panel shall not be constructed on a location becoming part of the final work, unless otherwise noted, and shall remain undisturbed until all work is completed. Contractor shall completely remove any panels not set in place as part of the final work, from site upon final acceptance of work.
 - 1. Sample Panel and Mockup Requirements:
 - a. Metal Handrail: One full segment of each type. May be used in the final Work if accepted and approved by the Engineer.
 - b. Metal Guardrail: One full segment of each type. May be used in the final Work if accepted and approved by the Engineer.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications:
 - 1. Work shall be done by a fabricator who has successfully produced and installed Work of required kind and quality for at least five years. He shall have the equipment, skilled workers and capacity to accomplish the Work and meet the constructions schedule.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable code and requirements, whichever is more stringent.

- D. Installer Qualifications: An experienced installer who has completed installation of bollards, railings and guardrails similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- E. Manufacturer Qualifications: A firm experienced in manufacturing railings similar to those required for this project and with a record of successful in-service performance. Welders shall be AWS – qualified operators.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.07 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.08 PERFORMANCE CRITERIA

- A. Individual and aggregate components of the Work of this Section shall be designed, fabricated, assembled, transported, installed and protected so that no evidence of the following shall be apparent, visually or measurable, when Work of this Sections is subject to the pressures, loads, temperatures and conditions specified.
 - 1. Damage of any kind.
 - 2. Offset from true alignment between consecutive components in line is in excess of 1/16 inch.
- B. Design Loads: Individual and aggregate components of this Section shall withstand the loads acting normal to the surface described hereinafter.
 - 1. Design load due to ice build-up of 3 psf.
 - 2. Uniform and point live loading on handrails and guardrails as per provision of the ASCE 7 Minimum Design Loads for Buildings and Other Structures.

3. Load combinations shall be as per the requirements of the State of Illinois Edition of the International Building Code.
 4. Handrails and guardrails: Withstand at least a 200 lb. concentrated load, applied downward or horizontally at any point, and a non-concurrent 50 lbs. per linear foot uniform load, applied downward or horizontally, without rotating or overstressing assemblies or their anchorages.
 5. Anchoring devices: Support dead loads plus live specified loads with specified safety factor.
- C. Thermal Movement: Exterior work shall accommodate a -30 degree F to a +180 degree F metal temperature shift without distortion or overstress.
- D. Structural Movement: Provision shall be made in the Work of this Section to accommodate differential structural movements, deflections, and thermal movement of the structure(s) due to gravity loads, wind loads, seismic loads and temperature.
- E. Analysis: Requirements of this Section shall be analytically and mathematically proven, except for those requirements to be proven exclusively by physical testing methods. Calculations, related data and their application in engineering, fabrications, assembly and installation shall be the responsibility of the Contractor's Professional Engineer registered in the State of Illinois.

PART 2 - PRODUCTS

2.01 GENERAL FABRICATION REQUIREMENTS

- A. Materials for fabricated items of this Section shall be new and free from defects impairing strength, function, durability, or appearance, and of best commercial quality for purposes specified. Exposed-to-view surfaces exhibiting pitting, seam marks, roller mark, "oil canning" stains, discolorations or other imperfections on finished units are not acceptable. Stock materials, patterns, products or fabricated items of manufactures meeting the requirements of the Approved Shop Drawings and as herein specified will be acceptable if approved by the Engineer.
- B. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- C. Make straight sections free of bow or camber. Make bends to constant radii without causing buckle, collapse or cracking. Abrupt or sharp bends or transitions shall not be accepted.
- D. Forming shall be true to detail, clean, straight, with sharply defined profiles. Metals shall have smooth finished surfaces excepting where otherwise particularly specified.

- E. Welding: Follow AWS recommendations. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Grind exposed welds smooth so that no roughness shows after finishing.
- F. Shear and punch Work cleanly accurately. Remove burrs, barbs, splinters and sharpness; all edges and ends rolled, rounded, or capped.
- G. Make flush, tight, butt joints where not otherwise shown/specified. Locate joints where least conspicuous.
- H. Fit and trial assemble Work in the shop. Permanently shop assemble Work into the largest Section that meet shipping and field conditions. Use connections that maintain structural value of joined pieces.
- I. All joints shall be of such a character, and so assembled, that they will be as strong and rigid as adjoining sections. Joints required to be welded shall be continuously welded as specified and face of welds dressed flush and smooth. Spot welding is only allowed for temporary shop connections.
- J. Exposed joints shall be close fitting and jointing made where least conspicuous. Joints exposed to weather shall be formed to exclude water.
- K. Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.
- L. All work shall be fabricated to allow for expansion and contraction of materials.
- M. Work to be built-in with masonry or concrete work shall be of form required for anchorage or shall be provided with suitable inserts, anchors, expansion shields, etc., as indicated, specified, or necessary for proper anchorage.
- N. Furnish and set all supporting members, fastenings, framing, hangers, bracing, brackets, strap bolts, angles, and the like required to set and connect the work rigidly and properly to other construction.
- O. Finish metal fabrications after assembly and field verification that assembles fit.
 - 1. All work shall be manufactured in ample time so as not to delay the progress of the work and shall be delivered at the building at such time as required for proper coordination. Fabrication shall be in a thorough and workmanlike manner.

2.02 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified:
 - 1. Provide metal handrail manufactured by

- a. Chicago Railings (tel: 312.600.4911)
 - b. P+P Artec Inc. (tel: 630.860.2990)
 - c. Or approved equal
2. Provide metal guardrail manufactured by
 - a. Chicago Railings (tel: 312.600.4911)
 - b. P+P Artec Inc. (tel: 630.860.2990)
 - c. Or approved equal

2.03 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes. Surfaces exposed-to-view that exhibit pitting, seam marks, roller marks, "oil canning," stains, discoloration or other imperfections are not acceptable.
- B. Bolts, Hardware and Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise noted in the Drawings.

2.04 STEEL AND IRON

- A. Tubing: ASTM A500.
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.05 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Concrete Base Slab and Foundation: Refer to Section 03 30 50.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.07 FABRICATION, GENERAL

- A. Shop Assembly: Pre-assemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.08 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.09 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Comply with Division 01 requirements.
- B. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work.
- C. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

3.02 FABRICATION GENERAL

- A. Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.
 - 1. Structural load requirements shall conform to the State of Illinois Building Code. Design and support systems with a safety factor of at least 6 unless otherwise indicated.
 - 2. Ease exposed edges to a radius of approximately 1/32 inch unless indicated otherwise. Form bent corner to smallest radius possible without causing grain separation or impairing work.
 - 3. Remove sharp or rough areas on all exposed traffic surfaces.
 - 4. Weld seams continuously. Spot welding is permitted for temporary welding only.

- B. Work Exposed to View: Select materials with special care. Provide materials that are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joint. Form welded joints and seams continuously. Grind welds flush to be smooth.
- C. Verify grading and measure conditions at all site locations before fabrication.
- D. The design of all Site Metal Fabrications shall endeavor to keep site operations at a minimum. Manufacturing, finishing and assembly processes shall be, to the extent practicable, carried out off-site and under controlled environmental conditions.
- E. Fit and trail assemble Work in the hop. Permanently shop-assemble Work into the largest section that meets shipping and field conditions. Use connections that maintain structural value of joined pieces.
- F. Manufacturer's Standards: Materials, components and systems incorporated in the Work shall be mixed, applied, installed and otherwise used in strict accordance with the recommended standards and procedures of the respective manufacturers.
- G. Storage and Handling: Storage of materials, components and systems shall be in a dry, well-ventilated location. Handling of materials shall be kept to a minimum, and all materials shall be carefully protected from soiling, condensation and other harmful moisture.
- H. Thermal Cutting:
 - 1. Perform thermal cutting by machine. If a thermal cutting machine is impractical, thermal cutting may be done by hand provided that cut edges are not exposed to view.
 - 2. Plane thermally cut edges to be welded.
- I. Holes:
 - 1. Provide holes required for securing the Work and for passage of other Work through components specified in the Section as indicated on the approved shop drawings.
 - 2. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- J. Joining and Reinforcing:
 - 1. Accurately fit and firmly secure all exposed metal joints with metal-to-metal hairline contacts.
 - 2. Accurately mill ends framing members transmitting loads in bearing.
 - 3. All work shall be properly reinforced for hardware, anchors and other attachments.
 - 4. All fasteners shall be installed at an approved spacing.
 - 5. No self-drilling fasteners or explosive fasteners shall be permitted.

6. Shop install and tighten high-strength bolts according to RCSC's Specification for Structural Joints Using ASTM A325 or A490 Bolts. Connection type shall be snug-tightened unless otherwise required by the engineering design.
7. All jointing and splicing of members shall be concealed.
8. Exposed Fasteners:
 - a. Exposed fasteners shall occur only where expressly permitted on the approved Shop Drawings.
 - b. Spacing and location of all fasteners shall be as indicated in the approved Shop Drawings.
 - c. Where exposed in finished surfaces, fasteners shall be socket-head countersunk type screws, spanner head bolts, or socket head cap screws, as indicated on the Contract Documents and as indicated in the approved Shop Drawings.
 - d. All exposed screws and bolts in Guardrail System specifically noted on the Drawings shall be tamperproof with a design subject to review and as indicated in the approved Shop Drawings.

K. Welding:

1. All welding of steel shall be in accordance with the recommendations of the American Welding Society.
2. Steel welding shall be done by skilled mechanics qualified by test as prescribed in the American Welding Society code and as applicable to the material thickness and type of welded join on which the welders will be employed.
3. All welding shall be done with electrodes and/or methods recommended by the suppliers of the metals being welded. The type, size, and spacing of welds shall be as shown on the approved shop drawings. Welding materials and methods shall be such as not to cause distortion, discoloration, or result in any adverse effect on the required profiles and finishes of visible surfaces of the Architectural Metals.
4. All welds shall be continuous or shall be intermittent structural welds infilled with seal welds to form a continuous, uniform, watertight connection.
5. Weld splatter and welding oxides on exposed surfaces shall be removed. All exposed welds shall be finished to match and blend with adjacent parent metal prior to final finish application.
6. Stud welding shall be done by mechanics trained by the manufacturer of the stud setting system. The manufacturer shall develop specific programs and instructions in cooperation with the fabricator to suit the need of the specific details. The fabricator shall exercise particular care that all recommendations of the manufacturer are closely followed.
7. The visible marks such as telegraphing on finished surfaces due to welding of studs shall not be acceptable.

3.03 PREPARATION AND GENERAL INSTALLATION REQUIREMENTS

- A. Prior to start of installation, inspect the structure and verify all conditions and dimensions as being acceptable to receive the Work of this Section.
- B. Should any conditions be found that may prohibit proper execution of the Work, the Trade Contractor shall immediately notify the Engineer in writing of these conditions. Installation shall not proceed until remedial action, acceptable to the Engineer, has been executed.
- C. Install work per approved Shop Drawings; square, level, plumb, and true; free from distortion; and in proper relation to adjoining work. Provide all anchoring devices necessary to secure work to structure.
- D. Carefully fit and true work before joining and anchoring it. Make field joints and connections to standard specified for fabrication. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and direction as required for installation.
- E. Avoid field cutting or drilling. No Field Welding of stainless steel metal work will be allowed.
- F. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete shall be furnished loose by this trade to be built-into concrete by those trades. No field cutting or drilling is allowed.
- G. Anchorage: Install work in Cast-in-place concrete footing per the approved Shop Drawings. Bollards shall be plumb, level, and aligned as indicated in the drawings.
 - 1. Maximum offset from true horizontal, vertical and design location shall not exceed 1/8 inch per 12 feet nor 1/2 inch over any one length of the structure.
 - 2. Maximum offset from true alignment between components separated by less than 3 inches, shall not exceed 1/16 inch.
 - 3. Joint widths as noted in the Contract Documents are the design joint width at an ambient temperature of 70°F. Installation procedures shall be adjusted to take into account the ambient temperature at the time of installation.
 - 4. All tolerances are non-cumulative.
- H. Where not otherwise specified for a particular fabrication, anchor work as follows:
 - 1. To Hardened Concrete: Use expansion and bolts except where cast-in-anchors are specified. Shim and grout base plates.
 - 2. To Sleeves Cast in Hardened Concrete: Set and plumb work in grout-filled sleeves. Support work until grout is set.
- I. Grouting: Mix, place, install, consolidate, and cure grout per manufacturer's instructions. Clean up excess.

- J. Separate dissimilar metals with bushings, grommets or washers to prevent electrolytic corrosion.
- K. Install work per approved Shop Drawings; square, level, plumb, and true; free from distortion; and in proper relation to adjoining work. Provide all anchoring devices necessary to secure work to structure.
- L. Care shall be exercised to properly brace and reinforce prefabricated assemblies against racking during hoisting and installation.
- M. Provide temporary shores, guys, braces and other supports during erection to keep members secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent components, connections and bracing are in place unless otherwise indicated.
- N. Base and Bearing Plates:
 - 1. Clean concrete and masonry bearing surfaces of bond reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surfaces of base and bearing plates.
 - 2. Set base and bearing plates for structural members on shims as required.
 - 3. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but, if protruding, cut-off flush with edge of base or bearing plate prior to packing with grout.
- O. Anchors and Connections:
 - 1. Anchors and connections shall be provided to fully satisfy their required purpose of adjustability, movement and load transfer.
 - 2. Anchors and connections that do not provide for movement shall be of such movement by appropriate means.
 - 3. Anchors and connections that are designed for movement shall be of such construction that friction is low enough to allow for such movement without causing buckling and any other damage and without causing binding and noises.
 - 4. Self-drilling fasteners shall not be permitted.
 - 5. Powder actuated or explosive fasteners shall not be permitted.
 - 6. Metal surfaces shall be separated in such a manner that metal does not move on metal. Materials used for this purpose shall be low-friction components.
 - 7. Connections between different materials, or different alloys of the same metal, shall be designed to accommodate the differential thermal movement of the materials to be connected.
 - 8. All anchors, connections and fixings exposed to view shall be UNS S31600 stainless steel or shall be hot-dip galvanized and finish painted to match adjacent surfaces. All other anchors shall be hot-dip galvanized.
 - 9. Avoid excess shimming that may induce additional stress on the fastener. The total thickness (t) of a shim pack shall not exceed a dimension equal to the

diameter (d) of the fastener/anchor. Where $t > d$, the fastener/anchor shall be recalculated to take into account the additional stress form bending on the fastener with the assumption that the shim does not contribute to resistance to fastener while bending. Additional stress due to bending shall be added to tension stress and the tension/shear interaction analyzed.

10. Shim packs that only resist compressive forces may be high-impact plastic, Korolath type or equal. Shim pack subject to shear forces shall be doughnut-type stainless steel or hot-dip galvanized steel plates pinned together or interlocking high-impact plastic shims acting as a monolithic shim.
11. Terminate and tension cables in accordance with the manufacturer's instructions. Provide tamper-resistant locktight materials on all fittings.

3.04 CLEANING

- A. Remove temporary coverings and protection of adjacent work.
- B. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance. Do not use chlorine-based or abrasive cleaners.
- C. Remove from Project site and legally dispose of construction debris associated with this Work.

3.05 PROTECTION

- A. Protect installed products and finished surfaces from ongoing construction activities.
- B. Replace defective or damaged components as directed by the Engineer.

END OF SECTION

SECTION 26 00 00

GENERAL PROVISIONS FOR ELECTRICAL WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. General Specifications of the Contract apply to this Section.

1.2 RELATED SECTIONS

- A. Division 1.
- B. Division 26.

1.3 SUMMARY

- A. Provide: For the purposes of these Contract Documents, the word, “Provide” shall mean furnish, transport, deliver, install, test and commission.
- B. Project Completion: The Contractor shall provide all electrical material, labor, and equipment necessary to complete the installation depicted herein. The work shall include all instrumentation and control required to provide a complete and fully operational installation as specified herein.
- C. Testing: The Contractor shall be responsible for calibration, testing, setting, programming, coordination, and all other associated work required to provide a complete and fully operational installation of the equipment specified in these Contract Documents.
- D. Ancillary Work Required to Make Equipment Operational: It is intended that all new equipment and instruments furnished and installed, and all existing equipment affected, under this contract **be entirely operational**. In general, these Contract Documents have been prepared to show electrical and control connections to new and existing equipment. However, in the event that details of such connections are omitted in these Contract Documents, and unless specifically instructed otherwise, the Contractor shall provide all ancillary work even if not shown or described herein to ensure the proper operation of all equipment.
- E. Clarification of Contractor’s Responsibility: The readily foreseeable components of work are listed in the detailed specifications. Failure to list a necessary component of work under one of these Sections shall not relieve the Contractor from furnishing the same at no additional cost to the District, if it is essential for the completed installation as described herein.
- F. Contradictions between Contract Documents: Any required work that appears in one part of the Contract Documents but not in another, shall be considered to be required just

as if it appeared everywhere in the Contract Documents. If there is any discrepancy between this item and the General Specifications – Electrical (GSE) of this Contract, the provisions of this item shall govern. If one part of the Contract Documents directly contradicts another part, the Contractor shall immediately bring it to the attention of the Engineer in writing. The Reference Drawings are intended only to provide general information that may be of assistance.

- G. Connections and Details: The Contractor shall make necessary connections to all equipment, whether existing or furnished under this Contract, and shall furnish and install equipment where indicated. The Contract Specifications are not intended to cover every equipment and conduit detail. The Contractor shall, however, furnish any and all devices and appurtenances which are necessary to fully complete the entire work, whether said details are particularly specified or not.
- H. Avoid Interferences: It shall be the Contractor's responsibility to install all electrical material, apparatus, and equipment in a coordinated procedure that will permit the installation of the work without interferences. To avoid interferences in the installation of the work, certain offsets in and rerouting of electrical conduit, may be required. All such work as required shall be furnished and installed under this Item at no additional cost to the District.
- I. Ground Connection: Each electrical apparatus and frame shall be connected to the main ground bus as specified under Section 2.07 of the General Specifications – Electrical (GSE) and according to latest National Electric Code (NEC).
- J. Storage of Electrical Equipment: Electrical equipment shall be protected from the weather at all times, especially from water dripping or splashing upon it during shipment, storage, and construction. Equipment shall not be stored outdoors. Where equipment is installed or stored in moist areas, such as unheated buildings, etc., it shall be provided with an acceptable means to prevent moisture damage. This may be a uniformly distributed source of heat to prevent condensation, if approved by the Engineer. All electrical equipment having heaters shall have the heaters activated while the equipment is in storage.
- K. Substitution of Specified Equipment: Whenever the phrase "OR EQUAL" is used in the Contract Documents, it is understood that **this phrase means "OR APPROVED EQUAL."** Whenever the Contractor requests to substitute equipment that is "EQUAL" to a specified item, the approval of the substitution is contingent upon whatever additional testing and inspection as may be requested by the Engineer to independently substantiate the claim made by the Contractor that the substitute equipment is "EQUAL" to the specified item. All testing and inspection that is required by the Engineer shall be performed at the Contractor's expense. Any delay in the schedule due to the furnishing of additional information, testing and inspection of a non-specified item is the responsibility of the Contractor and shall not be used as a basis for requesting a time extension to the Contract.

- L. Underwriters Laboratories, Incorporated (UL) Label: Electrical devices and materials shall be listed and labeled by UL, wherever standards have been established by that agency. Mere indication that such devices conform to UL standards shall not be considered an acceptable substitute for UL listing and labeling. Where UL listing is not available for equipment, the Contractor shall, where applicable, submit certified test reports of an adequately equipped, recognized, independent testing laboratory, approved by the Engineer, indicating that the equipment is in conformance with local code requirements and any other applicable requirements.
- M. National Electrical Manufacturers Association (NEMA) Rating: All distribution and control electrical equipment (starters, contactors, disconnects, breakers, push-buttons, etc.) furnished on this Contract shall be NEMA rated. International Electrotechnical Commission (IEC) rated distribution and control electrical equipment is **not** acceptable.
- N. Nameplates: All equipment shall have the name or trademark of the manufacturer and the rating in volts and amperes and other pertinent information clearly marked thereon in a location where they can be readily observed after installation.
- O. Manufacturer's Recommendations: All equipment, instruments, appliances, and other apparatus shall be installed in accordance with the manufacture's recommendations. Listed or labeled equipment shall be used or installed in accordance with any instructions included in the listing or labeling.
- P. Electrical Cables and Wires: All wiring shall be in accordance with the National Electrical Code (NEC), Chicago Electrical Code (CEC) for work in the City of Chicago, and the appropriate sections of the General Specifications - Electrical (GSE). Wherever recommended tightening torque values for wire connections for use with field wiring have been published, the Contractor shall comply with those recommendations by using appropriate torque wrenches or torque screwdrivers.
- Q. Cable Pull Calculations: Contractor shall be responsible for preparing cable pull calculations to ensure that pulling tensions and cable sidewall pressure do not exceed cable manufacturer specifications. For certain cable pulls, the Engineer may require the Contractor to submit Cable Pull Calculations for approval.
- R. Electrical wires installed in conduits exposed to direct sunlight: All wires installed in conduits exposed to direct sunlight shall be XHHW-2. If any other type of wire is installed, the wire shall be de-rated as required by NEC.
- S. Disposal of Removed Items: The Contractor shall be responsible for the disposal of all removed items, unless instructed otherwise by the Contract Documents.
- T. Electrical Power for Construction: The contractor shall furnish all equipment, cables, conduit and labor for his own temporary electrical power.

- U. Utilities: Unless specified otherwise in Contract Documents, the Village will pay for all Commonwealth Edison Company and telephone company Excess Facility charges wherever such are imposed. The Contractor shall be responsible for coordination of the contract work with utility requirements. Refer to detailed specifications for additional requirements.
- V. Utilities Maintenance and Removal: The Contractor shall provide and maintain all equipment and material for temporary power, lighting, telephone, and Port-A-Let required during construction. The Contractor shall remove all debris and clean the site prior to final completion of the Contract.
- W. Safety of Personnel: Where work is required to be performed in areas close to electrically energized conductors, due care shall be exercised to protect the safety of personnel and to protect equipment from possible damage.
- X. Temporary Wiring: Temporary wiring will be required to keep certain equipment in operation during the progress of the work. The Contractor shall provide all required temporary wiring at no additional cost to the District.

1.4 REFERENCES/GOVERNING CODES

- A. Wherever applicable, the latest revisions of the codes, standards, and recommended practices of the following organizations shall govern the design, construction, installation, inspection, and testing of all work and materials.
- B. The publications and standards listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- C. If the referenced publications have been revised prior to contract award, the latest edition/revision shall be substituted for the referenced document.
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA 70, "National Electrical Code" (hereinafter referred to as NEC).
 - b. NFPA 70E, "Standard for Electrical Safety in the Workplace."
 - 2. Occupational Safety and Health Administration (OSHA).
 - 3. American Concrete Institute (ACI).
 - 4. American Institute of Steel Construction (AISC).
 - 5. American National Standards Institute (ANSI).
 - 6. American Society of Mechanical Engineers (ASME).
 - 7. American Society for Testing Materials (ASTM).

8. American Water Works Association (AWWA).
9. American Welding Society (AWS).
10. Illinois Department of Transportation (IDOT).
11. Institute of Electrical and Electronics Engineers (IEEE).
12. Insulated Cable Engineers Association (ICEA).
13. International Society of Automation (ISA).
14. International Electrical Testing Association (NETA)
15. Metropolitan Water Reclamation District of Greater Chicago (District).
16. National Association of Corrosion Engineers (NACE).
17. National Electrical Contractors Association (NECA).
18. National Electrical Manufacturer's Association (NEMA).
19. Refer to Division 16 specifications for supplemental references.

END OF SECTION

SECTION 26 00 01

SCOPE OF ELECTRICAL WORK

PART 1 – GENERAL

1.1 SUMMARY

- A. Under this Section, the Contractor shall provide all electrical material, labor, equipment, and services necessary for the installation of site lighting and control cabinet as shown in the contract drawings and Division 26 specifications.
- B. The Contractor shall be responsible for coordinating electrical work with other disciplines. Removal work, temporary relocation and installation of all electrical equipment, conduit, wire, and lighting shall be coordinated with Structural, Civil, Process, and Mechanical work planned under this Contract.

1.2 RELATED SECTIONS

- A. Division 1.
- B. Division 26.

1.3 RESTORATION

- A. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work to their original condition. Include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

1.4 SHOP DRAWINGS AND OTHER DOCUMENTS

- A. The Contractor shall provide shop drawings, electrical installation drawings, As-Built drawings and other related drawings as required by the General Specifications and the General Specifications - Electrical (GSE).
- B. Contractor shall confer with the Engineer in regard to questions it may have as to District methods, requirements on construction, installation, handling of drawings, and other related procedures.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volts and less.

1.02 DEFINITIONS

A. Underfloor Conduits.

1. Conduits run underground within perimeter of building walls under building floor. This may consist of 1 conduit, or several conduits grouped together.

B. Duct Bank Conduits

1. Conduits run underground outside perimeter of building walls. This may consist of 1 conduit, or several conduits grouped together.

C. Underground Conduits

1. Underground conduits are both underfloor conduits and duct bank conduits.

1.03 REFERENCES

A. NECA National Electrical Installation Standards (NEIS).

B. Metropolitan Water Reclamation District of Greater Chicago General Specifications: Electrical (GSE).

C. Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems (NETA ATS)

1.04 SUBMITTALS FOR REVIEW

A. Conductor testing results.

B. Product data.

C. Submit in accordance with Section 01 33 00.

1.05 QUALITY ASSURANCE

A. Items provided under this Section shall be listed or labeled by Underwriters Laboratories, Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.
2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

B. Regulatory Requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to National Electrical Manufacturers Association (NEMA) WC 26.

PART 2 – PRODUCTS

2.01 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as required to meet application and NEC requirements.

B. Wire and cable for 600 volts and below: Soft drawn, copper wire with 600 volt insulation.

1. Conductors:

- a. Annealed, copper in accordance with American Society for Testing and Materials (ASTM) B33.
- b. Stranding: Class B in accordance with ASTM B8.

2. Insulations and Coverings:

- a. Rubber: Conform to NEMA WC 3.
- b. Thermoplastic: Conform to NEMA WC 5.
- c. Cross-Linked Polyethylene: Conform to NEMA WC 7.
- d. Ethylene Propylene Rubber: Conform to NEMA WC 8.

C. Branch Circuits:

1. Single Conductor Type XHHW-2

2. No. 12 American Wire Gauge (AWG) minimum size (unless otherwise noted) for branch circuit wiring, including motor circuits.
3. Size 120 volt branch circuits for length of run on following basis.
 - a. 0 to 50 feet Run From Panelboard to first outlet: No. 12 AWG minimum.
 - b. 51 to 100 feet Run: Increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.
 - c. 101 to 150 feet Run: Increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.
 - d. 151 feet and above: Wiring sized for 3% maximum voltage drop.
4. For other branch circuits, voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of the NEC 215.

2.02 CONNECTORS AND SPLICES

- A. UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.
- B. Select to comply with Project's installation requirements and as required to meet application.
- C. Conductors No. 10 AWG and Smaller: 3M Electric Products, Skotchlok, or equal pre insulated spring connector. Comply with manufacturer's packaging requirements for number, size, and combination of conductors.
- D. Conductors No. 8 AWG and Larger: Bronze 2-bolt type connectors with spacer.

2.03 TERMINATIONS

- A. Power Conductors: Compression crimp type lugs.
- B. Control and Instrumentation Conductors: Compression crimp type fork tongue, insulated support type lugs on terminal strips. Do not splice.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and National Electrical Contractors Association (NECA) "Standard of Installation".
- B. Run wire and cable in conduit unless otherwise indicated on Drawings. Pull conductors into raceway simultaneously where more than 1 is being installed in same raceway.
 1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- C. Install cable supports for vertical feeders in accordance with NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- D. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie cables in individual circuits.
- E. Wiring at Outlets: Install with at least 12 inch (300 millimeter) of slack conductor at each outlet.
- F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.
- G. Drawings do not designate number of conductors in conduit nor does location of branch circuits and switch legs indicated on Drawings designate location or routing. Route branch circuits and switch legs as dictated by construction and these Specifications.

3.02 TERMINATIONS AND SPLICES

- A. Terminate control, instrumentation, and communication cables on terminal strips in separate terminal cabinets or as shown on Drawings.
- B. Power/Lighting Cable Splices (no splices in cables unless approved by Engineer):
 1. Provide continuous lengths of cable without splices in motor circuits and feeders unless otherwise noted. Splices may be installed in motor circuits and feeders with prior approval by Engineer.
 2. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
 3. Use splice and tap connectors that are compatible with conductor material.
 4. Where pre-insulated spring connectors are used for equipment connections, tape connector to wire to prevent loosening under vibration.
 5. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and finish wrap of color coding tape where required by code.
 6. Cable splices shall be made only in manholes, handholes, wireways, distribution boxes, and junction boxes.
- C. Power/Lighting Cable Terminations:

1. Termination of wires with full compression type lugs installed with appropriate hand or hydraulic tool. Use proper dies to achieve the desired compression.
2. For screw type terminal blocks, terminations for stranded conductors shall be made with T & B lock-on fork connector with insulated sleeves.

3.03 BRANCH/LIGHTING CIRCUITS

- A. Branch/Lighting circuits for single phase equipment devices from same Lighting Panel (LP) or Power Panel (PP) may be combined provided that such combining does not result in having to derate ampacity of conductors.

3.04 FEEDERS:

- A. Extend feeders at full capacity from origin to termination.
- B. Each conduit raceway shall contain only those conductors constituting single feeder circuit.
- C. Where multiple raceways are used for single feeder, each raceway shall contain conductor of each phase and neutral if used.
- D. Confine feeders to insulated portions of building unless otherwise shown.
- E. On network systems, neutral shall be run with phase wires. Unbalanced neutral current shall not exceed normal or derated conductor capacity.

3.05 CONTROL, COMMUNICATION AND SIGNAL SYSTEM IDENTIFICATION

- A. Install permanent wire marker at termination.
- B. Identifying numbers and letters on wire markers shall correspond to those on terminal blocks or wiring diagrams used for installing systems.
- C. Plastic sleeve or self adhesive vinyl cloth.

3.06 FEEDER IDENTIFICATION

- A. Manholes, handholes, pullboxes, and junction boxes, install metal tags on circuit cables and wires to clearly designate circuit identification and voltage.
- B. Provide tags of embossed brass type, in manholes and handholes showing cable type and voltage rating. Attach tags to cables with slip-free plastic cable lacing units.

3.07 FIELD QUALITY CONTROL

- A. Visual and Mechanical Inspection:

1. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
2. Test cable mechanical connections to manufacturer's recommended values using calibrated torque wrench.
3. Check cable color coding with specifications and NEC standards.

B. Electrical Tests:

1. Perform insulation-resistance (megger) test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts direct current for 1 minute. Investigate any value less than 50 megohms.
2. Perform continuity test to insure proper cable connection.
3. Perform tests on all conductors.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems.
2. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.02 REFERENCES

- A. Metropolitan Water Reclamation District of Greater Chicago General Specifications: Electrical (GSE).
- B. Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems (NETA ATS)

1.03 SUBMITTALS

- A. Product data.
- B. Submit in accordance with Section 01 33 00.

1.04 QUALITY ASSURANCE

- A. Comply with Underwriters Laboratories, Inc (UL) 467.
- B. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.
 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code (NEC), Article 100.
- C. Regulatory Requirements:
 1. NEC: Components and installation shall comply with National Fire Protection Association (NFPA) 70.

PART 2 – PRODUCTS

2.01 GROUNDING AND BONDING PRODUCTS

- A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, more stringent requirements and greater size, rating, and quantity indications govern.

2.02 WIRE AND CABLE GROUNDING CONDUCTORS

- A. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
 - 1. Material: Copper.
- B. Equipment Grounding Conductors: Insulated with green color insulation.
- C. Grounding-Electrode Conductors: Bare, Tinned, Stranded cable.
- D. Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.
- E. Bare Copper Conductors:
 - 1. Solid Conductors: American Society for Testing and Materials (ASTM) B3.
 - 2. Assembly of Stranded Conductors: ASTM B8.
 - 3. Tinned Conductors: ASTM B33.

2.03 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 3/0 American Wire Gauge (AWG) bare copper wire, terminated with copper ferrules.
- C. Bonding Straps: Soft copper, 0.05 inch (1 millimeter) thick and 2 inches (50 millimeters) wide, except as indicated.

2.04 CONNECTOR PRODUCTS

- A. Pressure Connectors: Copper, High-conductivity-plated units.
- B. Bolted Clamps: Copper Heavy-duty type.

- C. Exothermic-Welded Connections: Bronze. Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.05 GROUNDING ELECTRODES

- A. Grounding Rods: Copper-clad steel.

1. Size: 3/4 inch by 120 inches (19 by 3000 millimeters).

PART 3 – EXECUTION

3.01 APPLICATION

- A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.

1. Install equipment grounding conductor with circuit conductors for items below in addition to those required by Code:
 - a. Lighting circuits.

3.02 INSTALLATION

- A. Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Grounding Rods: Locate minimum of 1 rod length from each other and at least same distance from any other grounding electrode.
 1. Drive until tops are 2 inches (50 millimeters) below finished floor or final grade, except as otherwise indicated.
 2. Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.
- C. Grounding Conductors: Route along shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- D. Underground Grounding Conductors: Use bare tinned copper wire. Bury at least 24 inches (600 millimeters) below grade.

3.03 CONNECTIONS

- A. Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and copper mechanical clamps.
 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and copper mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make visible indication that connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.04 FIELD QUALITY CONTROL

- A. Testing: Upon completion of installation of ground-fault protection system and after electrical circuits have been energized, demonstrate capability and compliance with requirements..
- B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.05 RESTORATION

- A. Restore surface features, including vegetation, at areas disturbed by work of this Section.
 - 1. Re-establish original grades, except as otherwise indicated.
 - 2. Where sod has been removed, replace it as soon as possible after backfilling is completed.
 - 3. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition.
 - 4. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
 - 5. Maintain restored surfaces.
 - 6. Restore disturbed paving.

END OF SECTION

SECTION 26 05 33.13

CABINETS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Site Lighting Cabinet

1.02 DEFINITIONS

- A. Cabinets: Enclosure designed either for surface or for flush mounting and having frame, or trim in which door or doors may be mounted.
- B. Device Box: Outlet box designed to house receptacle device or wiring box designed to house switch.
- C. Enclosure: Box, case, cabinet, or housing for electrical wiring or components.
- D. Hinged Door Enclosure: Enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with walls of box.
- E. Outlet Box: Wiring enclosure where current is taken from wiring system to supply utilization equipment.
- F. Wiring Box: Enclosure designed to provide access to wiring systems or for mounting of indicating devices or of switches for controlling electrical circuits.

1.03 SUBMITTALS

- A. Product Data: Submit for cabinets and enclosures with classification higher than National Electrical Manufacturers Association (NEMA) 1.
- B. Submit in accordance with Section 01 33 00.

1.04 QUALITY ASSURANCE

- A. Items provided under this section shall be listed or labeled by Underwriters Laboratories, Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).
 1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electrical Code (NEC), Article 100.

B. Regulatory Requirements:

1. NEC: Components and installation shall comply with National Fire Protection Association (NFPA 70).

PART 2 – PRODUCTS

2.01 CABINETS, BOXES, AND FITTINGS, GENERAL

- A. Electrical Cabinets, Boxes, and Fittings: Of indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for use and location. Provide items complete with covers and accessories required for intended use. Provide gaskets for units in damp or wet locations.

2.02 MISCELLANEOUS MATERIALS AND FINISHES

- A. Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.
- B. Fasteners for Damp or Wet Locations: Stainless steel screws and hardware.
- C. Fittings for Boxes, Cabinets, and Enclosures: Conform to UL 514B. Malleable iron or zinc plated steel for conduit hubs, bushings and box connectors.

2.03 SITE LIGHTING CABINET

- A. Comply with UL 50 and NEMA ICS 6.
- B. Construction:
1. NEMA 4X 316 Stainless steel.
- C. Doors: Hinged directly to cabinet and removable, with approximately 3/4 inch flange around each edge, shaped to cover edge of box. Provide handle operated, key locking latch. Individual door width shall be no greater than 24 inch. Provide multiple doors where required.
- D. Mounting Panel: Provide painted removable internal mounting panel for component installation.
- E. Enclosure: NEMA 4X Pedestal. Where door gasketing is required, provide neoprene gasket attached with oil-resistant adhesive, and held in place with steel retaining strips. For enclosures of class higher than NEMA 1, use hubbed raceway entrances.

2.04 SITE LIGHTING CABINET COMPONENTS

A. Manufacturers:

1. Square D.
2. Eaton.
3. Or equal.

B. The following components shall be supplied and connected in the Site Lighting Cabinet:

1. Cabinet components shall be rated for minimum 30A.
2. Service rated 30A disconnect switch for a 240 VAC 1P service.
3. 3 Pole 30A circuit breaker.
4. Neutral Block and Ground Lug rated for minimum 30A.
5. Electromechanical Lighting contactor suitable for 3 240VAC 1P lighting circuits as indicated on the drawings.
6. MOV Surge Protection: 22,000 AIC.
7. 120V Receptacle located within the Cabinet.
8. Timer for lighting control.
9. Photocell for lighting control.
10. Hand-Off-Auto switch for manual lighting control.
11. Components shall be suitable for temperatures -25 to 55 degrees C.

C. Functional description:

1. Lighting control cabinet shall be wired to provide power and control to up to three 240V 1P lighting circuits. Lighting circuits shall be controlled with either a photocell or timer based on user selection, and have a bypass Hand-Off-Auto switch for manual lighting control.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

- A. Locations: Install items where indicated and where required to suit code requirements and installation conditions.
- B. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
- C. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.
- D. Remove sharp edges where they may come in contact with wiring or personnel.

3.02 INSTALLATION OF CABINETS AND HINGED DOOR ENCLOSURES

A. Mount Cabinet as indicated.

B. Terminate wires and cables on terminal strips.

3.03 GROUNDING

A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes grounding conductor, provide grounding terminal in interior of cabinet, box or enclosure.

3.04 CLEANING AND FINISH REPAIR

A. Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.

END OF SECTION

SECTION 26 05 33.16

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Raceways:
 - a. Reinforced Thermosetting Resin Conduit (RTRC).

1.02 DEFINITIONS

A. Underground Conduits

1. Underground conduits are both underfloor conduits and duct bank conduits.

1.03 REFERENCES

- A. Metropolitan Water Reclamation District of Greater Chicago General Specifications: Electrical (GSE).
- B. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated and Stainless-Steel Conduit.
- C. NECA National Electrical Installation Standards (NEIS).
- D. National Electric Manufacturers Association (NEMA):
 1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
 2. NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 3. NEMA TCB 2 – Guidelines for the Selection and Installation of Underground Nonmetallic Raceways.
 4. NEMA TC 14 – Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
- E. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Bodies for Conduit and Cable Assemblies.
- F. National Fire Protection Association (NFPA)
 1. NFPA 70 – National Electrical Code (NEC).
 2. NFPA 70E – Standard for Electrical Safety in the Workplace.

G. Underwriters Laboratories, Incorporated (UL) 1684 – Reinforced Thermosetting Resin Conduit: Type RTRC.

1.04 QUALITY ASSURANCE

A. Items provided under this section shall be listed or labeled by Underwriters Laboratories, Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.
2. Terms "listed" and "labeled" shall be as defined in National Electrical Code (NEC), Article 100.

B. Regulatory Requirements:

1. NEC: Components and installation shall comply with National Fire Protection Association (NFPA) 70.

C. Comply with National Electrical Contractors Association (NECA) "Standard of Installation."

1.05 SUBMITTALS

A. Product data.

B. Manufacturer's installation instructions

C. Submit in accordance with Section 01 33 00.

PART 2 – PRODUCTS

2.01 REINFORCED THERMOSETTING RESIN CONDUIT

A. Manufacturers:

1. Champion Fiberglass.
2. United Fiberglass.
3. Or approved equal.

B. Description:

1. Conduit:

- a. Conduit shall be manufactured from reinforced thermosetting resin.
- b. Conduit shall be IPS based and sized per standard electrical trade size. Conduits shall not be tapered.

- c. Nominal minimum wall thickness: 3/4 inch – 4 inch = .070 inches (Standard wall).
- d. The conduit shall be free from defects including delamination, foreign inclusions, etc. It shall be nominally uniform (as commercially practical) in color, density and physical properties.
- e. The conduit shall be straight, and the ends shall be cut square to the inside diameter.
- f. No mitered fittings will be allowed.
- g. Conduit and fittings shall be pigmented black.

2. Environmental:

- a. UL 2515 listed or TC 14 compliant for above ground and below ground.
- b. Temperature Range: -60 degrees Fahrenheit to 250 degrees Fahrenheit.
- c. The conduit and fittings shall be manufactured with carbon black as a component of the UV inhibitor(s) required to meet the requirements of UL 2515 or NEMA TC14.

3. Conduit Joints:

- a. Underground in duct bank: Bell and spigot joined with two-part adhesive or triple seal gasket.
- b. Above ground: Bell and spigot joined with two-part adhesive.
- c. Field Cut: Field cut joints shall utilize a stop coupling.
- d. Factory installed conduit couplings may be substituted for conduit bells.

- 4. Conduit Bodies: Manufactured of compressed molded vinyl ester resin with a high glass content. All conduit body hardware shall be stainless steel.
- 5. Accessories: All hubs, fittings, expansion joints, connectors, and accessories shall be supplied by the same conduit manufacture to form a complete raceway system.
- 6. Bends: Conduit bends and offsets shall be factory manufactured from the same material as the conduit. Field bends are only acceptable as a limited supplement, and only when performed per manufacture's recommendations using appropriate forms for the intended purpose. Bends shall be tested and certified to be watertight.
- 7. Above Ground Expansion Joints: A minimum of one expansion joints shall be installed for every 200 feet of conduit installed. Expansion joints shall be installed at every building expansion joint regardless of distance.
- 8. It shall be possible to field bend the RTRC conduits with the use of standard PVC hotbox.
- 9. RTRC conduit and fittings shall be UL listed.

2.02 FITTINGS

A. RTRC Conduit Fittings:

1. NEMA TC 14:

- a. Watertight: Conduit joints and fitting joints shall use manufacturer's epoxy adhesive for a permanent watertight bond.

2.03 RACEWAY/DUCT SEALING COMPOUND

- A. Nonhardening, putty-like consistency workable at temperatures as low as 35°F.
- B. Compound shall not slump at temperature of 300 °F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive raceways, wireways, and fittings for compliance with installation tolerances and other conditions affecting performance of raceway system.
- B. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

3.02 WIRING METHODS

- A. Outdoors, Damp or Wet Locations: Use following wiring methods unless otherwise noted on Drawings:
 - 1. Exposed/Stub-up: RTRC.
 - 2. Concealed: RTRC.
 - 3. Underground Power and Control, Single Run: Rigid nonmetallic RTRC conduit.
- B. Underground conduits:
 - 1. Underground conduit shall be minimum of 1 inch, buried at depth of not less than 24 inch below grade.
 - 2. Provide conduits or ducts terminating below grade with means to prevent entry of dirt and moisture.

3.03 INSTALLATION

- A. Install and route conduit as required to meet project conditions.
- B. Install new conduit in accordance with NECA (NEIS), local applicable codes, and the manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit as shown on “Standard Electrical Details - Sheet B” of the Contract Plans.

- E. Group related conduits; support using conduit rack. Provide space on each rack for 25 percent additional conduits. All conduit mounting hardware, such as strut, bolts, nuts, clamps, etc., shall be type 316 stainless steel.
- F. Arrange conduit to maintain headroom and present neat appearance.
- G. Route exposed conduit parallel and perpendicular to walls.
- H. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- I. Route conduit in and under slab from point-to-point.
- J. Do not cross conduits in slab.
- K. Maintain adequate clearance between conduit and piping.
- L. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees Fahrenheit (40 degrees Celsius).
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings and fasten securely.
- O. Join nonmetallic conduit using cement or two-part adhesive as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat to entire area inserted in fitting. Allow joint to cure for a minimum of 20 minutes before applying stress to the joint. The interior bore shall be free of hardened adhesive that would damage conductors. The conduit shall be cleaned prior to installation of conductors.
- P. Use conduit hubs to fasten conduit to boxes in damp and wet locations.
- Q. Install no more than the equivalent of three 90-degree bends between boxes. Use conduit bodies or junction boxes to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or use factory elbows for bends in metal conduit larger than 1.25-inch (30 mm) size.
- R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- S. Provide suitable fittings and grounding straps to accommodate expansion and deflection where conduit crosses expansion joints.
- T. Provide all nipples as required.
- U. Provide suitable pull string in each empty conduit except sleeves and nipples.
- V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

- W. Ground and bond conduit under provisions of Section 26 05 26.
- X. Provide insulating couplings where the contact of dissimilar metals may result in galvanic corrosion. Ensure that system grounding is not compromised.
- Y. Use existing conduit racks and cable trays where possible and not in violation of Regulatory Requirements.
- Z. Add stainless steel conduit identification tags on all new conduits.
- AA. Conduits, pipes, and sleeves passing through a slab or wall shall not impair significantly the strength of the concrete.
- BB. Conduit penetrations through walls and floors shall have the core hole sealed with a fire barrier caulk sealant.
- CC. Conduits and pipes embedded within a slab, wall or beam (other than just passing through) shall satisfy the following:
 - 1. They shall not be larger in outside dimension than one-third the overall thickness of the slab, wall, or beam in which they are embedded.
 - 2. They shall not be spaced closer than three diameters or widths on center.
 - 3. They shall not significantly impair the strength of the construction.
 - 4. Concrete cover for pipes, conduits and fittings shall not be less than two inches for concrete exposed to contained liquids, 1.5 inches for concrete exposed to earth or weather, nor less than three-quarter inch for concrete not exposed to contained liquids, weather, or in contact with ground.
 - 5. Piping and conduit shall be so fabricated and installed so that cutting, bending, or displacement of reinforcement from its proper location will not be required.
- DD. Provide a union within three feet of load device to allow conduit to be easily disconnected. If a conduit seal is required, install union between conduit seal and device.

3.04 CONDUIT BENDS

- A. Make bends and offsets so inside diameter is not reduced. Unless otherwise indicated, keep legs of bend in same plane and straight legs of offsets parallel.
- B. Provide NEMA standard conduit bends, except for conduits containing medium voltage cable, fiber optic cable, or conductors requiring large radius bends.

3.05 FITTINGS

- A. Use raceway fittings compatible with raceway and suitable for use and location.

3.06 GROUNDING

- A. Ground in accordance with Section 26 05 26.
- B. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

3.07 EXCAVATION AND BACKFILL

- A. Conform to Section 31 23 16 except as modified below:
 - 1. Do not use heavy-duty, hydraulic-operated compaction equipment.
 - 2. Excavation: Cut trenches neatly and uniformly, and slope uniformly to required pitch.
 - 3. For direct-buried, nonencased ducts prepare trench bottoms free from stones, soft spots, and sharp objects. Where necessary, add 3 inch layer of stone-free sand or earth to trench bottom and compact to density of adjacent undisturbed soil to provide suitable bearing for ducts. Backfill over and around ducts on bottom of trench with stone-free sand or earth to 6 inch minimum above tops of ducts and compact by hand or pneumatic tamper to density of adjacent undisturbed earth.

3.08 PROTECTION

- A. Provide final protection and maintain conditions, in manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

3.09 CLEANING

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 05 90

ELECTRIC UTILITY SERVICES

PART 1 – GENERAL

1.01 SUMMARY

A. Electric Utility Charges:

1. Contractor shall be responsible for Electric Utility charges for extension of Electric Utility distribution system to point of services, termination, and meters.

1.02 DEFINITIONS

A. Electric Utility: Com-Ed

1.03 Regulatory Requirements:

1. National Fire Protection Association (NFPA):
 - a. NFPA No. 70 - National Electrical Code (NEC).

PART 2 – PRODUCTS

2.01 ELECTRIC SERVICE

A. Electric Service Characteristics:

1. As indicated on Drawings and provided by Electric Utility.

PART 3 – EXECUTION

3.01 PREPARATION

A. Confirmation of Electric Service:

1. Consult with Electric Utility to verify service information specified and shown on Drawings.
2. Include deviations required by Electric Utility from contract documents to comply with Electric Utility standards and requirements.

B. Metering:

1. Consult with Electric Utility regarding service entrance requirements and metering equipment.

2. Install metering equipment and empty conduit for metering conductors to meet standards and requirements of Electric Utility.

C. Application for Electric Service.

1. Obtain required forms from Electric Utility.
2. Assist Owner in completion of forms and deliver completed forms to Electric Utility.
3. Coordinate schedule for installation of electric service with Electric Utility.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior lighting fixtures.
2. Lamps.
3. Pole standards.
4. Accessories.

1.02 DEFINITIONS

- A. Fixture: Complete lighting device. Fixtures include lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.
- B. Lighting Unit: Fixture or assembly of fixtures with common support, including pole or bracket plus mounting and support accessories.
- C. Luminaire: Fixture.
- D. CCT: Correlated color temperature.
- E. CRI: Color rendering index.
- F. IP: International Protection or Ingress Protection Rating.
- G. Lumen: Measured output of lamp and luminaire, or both.

1.03 REFERENCES

- A. Illuminating Engineering Society of North America (IESNA) or Illuminating Engineering Society (IES).
 1. LM-79-08 (or latest), IESNA Approved method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 2. LM-80-08 (or latest), IESNA Approved Method for Measuring Lumen Maintenance of Light Emitting Diode (LED) Light Sources.
 3. TM-21-11, IESNA Projecting Long Term Lumen Maintenance of LED Light Sources.

- B. Underwriters Laboratories, Incorporated (UL).
 - 1. UL 844 – Luminaires for Hazardous Locations.
 - 2. UL 1598 – Standard for Luminaires.
 - 3. UL 8750 – LED Equipment for Use in Lighting Products.
- C. National Electrical Manufacturers Association (NEMA).
 - 1. American National Standards Lighting Group C78.377-2008 (or latest), American National Standard for the Chromaticity of Solid-State Lighting Products.
 - 2. WD 6 – Wiring Devices – Dimensional Requirements.
- D. National Fire Protection Association (NFPA)
 - 1. NFPA 70 – National Electrical Code (NEC).
 - 2. NFPA 101 – Life Safety Code.

1.04 SUBMITTALS

A. Product Data:

- 1. Describe fixtures, lamps, ballasts, poles, and accessories. Arrange Product Data for fixtures in order of fixture designation. Include data on features, poles, accessories, finishes, and following:
 - Outline drawings indicating dimensions and principal features of fixtures and poles.
 - Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.

1.05 QUALITY ASSURANCE

A. Comply with American National Standards Institute (ANSI) C2.

B. Items provided under this section shall be listed or labeled by Underwriters Laboratories, Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).

- 1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.
- 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

C. Regulatory Requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

1.06 STORAGE AND HANDLING OF POLES

- A. Store poles on decay-resistant treated skids at least 12 inch (300 millimeter) above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.
- B. Wood Poles: Do not drag treated poles along ground. Do not handle poles with tongs, cant hooks, and other pointed tools capable of producing indentation more than 1/4 inch (6 millimeter) in depth. Do not apply tools to ground-line section of poles.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. See Fixture Schedule on drawings.

2.02 FIXTURES AND FIXTURE COMPONENTS

- A. Metal Parts: Free from burrs, sharp edges, and corners.
- B. Sheet Metal Components: Corrosion-resistant aluminum, except as otherwise indicated. Form and support to prevent warping and sagging.
- C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.
- D. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UltraViolet (UV) radiation.
- E. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
- F. Light Emitting Diodes (LED)
 1. Driver shall be accessible for easy replacement.
 2. Weatherproof fixture housing shall be sealed completely against moisture and environment contaminants.
 3. Color rendering index (CRI) greater than 70.
 4. LED driver shall have power factor greater than 90% and THD less than 20%.
 5. CSA Certified to US standards for 40°C ambient.

2.03 FIXTURE SUPPORT COMPONENTS

- A. Pole-Mounted Fixtures: Conform to American Association of State Highway and Transportation Officials (AASHTO) LTS-3.
- B. Wind-load strength of total support assembly, including pole, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 Miles per Hour (mph) (160 Kilometers per Hour (km/h)) with gust factor of 1.3.
- C. Arm, Bracket, and Tenon Mount Materials: Match poles.
- D. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.
- E. Pole Shafts: Square, straight.
- F. Pole Bases: Embedded type with underground cable entry.
- G. Laminated-Wood Poles: Pressure treat with pentachlorophenol preservative. Equip with concealed raceway path connected to access handhole.
- H. Wood Pole Brackets: Conform to ANSI C136.13.
- I. Pole-Top Tenons: Fabricated to support fixture or fixtures and brackets indicated and securely fastened to pole top.

2.04 FINISHES

- A. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
- B. Other Parts: Manufacturer's standard finish, except as otherwise indicated.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Set units plumb, square, level, and secure according to manufacturer's written instructions and approved submittals.
- B. Embedded Poles: Set poles to indicated depth, but not less than 1/6 of pole length below finish grade. Dig holes large enough to permit use of tampers the full depth of hole. Backfill in 6 inch (150 millimeter) layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- C. Pole Installation: Use web fabric slings (not chain or cable) to raise and set poles.

- D. Fixture Attachment: Fasten to indicated structural supports.
- E. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.02 GROUNDING

- A. Ground fixtures and metal poles according to Section 26 05 26.
 - 1. Poles: Install 10 feet (3 meters) driven ground rod at each pole.
 - 2. Nonmetallic Poles: Ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged fixtures and components.
- B. Tests and Observations:
 - 1. Give advance notice of dates and times for field tests.
 - 2. Provide instruments to make and record test results.
- C. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.

3.04 ADJUSTMENTS AND CLEANING

- A. Clean units after installation. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Subsoil materials.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 31 20 00 – Earthwork
4. Section 31 23 15 – Excavation, Backfill, and Compaction for Buildings and Structures
5. Section 31 23 16 – Trench Excavation, Backfill, and Compaction.
6. Section 32 91 13 – Planting Soils
7. Section 32 91 19 – Landscape Earthwork
8. Section 32 93 00 – Planting and Fine Grading
9. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. State of Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition including Supplemental Specifications (Standard Specifications).

B. ASTM International (ASTM):

1. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700 kN-m/m³))
2. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
3. ASTM D5268 – Standard Specification for Topsoil Used for Landscaping Purposes.
4. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

- B. Contractor shall provide name and qualifications of selected independent testing agency to the MWRD prior to commencement of Work. Contractor shall pay all costs related to soil type verification testing.
- C. Independent testing laboratory shall conduct testing on soils proposed for use as fill or backfill in accordance with the following ASTM standards;
 - 1. ASTM D2487 – Laboratory test reports for soil classification analysis.
 - 2. ASTM D5268 – Laboratory test reports for topsoil classification analysis.
 - 3. ASTM D1557 – Laboratory test reports and analysis for soil maximum dry density and optimum water content.
 - 4. ASTM D6938 – Laboratory test reports and analysis for in-place density and water content of soil.
- D. Submit test reports to the MWRD for review.
- E. Any additional testing due to submission of incorrect material shall be paid for by the Contractor.
- E. Samples: Submit, in airtight containers, 10 lb. sample of fill to testing laboratory.
- F. Materials Source: Submit name of source of imported materials.

PART 2 – PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1:
 - 1. Site excavated soils conforming to the following requirements:
 - a. A well graded combination of gravel, sand, and a limited amount of high plasticity soil. The material shall have at least 30% by weight retained on the No. 4 sieve, and not more than 12% passing the No. 200 sieve (ASTM D6913).
 - b. No gravel or stone shall be larger than 4 inches.
 - c. The material shall be free from trash, construction debris, brick, broken concrete, tree roots, sod, ashes, cinders, ice, or frozen materials.
 - d. The material shall be free of lumps larger than three (3) inches.
- B. Subsoil Type S2:
 - 1. Imported or local borrow; structural.
 - a. A well graded combination of gravel, sand, and a limited amount of high plasticity soil. The material shall have at least 30% by weight retained on the No. 4 sieve, and not more than 12% passing the No. 200 sieve (ASTM D6913).
 - b. No gravel or stone shall be larger than 4 inches.
 - c. The material shall be free from trash, construction debris, brick, broken concrete, tree roots, sod, ashes, cinders, ice, or frozen materials.
 - d. The material shall be free of lumps larger than three (3) inches.
 - e. Imported subsoil and borrow shall be similar in composition when compared to existing site subsoil.

2.3 SOURCE QUALITY CONTROL

- A. Testing and analysis of subsoil material shall conform to Section 01 40 00 – Quality Requirements.
- B. When tests indicate materials do not meet specified requirements, change material and retest.
- C. Furnish materials of each type from same source throughout the Work. Changes in material source require approval by the MWRD.
- D. Off-site borrow Backfill material shall be tested to meet the Illinois Tiered Approach to Corrective Action Objectives Tier 1 Soil Remediation Objectives for Residential Properties at a frequency of once per 250 cubic yards.
- E. A minimum of one set of classification tests shall be performed per borrow source.
- F. Backfill shall not be used until borrow source chemical and physical test results have been submitted and approved.

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate materials.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications, and Detailed Technical Specifications utilized for this project.
3. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. State of Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

B. ASTM International (ASTM):

1. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
2. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700 kN-m/m³))
3. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. AASHTO

1. T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Sieve analysis performed in accordance with ASTM C136 or AASHTO T27 indicating conformance with gradation specified.

2. Materials Source: Supplier shall be on the IDOT list of approved suppliers.

C. Test results:

2. ASTM D1557 – Laboratory test reports and analysis for aggregate maximum dry density and optimum water content.
3. ASTM D6938 – Laboratory test reports and analysis for in-place density and water content of soil.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the IDOT Standard Specifications except as modified herein.

PART 2 – PRODUCTS

2.1 AGGREGATE MATERIALS

- A. Aggregate Type A1 (Gravel): Crushed Gravel: free of organic matter and debris; CA-6 or CA-10, Class A quality level in accordance with the IDOT Standard Specifications.
- B. Aggregate Type A2 (Gravel): Crushed Gravel: free of organic matter and debris; CA-7 or CA-11, Class A quality level A in accordance with the IDOT Standard Specifications.
- C. Aggregate Type A3 (Recycled): Crushed Concrete; free of from wood, steel, roots, bark or other extraneous material; CA-10 in accordance with the IDOT Standard Specifications.
- D. Aggregate Type A4 (Recycled): Crushed Asphaltic Concrete; free of from wood, steel, roots, bark or other extraneous material; CA-10 in accordance with the IDOT Standard Specifications.
- E. Aggregate Type A5 (Stone): Crushed Stone; free of clay, shale, organic matter; CA-7 or CA-11, Class A quality level in accordance with the IDOT Standard Specifications.
- F. Aggregate Type A6 (Pipe Bedding): Crushed stone; free of clay, shale, organic matter; CA-11 or CA-13 in accordance with the IDOT Standard Specifications.
- G. Aggregate Type A7 (Pea Gravel): Fractured, washed, free of clay, shale, organic matter; graded in accordance with the following limits:
1. Minimum Size: one-quarter inch (1/4").
 2. Maximum Size: three-eighths inch (3/8").
- H. Aggregate Type A8 (Granular Fill): Natural gravel/stone; free of clay, shale, organic matter; CA-2 in accordance with the IDOT Standard Specifications.
- I. Aggregate Type A9 (Bank Run Sand/Gravel): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with Section 1003 – Gradation FA-5 and Section 1004 – Gradation CA-3 of the IDOT Standard Specifications.

- J. Aggregate Type A10 (Bedding Sand): Unwashed bank-run sand or rejected concrete sand, free of silt and clay or loam lumps; graded in accordance with Section 1003 – Gradations FA-1, FA-2, FA-6 through FA-21 of the IDOT Standard Specifications.
- K. Aggregate Type A11 (Sand Fill): Natural river or bank sand; free of silt, clay, or loam, friable or soluble materials, or organic matter; consisting of durable particles ranging in size from fine to coarse in uniform combinations; maximum moisture content shall be ten percent (10%), graded in accordance with Section 1003 – Gradation FA-20 of the IDOT Standard Specifications.
- L. Aggregate Type A12 (PGE – Porous Granular Embankment): Crushed Stone; free of clay, shale, organic matter; CA-18 in accordance with the IDOT Standard Specifications.
- M. Aggregate Type A13 (Crushed Stone Surfacing): Crushed aggregate material consisting of one-hundred percent (100%) crushed native material and buff in color as typically found in the Fox River valley of Northern Illinois and Southern Wisconsin; graded in accordance with Section 1003 – Gradation FA-21 of the IDOT Standard Specifications. Limestone screenings are not acceptable. Furnished material shall be obtained from one of the following locations:
 - 1. Meyer Material Company
Dyer Lake, Wisconsin Quarry
815-385-4920
 - 2. Thelen Sand and Gravel
Route 173 (North Pit)
Antioch, Illinois
Prime Bike Path Mix
847-395-3313
 - 3. Payne & Dolan, Inc.
28327 W. Route 173
Antioch, IL 60002
Prime Bike Path Mix
847-838-3700
 - 4. Or approved equal.

2.2 SOURCE QUALITY CONTROL.

- A. Testing and analysis of aggregates shall conform to Section 01 40 00 – Quality Requirements.
- B. When tests indicate materials do not meet specified requirements, change material or material source and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 31 05 19

GEOSYNTHETICS FOR EARTHWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Contract Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

A. Section Includes:

- 1. Geotextile fabric.
- 2. The Contractor shall furnish all labor, materials, tools, equipment, and all other appurtenant items required for furnishing and installing geotextile fabric, as indicated in the Drawings and as specified herein.

B. Related Sections

- 1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
- 2. Section 31 20 00 – Earthwork
- 3. Section 31 25 00 – Erosion Control
- 4. Section 32 91 13 – Planting Soils
- 5. Section 32 93 00 – Planting and Fine Grading
- 6. Section 31 37 00 – Riprap
- 7. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
- 8. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. ASTM International:

- 1. ASTM D422 Standard Method for Particle Size Analysis for Soils
- 2. ASTM D4632 Standard Method for Grab Breaking Load
- 3. ASTM D3776 Standard Test Method for Mass Per Unit Area (Weight) of Fabric
- 4. ASTM D3786 Standard Method for Bursting Strength of Textile Fabrics
- 5. ASTM D5733 Standard Method for Trapezoidal Tear Strength
- 6. ASTM D4491 Standard Method for Water Permeability of Geotextiles
- 7. ASTM D4751 Standard Method for Apparent Opening Size of a Geotextile

8. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

1.3 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for Submittals.
- B. The Contractor shall submit material samples and product certifications for all materials provided under this Section.

PART 2 – PRODUCTS

2.1 PRODUCT DESCRIPTION

- A. The geotextile fabric material shall consist of nonwoven filaments formed from a plastic yarn of a long chain synthetic polymer composed of at least eighty-five percent (85%) by weight of polyolefins or polyesters, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. After forming, the fabric shall be processed so that the filaments retain their relative positions with respect to each other. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties.
- B. The geotextile fabric shall be formed in widths of not less than six feet (6'). Sheets of fabric may be sewn together with thread of a material meeting the chemical requirements given for the plastic yarn to form the fabric widths required. The sheets of geotextile fabric shall be sewn together at the point of manufacture or another approved location.
- C. The texture of the fabric shall be such that the bedding and riprap will remain in an equilibrium state and not slip or slide. The geotextile fabric shall be rot proof, mildew proof, insect resistant, have a high dimensional stability when set, have good soil filtration characteristics, have a high resistance to tear propagation in all directions, and be according to the following:

Physical Properties	Riprap
Weight of Fabric (oz/sq yd), ASTM D 3776 (Mod.)	6.0
Burst Strength (psi), ASTM D 3786 ^{1/}	250
Trapezoidal Tear Strength (lb), ASTM D 5733 ^{2/}	60
Grab Tensile Strength (lb), ASTM D 4632 ^{2/}	160
Grab Tensile Elongation (%), ASTM D 4632 ^{2/}	20

1/ Manufacturer's certification of fabric to meet requirements.

2/ Test sample shall be tested wet.

The vendor shall furnish certified test reports with each shipment of material attesting that the fabric meets the above requirements.

A five (5) square yard sample of the fabric shall be furnished from each shipment for quality control at the request of the Engineer.

- D. The fabric shall meet the requirements noted in the following and provide an apparent opening size (AOS) determined by the Engineer after an on-site investigation of the soil to be protected, based on the following criteria.
1. Piping Resistance. (soil retention)
 - a. Soil with fifty percent (50%) or less particles by weight (mass) passing U.S. No. 200 Sieve. AOS less than 0.6 mm (greater than No. 30 Sieve) TF25 Method 6.
 - b. Soil with more than fifty percent (50%) particles by weight (mass) passing U.S. No. 200 Sieve. AOS less than 0.3 mm (greater than No. 50) TF 25 Method 6.
 2. Permeability. (cm/sec) K of fabric greater than 10K of soil – ASTM D 4491.
 3. Certification from the manufacturer of fabric is required stating that the product meets the piping resistance and permeability requirements.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The surface of the subgrade where the fabric is to be placed shall be smooth, even, and sloped as shown on the Drawings. The surface shall be free of projections or any objects which may prevent the fabric from lying flat and in full contact with the subgrade.
- B. The surface of the subgrade shall be free of standing water at the time of placement of the fabric.

3.2 INSTALLATION

- A. Prepare the subgrade to the required grade and slope.
- B. Where required, the fabric shall be overlapped a minimum of twenty-four inches (24") or as required by the manufacturer's instructions, whichever is greater. Laps shall be fastened or sealed according to the manufacturer's instructions.
- C. Geotextile fabric used for riprap applications shall be keyed in per Section 31 37 00 Riprap.
- D. Geotextile fabric shall be protected from sunlight, moisture, and construction equipment according to the manufacturer's instructions.

END OF SECTION

SECTION 31 11 00

SITE CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes removal of existing trees, brush, vegetation, debris, and other miscellaneous materials in areas of grading and other Work.
- B. Related Documents:
 - 1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.
- C. Related Sections:
 - 1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
 - 2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
 - 3. Section 02 41 13 – Site Demolition.
 - 4. Section 31 20 00 – Earthwork.
 - 5. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

- A. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplement Specifications (Standard Specifications).
- B. The Urban Committee of the Association of Illinois Soil and Water Conservation Districts:
 - 1. Illinois Urban Manual.

1.3 DEFINITIONS

- A. Tree: Woody perennial plant, single main stem with trunk. Multiple-stem trees with forks up to four (4) feet from ground elevation shall be considered a cluster of trees. Trees that fork above four (4) feet shall be considered a single tree.
- B. Root Zone: Area around a tree extending as far from tree base as longest horizontal branches.
- C. Surface Water: Water that flows through ditch lines, creeks, and streams by gravity.
- D. Grubbing: To clear project site by removing roots and stumps.
- E. Clearing: Clearing shall consist of the removal and disposal of all obstructions such as

fences, walls, foundations, buildings, accumulations of rubbish of whatever nature, existing structures, logs, herbaceous and woody vegetation, stumps, and other such materials.

- F. Clearing Limits: Area designated on Drawings where earthwork including excavation, grading, and placement of fill are to occur.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 - Submittal Procedures.
- B. Contractor to submit current licensing documentation for firms and/or persons as required to perform scope noted herein.
- C. Product data: Submit the following to the MWRD Engineer for each product to be used during work of this section:
 - 1. Material Safety Data Sheets (MSDS).
 - 2. Manufacturer's label.
- D. An herbicide record shall be maintained by the Contractor and submitted at the completion of the Work of this section. This record shall document, at the time of each herbicide application, temperature range, percent humidity, wind speed and direction, last precipitation event and amount, type of herbicide used, amount of herbicide used, number of hours spent applying herbicide, and name(s) and license numbers of all those applying herbicides.

1.5 REGULATORY REQUIREMENTS

- A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- B. Contractor shall comply with the Urban Committee of the Association of Illinois Soil and Water Conservation Districts - Illinois Urban Manual.
- C. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- D. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.
- E. Conform to applicable code for environmental requirements, disposal of debris, and burning debris on site.
- F. Coordinate clearing Work with utility companies.

PART 2 – PRODUCTS

2.1 HERBICIDES

- A. Triclopyr in its amine form and approved for use over water/in wetlands, trade name Garlon 3A or approved equal.
 - 1. Triclopyr in its ester form may be used in upland areas.
- B. Glyphosate in a form approved for use over water/in wetlands, trade name Aquamaster or approved equal.
- C. Clopyralid, trade name Transline or approved equal, may be used in upland areas.

PART 3 – EXECUTION

3.1 NOTIFICATION TO AUTHORITIES FOR CLEARING AND GRUBBING WORK

- A. Contractor, prior to any clearing and grubbing work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to, have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
 - 1. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 PREPARATION PRIOR TO COMMENCING CLEARING AND GRUBBING OPERATIONS

- A. Verify that erosion control is in place prior to start of Work.
- B. Verify that existing plant life designated to remain is identified and protected.
- C. Identify waste and salvage areas for placing removed materials. Coordinate with the MWRD Engineer.

3.3 PROTECTION OF EXISTING UTILITIES, LANDSCAPING, ROADWAYS AND RELATED SITE ITEMS

- A. Maintain and repair damaged erosion control items throughout Work.
- B. Protect utilities to remain.
- C. Do not divert or relocate surface water without prior written approval from the MWRDGC.
- D. Protect existing trees, plant growth, and features designated to remain.

- E. Protect benchmarks, survey control points, and existing structures from damage or displacement.
- F. Keep entrances and exits, trails, and adjacent roadways free of debris from clearing and grubbing operations.
- G. Do not cut or destroy any trees between and including June 1 and July 31 due to the potential presence of the federally endangered Northern Long-Eared Bat.

3.4 CLEARING AND GRUBBING

- A. Clear and grub area required for access to site and execution of Work.
- B. Remove only those trees indicated on the Plans.
- C. Legally dispose of all debris resulting from clearing and grubbing operations.
- D. Notify the MWRD if underground storage tanks, piping, or other unknown and/or hazardous conditions are uncovered during Work.
- E. Cease work in immediate area of any discovered storage tanks or other potentially hazardous situations until approval to proceed is granted by MWRD.
- F. If it is determined that herbicide application is required during the clearing and grubbing operations contractor shall follow submittal procedures as defined in the Division 1 specifications. Use of herbicides is not permitted on the project site without the written approval of MWRD.

3.5 DISPOSAL

- A. Debris and rubbish shall be recycled or legally disposed of off-site.
- B. Dispose of landscape waste via:
 - 1. All logs twelve (12) inches or greater in diameter shall be de-limbed and hauled from the Work Site to the staging area for removal from the project Site unless otherwise approved by the MWRD. Logs shall be mechanically carried from the work area to the staging area, dragging shall not be allowed. An access plan indicating major haul routes shall be submitted by the Contractor at least two (2) weeks prior to the start of clearing and grubbing operations. The MWRD will assist the Contractor in making field determination(s) of sensitive areas that shall be avoided. Haul roads shall avoid wet depressions, remain at least 100 feet from wetland edges and stream corridors when possible, avoid downed woody material to protect wildlife habitat, and avoid locations of desirable vegetation to remain when practical. The crossing of stream channels may only occur in compliance with an approved in-stream work plan.
 - 2. Chip, remove from site, and legally dispose of landscape waste. With prior coordination and approval from MWRD, wood chips and other organic landscape waste may be disposed of at the Calumet Water Reclamation Plant. Contractor may dispose of wood chips at the Harlem Avenue Solids Management Area (HASMA). No tipping fee is required for wood chip delivery at the HASMA. Contractor shall notify

Neil Paradela at (708) 203-2719 one working day prior to delivery.

3. In some locations and seasons the Contractor may be able to construct brush piles for removal through prescribed burning. Construction of brush piles will be contained within the project boundaries at sites approved by the MWRD. Brush piles will be of significant size and density to accomplish ignition and consumption of brush through prescribed burning. Brush piles can be ignited under favorable conditions and at the discretion of the MWRD. The Contractor must monitor the burn piles to ensure that smoke hazards do not occur; that no loss of property or ecological habitat occurs; and that the safety and well being of the public and preserve users is protected at all times.
 - a. Brush piles shall be constructed in areas where low ground fuel levels exist, soil is bare or there is sparse leaf litter. Brush piles shall be away from any permanent trail, recreation feature, and significant cultural or ecological feature. Brush piles must be constructed at least 20 feet away from the base of any standing tree(s), under openings of the woodland canopy and at least 30 feet away from any standing dead trees or snags.
 - b. Brush piles shall be constructed by cutting the woody debris into lengths of less than 10 feet. Piles shall be no more than 10 feet high. Brush shall be stacked in a parallel manner so that it compresses as the pile is built. A 12 inch layer of smaller diameter (less than 2.5 inch diameter) brush shall form the base of the pile, with larger denser material higher up in the pile. Large branches and heavy brush must be placed higher in the pile in order to create compression of the brush material, and proper combustion conditions.
 - c. The Contractor shall have on site at all times appropriate personnel protective equipment, fire control equipment, water tanks, back pack pumpers, and hand tools to manage the brush piles during ignition, burning, and clean up.
 - d. Brush piles may be ignited when prevailing winds are between 5 and 25 mph, Relative Humidity is 35% or greater, and air temperatures is below 50°F. The Contractor shall contact the MWRD at the beginning of the work week to notify the MWRD of the Contractor's plans to burn brush piles under the conditions described above. The MWRD has the authority to suspend brush pile burning at any time. Ignition and burning may occur under conditions other than those described above at the discretion of the MWRD.
 - e. When conditions are such that dormant season vegetative fuels are readily available for ignition the Contractor must seek approval **ON A DAILY BASIS** from the MWRD to ignite a brush pile. Those conditions are when there is a lack of snow cover, the winds are above 10 mph, the peak in Relative Humidity is below 45% and the high temperatures are above 40°F.
 - f. The Contractor must monitor the burn piles to ensure that smoke hazards do not occur; that no loss of property or ecological habitat occurs; and that the safety and well being of the public and preserve users is protected at all times. Material which has been burned shall be raked inward as the burn pile decreases in size. **Adequate equipment, water and other fire fighting tools must be on site at all times.** When vegetative fuels are readily available for ignition additional suppression resources shall be required. All burn piles must be monitored by the Contractor until the brush fuel is consumed to embers. The condition that a burn pile shall be consumed prior to the Contractor leaving the Work Site (e.g., to glowing embers, to ash, etc.) shall be determined by the MWRD based on site specific conditions. Ash piles generated from the consumption of brush shall be raked out evenly with

- the surrounding terrain. Extinguishing of burn piles is the responsibility of the Contractor should smoke, or other cultural or ecological factors prevail.
- g. Under the circumstance that a standing dead tree (snag) catches on fire during a brush pile burn and the Contractor is unable to extinguish the snag, the Contractor shall contact the MWRD immediately and shall not leave the Work Site until authorized by the MWRD.
 - h. During times when there is a lack of snow cover, the Contractor shall rake any leaf or ground litter back away from the brush pile for a radius of 15' from the perimeter of the brush pile.
 - i. The Contractor must have available on site a means for direct communication with the MWRD and local Fire Departments such as a cellular phone.
 - j. The Contractor shall be responsible for securing and complying with all required permits, including local and Illinois Environmental Protection Agency Open Burning Permit, prior to the burning of brush piles. Provide the MWRD with a copy of all permits.
 - k. The authority of the local fire departments supersedes that of the MWRD with regard to ignition and burning of brush piles.
4. Other method approved by the MWRD.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Contract Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. Provide labor, material, equipment, and services as necessary to perform all excavation and backfill as shown on the Contract Drawings and as specified herein. Work of this section shall include but is not limited to the following:
 - 1. Preserve and protect existing and new site improvements during the course of the Work.
 - 2. Designing, furnishing, installing, and removing temporary excavation supports, dewatering, and other temporary protection including erosion control required for and incidental to performing and maintaining earthwork.
 - 3. Excavate all materials, including soil, boulders, abandoned utilities, and all other materials as necessary to construct the improvements shown on the Drawings.
 - 4. Excavate and salvage all stone removed from the site that aligns with the designed salvage and reuse designation in the Drawings.
 - 5. Prepare, grade, shape, compact and protect all subgrades, backfills, and ground surfaces as shown on the Drawings. The Contractor shall note that the vertical limits of the earthwork covered under this Section shall extend to finished subgrade beneath all structures, pavements, slabs, planting soils or as shown on the Drawings.
 - 6. Prepare, grade, shape, and compact site filled and backfilled areas to design grades with allowance for design thicknesses of planting soils, paving systems, and the like, and allowing for even flow of grade transitions to adjacent site areas.
 - 7. Contractor to perform material testing of existing on-site soil materials and borrow soil materials specified in this Section.
 - (a) Contractor to provide quality control of on-site soil compaction testing that will be by MWRD Approved Testing Laboratory to confirm uniform compaction at locations of new footings and at

site areas to receive structures, pavement systems, and planting soil installations.

8. Obtaining imported (borrow) material from off-site sources to extent required and of materials specified and tested for approved use in earthwork operations.
9. Below-grade obstructions from previous site uses could be encountered and require over-excavation to remove obstructions.
10. Manage groundwater and storm water as necessary to complete the Work specified herein.
11. Manage and legally dispose off-site all excess or unsuitable generated materials that cannot be reused on-site in accordance with applicable local, state, and federal requirements.
12. Coordinating this work between and together with related work of Contract and with adjacent work of separate contractors, including sequencing and scheduling of construction operations and use of site areas.

1.3 RELATED SECTIONS

A. The following Items of related work are specified and included in other Sections of the Specifications:

1. Section 01 56 39 – Temporary Tree and Plant Protection
2. Section 02 22 20 – Removal and Disposal of Surplus Soil and Construction or Demolition Debris
3. Section 02 41 13 – Site Demolition
4. Section 02 61 13 – Removal and Disposal of Contaminated Materials
5. Section 31 05 13 – Soils for Earthwork
6. Section 31 05 16 – Aggregates for Earthwork
7. Section 31 05 19 – Geosynthetics for Earthwork
8. Section 31 23 15 – Excavation, Backfill, and Compaction for Structures
9. Section 31 23 16 – Excavation, Backfill, and Compaction for Utilities
10. Section 31 25 00 – Erosion Control
11. Section 31 23 19 – Dewatering and Control of Water
12. Section 32 14 40 – Stone
13. Section 32 91 13 – Planting Soils
14. Section 32 92 19 – Seeding
15. Section 32 93 00 – Planting and Fine Grading
16. Section 32 96 00 – Transplanting

B. Contract work subject to Specifications not in Project Manual:

1. Standard Specifications of the State of Illinois Department of Transportation, latest edition and addenda.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM).
1. D 422 – Particle Size Analysis of Soils.

2. D 698 – Moisture Density Relations of Soils and Soil Aggregate Mixture.
 3. D 1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³).
 4. D 1241 – Specification for Soil-Aggregate Subbase Base and Surface Courses
 5. D 2216 – Moisture Content of Soil and Rock
 6. D 2487 – Classification of Soils for Engineering Purposes
 7. D 2922 – Density of Soil and Soil-Aggregate In Place by Nuclear Methods
 8. D 3017 – Water Content of Soil and Rock In Place by Nuclear Methods
- B. Occupational Safety & Health Administration (OSHA): Sloping and Benching Standard - #1926.
- C. Geotechnical Report

1.5 DEFINITIONS

- A. Backfill: General reference for soil materials to be used and the operation to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the compacted sub-grade and structure or paving system.
- C. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.
- D. Borrow: Suitable soil or gravel / crushed stone imported from off-site for use as fill or backfill material.
- E. Bulk Excavation: Excavation of soils and unclassified or classified materials in any areas not defined as trench or pit excavation.
- F. Debris and/or Obstructions: See definition in Section 02 41 13.
- G. Design Bearing Grades or Elevations: The design vertical levels of foundation bottoms indicated by Contract Documents.
- H. Excavation: Removal of unclassified or classified material encountered above design sub-grade elevations.
1. Additional Excavation: Excavation below design sub-grade elevations as directed by Engineer. Additional excavation and replacement material will be paid by MWRD according to Contract provisions for changes in the Work.

2. Unauthorized Excavation: Excavation below design sub-grade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer shall be without additional compensation.
- I. Excavation Grades or Elevations: The design vertical levels specified or indicated by Contract Documents or revised during construction by Engineer to accommodate field conditions and to which excavation shall be conducted.
- J. Fill: Soil materials used to raise existing grades.
- K. Finish Grade: Elevation of top most surface indicated by Contract Documents for hardscape surfacing such as paving areas, for planting soil including root mat of sod turf grass at lawn areas, and for planting soil surface at planting bed areas. Where not otherwise indicated, project site areas shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.
- L. Pit Excavation: Small, local excavations, such as for utility structures, column footings, pile caps, and other item footings where the plan dimensions do not exceed 10 feet in either length or width.
- M. Rock: Rock material in beds, ledges, un-stratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping.
- N. Salvage Stone: Existing boulders and stratified rock material in beds, ledges, un-stratified masses, and conglomerate deposits removed as required to meet the designed elevations but that is of sizes as noted in the Drawings and is to be retained and repurposed on site. In the circumstance that material excavated exceeds the amount required for the project, the Contractor shall consult the Engineer for direction regarding stockpile location for material retention by the MWRD.
- O. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- P. Subbase Course: Course placed between the subgrade and pavement.
- Q. Sub-grade: Surface or elevation of subsoil, borrow fill or compacted fill. This surface is immediately beneath the proposed design fill materials as noted on the Drawings, or other proposed surface material. Typically a Design Bearing Grade or Excavation Grade.

- R. Suitable Fill Materials: Classified as specified for each type and condition of use such as described herein, Section 31 05 13 – Soils for Earthwork, Section 31 05 16 Aggregates for Earthwork, Section 32 91 13 – Planting Soils or other related Sections.
- S. Trench Excavation: Excavations where the required depth is greater than twice the width such as required for installation of utilities and pipes.
- T. Unclassified Excavation: Removal of materials encountered within the required excavations between the existing ground surface and design excavation grade to the top of suitable sub-grade material, whichever is deeper, regardless of the nature of the materials encountered, their geologic definitions, the water contents thereof, and the means of excavation required. Resultant Unclassified Excavation material will be further classified as "Suitable Fill Material" or "Unsuitable Material". Classification of material(s) shall be approved by the Engineer whose decision shall be final and binding upon Contractor.
- U. Unsuitable Material(s): Whenever the words "Unsuitable Material" or words of similar meaning are used, they are taken to include combustible, organic and frozen materials, vegetation, bricks, ashes, wood, cinders, trash, snow, ice and fill previously placed on the site in an uncontrolled manner or with "uncontrolled material", material with excessive water content, material with an inability to obtain necessary compaction, and material which is not in conformance with approved test results of "Suitable Fill Material". Classification of material(s) shall be approved by the Engineer whose decision shall be final and binding upon Contractor.
- V. Utilities: Existing and proposed new utilities including on-site underground pipes, conduits, ducts, and cables, wiring, or other underground services on-site or within buildings.

1.6 SUBMITTALS

- A. Qualification Data: For Project Manager, Site Superintendent/Foreman, showing years of experience, certifications and licenses, education, projects worked on of a similar size, scale and complexity. For each project list client, type of project, cost of project, duration and role of personnel.
 - 1. Provide a minimum of three project references (name, title, company, phone number and email address) for the Project Manager and Site Superintendent/Foreman. For every project provide at least one Landscape Architectural reference.
- B. Submit for approval at least 30 days prior to the start of excavation work details of all proposed materials, construction methods and equipment including:
 - 1. Excavation, backfill and compaction procedures and equipment,
 - 2. Obstruction removal procedures and equipment,

3. Material test reports including compaction characteristics and samples for each type of material to be used as fill.
- C. Product Data: Submit to include and confirm material sizes, performance criteria, composition, and other characteristics for the following:
1. Imported bedding, fill, and backfill material of each type specified in this Section.
 2. Geotextile and soil separation filter fabric materials, each type with identification of proposed function on Project. Relate to and arrange together with specified requirements of other Sections applying like material.
 3. Submit technical descriptive data for each manufactured or packaged product of this Section. Include manufacturer's product testing and analysis and installation instructions for manufactured or processed items and materials. Include guaranteed analysis and weight of pre-packaged material as specified for certification of material not pre-packaged.
- D. Equipment Data: Submit descriptive information including wheel type and load data for each proposed item of equipment to be used for execution of earthwork and related operations of Contract work. Equipment Data will be evaluated for conformance to site restrictions of use and shall show selection of equipment type to maximize protection of horticultural soil installations.
1. Include identification of operation function for each type of equipment to be used including but not limited to the following:
 - (a) Bulk, trench, and pit excavation to sub-grade and/or design elevation.
 - (b) Handling and transporting soils on site.
 - (c) Utility and structure backfilling.
 - (d) Placing, compaction, and grading of the different soils types and layers.
 - (e) Grading of aggregates and soils around new and existing structures.
 2. Reference Part 3 Article "General Execution Requirements" for additional equipment criteria.
- E. Samples: Allow sufficient time for submittal review and confirmation testing and evaluation of material test results by the Engineer before start of earthwork and material procurement.
1. For Testing: Submit samples of each type soil and bedding material specified from the proposed source of supply as required for testing (Soil Certification and Analysis) specified herein and for confirmation review of characteristics.
 - (a) Submit samples for testing directly to Contractor's soil testing laboratory/agency, a bagged minimum quantity indicated for each test clearly identified for each material type and each source and with copy of transmittal and material type identification to the Engineer.

- (b) Submit additional quantities if requested.
 - (c) Certification and analysis of horticultural soil materials and amendment materials shall be documented and reported based on testing by a licensed independent agricultural testing laboratory engaged by Contractor using material samples proposed for Project Work and as specified herein. See Article “Quality Assurance” herein for additional criteria.
 - 2. For Quality Control: Other soil samples shall be submitted as requested by Engineer or allowed to be taken as required for quality control services by MWRD’s separately engaged Testing Laboratory.
 - 3. Samples For Verification:
 - (a) Soils: For visual characteristics, submit to the Engineer, a bagged clearly identified 10 pound quantity of each type soil material. Submit from each material source if any material from is multiple sources.
 - (b) Aggregates, a bagged clearly identified 10 pound quantity of each type aggregate material. Submit from each material source if any material from is multiple sources.
- F. Quality Control Test Reports:
- 1. Submit material test reports as specified herein for confirmation of each soil type specified in this Section and soil material sample tested.
 - 2. Each test report shall include the following as a minimum and such other information required specific to the material tested:
 - (a) Date Issued.
 - (b) Project Title and names, addresses and telephone number(s) of Contractor and material supplier, and material type tested.
 - (c) Testing laboratory name, address and telephone number, and name(s) as applicable, of each field and laboratory inspector.
 - (d) Date, place, and time of sampling or test, with record of temperature and weather conditions.
 - (e) Location of sampling material source.
 - (f) Type of test including ASTM reference and/or written description of testing parameters used.
 - (g) Particle size analysis/distribution as defined below as well as by hydrometer method.
 - (h) Particle size analysis report for each soil type shall include the material gradation(s) and shall indicate percent passing and retained together with Dimension Class.
 - (i) Percolation test describing the material drainage rate percentage passing and retained.
 - (j) Hydrometer Test describing percentage of sand, clay, and silt.
 - (k) Bulk Density.
 - 3. Include Laboratory compaction curve according to ASTM D1557 (Modified Proctor) for each existing on-site or borrow soil material of this Section proposed for bedding, fill and backfill.

- G. Survey Drawings:
 - 1. Include Certifications of Elevations as specified in Part 3 Article “Field Quality Control” herein. Submit during fill placement operations and at completion.
 - 2. Prepare and submit as additionally specified in Division 1 Sections.
- H. Data Submitted for Information and Reference:
 - 1. Copies of permits necessary to transport materials off site.
 - 2. Location of legal disposal sites for waste materials of this Project.

1.7 QUALITY ASSURANCE

- A. Earthwork shall be performed in compliance with the applicable requirements of all laws, codes, ordinances and regulations of authorities having jurisdiction over this work.
- B. The presence of the Engineer and/or MWRD’s Representative shall not relieve the Contractor of its responsibility to perform the Work and quality control testing in accordance with the Contract Documents, nor shall it be construed to relieve the Contractor from full responsibility for the means and methods of construction, protection of site improvements against damage, and for safety on the construction site.
- C. Lines and Grades: All line and grade work not presently established at the site shall be laid out by a survey team under the supervision of a Registered Land Surveyor employed by the Contractor in accordance with Drawings and Specifications. The Contractor shall establish permanent benchmarks and replace as directed any which are destroyed or disturbed.
- D. Testing and Inspection Services: The Contractor shall engage an independent soils testing and inspection services for quality control testing during earthwork.
- E. Controlled Inspection: The Contractor shall perform Controlled Inspections as required by applicable building codes.
- F. Pre-excavation Conference: Conduct conference at Project site to discuss earthwork operations. Prior to the start of Work the Contractor shall arrange an on-site meeting with the MWRD for the purpose of establishing Contractor’s schedule of operations and scheduling inspection procedures and requirements.

1.8 SITE CONDITIONS

- A. The Contractor shall fully inform him/herself of existing conditions of the site. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best knowledge of the Engineer.
- B. The Contractor may, at his/her own expense, conduct additional subsurface explorations as required for his own information after approval by the MWRD.

- C. Plans, surveys, measurements and dimensions, under which the Work is to be performed, are believed to be correct to the best of the MWRD's knowledge, but the Contractor shall have examined them for itself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found herein.
- D. The Contractor shall visit the site prior to submitting a bid to become thoroughly familiar with the site and the extent of the Work to be done under this Contract, consult records and drawings of adjacent structures and of existing utilities and their condition, and note all conditions which may affect the Work of this Section.
- E. The Contractor shall be responsible for determining the quantities of earth materials necessary to complete the Work under this Section.
- F. Information on the Drawings, Reference Drawings, and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.
- G. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting Work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.
- H. Existing Utilities: Do not interrupt utilities serving facilities occupied by the MWRD or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify the MWRD no less than seven days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without MWRD's written permission.
 - 3. Contact utility-locator service (JULIE – Illinois One Call 800-892-0123) for area where Project is located before excavating.
- I. Use of Explosives: The use of explosives is not permitted.

1.9 PERMITS CODES AND SAFETY REQUIREMENTS

- A. All Work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.
- B. Comply with the rules, regulations, laws and ordinances of the Village of Robbins, appropriate agencies of the State of Illinois and all other authorities having jurisdiction. Coordinate all Work done within Village and State "Rights of Way" with the appropriate Agencies. Provide all required traffic control and safety measures, including uniformed police officers per town/city and State requirements. All labor, materials, equipment and services necessary to make the

Work comply with such requirements shall be provided without additional cost to the MWRD.

- C. Comply with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc. and the requirements of the Occupational Safety and Health Administration (OSHA), United States Department of Labor.
- D. The Contractor shall procure and pay for all permits and licenses required for the complete Work specified herein and shown on the Drawings except those specified herein, or elsewhere in the contract documents, as being obtained by the MWRD.
- E. The Contractor shall not close or obstruct any street, sidewalk, or passageway unless authorized in writing by the MWRD. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks or other facilities near enough to the Work to be affected hereby. The Contractor shall comply with the time limits established by the terms for trucking onto and off of the site.
- F. Any apparent conflict between the Drawings and Specifications and the applicable codes and regulations shall be referred to the MWRD in writing, for resolution before the Work is started.

PART 2 PRODUCTS

2.1 GENERAL

- A. General provisions as described in Division 01 shall be followed, including: manufacturer's specifications, transportation and handling, installation, product options, and substitutions of materials.

2.2 MATERIALS

- A. Materials to be excavated include sandy and gravelly materials with possible brick, concrete, boulder, and other miscellaneous materials. Contractor to retain all stone and boulders excavated on the site for reuse as denoted on the Drawings.
- B. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- C. Backfill and Fill: Refer to Section 31 05 13 – Soils for Earthwork.
- D. Bedding: Refer to Section 31 23 16 – Trench Excavation, Backfill, and Compaction.

- E. Dense-Graded Crushed Stone (Aggregate Base): Refer to Section 31 05 16 – Aggregates for Earthwork.
- F. Engineered Fill: Refer to Section 31 05 13 – Soils for Earthwork.
- G. Granular Backfill: Refer to Section 31 05 16 – Aggregates for Earthwork.
- H. Planting Soils: Refer to Section 32 91 13 – Planting Soils.
- I. Satisfactory Soils: Refer to Section 31 05 13 – Soils for Earthwork.
- J. Subsoil: Existing undisturbed earth.
- K. Topsoil: A Horizon soil; the uppermost layer of the existing soil that is natural, fertile, friable and contains organic matter. It is distinguished by its darker color compared to other horizons below it.
- L. Unsatisfactory Soils: Soil Classification Groups GC, SC, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

2.3 ACCESSORIES

- A. Erosion Control Materials: Refer to Sections 31 25 00 – Erosion Control and 31 05 19 – Geosynthetics for Earthwork.

PART 3 EXECUTION

3.1 PREPARATION

- A. Examine the areas and conditions under which earthwork for the site is to be performed and notify the Engineer of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- C. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 31 11 00 – Site Clearing and Grubbing.
- D. Protect and maintain erosion and sedimentation controls during earthwork operations as specified in in the Standard Specifications.

- E. Identify required lines, levels, contours, and datum. The layout shall be under the direction of a Registered Professional Surveyor. Review layout in field with Engineer.
- F. Identify below grade utilities. Stake and flag locations.
- G. Set required lines and levels using project benchmarks and monuments.
- H. Maintain benchmarks, monuments and other reference points.
- I. Maintain and protect existing utilities that pass through work area.
- J. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.
- K. When necessary, compact subsoil surfaces to density requirements for backfill material.

3.2 GENERAL REQUIREMENTS

- A. Excavation, backfilling, and other earthwork activities shall conform with the Contract Documents and approved submittals. No work shall be performed unless it is conducted under in accordance with the submitted schedule and sequence.
- B. All excavated/screened material shall be managed (i.e., reused on-site and disposed off-site) in accordance with all applicable local, state, and federal laws.
- C. Use of On-Site Materials:
 - 1. Existing on-site stockpile subsoil will be suitable for reuse as Fill. The Contractor shall reuse those on-site soils approved by the MWRD as Fill at the locations required. The Contractor shall conduct all on-site reuse activities, including pulling aside larger than allowed fragments, mixing and stockpiling, at no additional cost to the MWRD.
- D. Stockpiling of Material:
 - 1. Establish material stockpiles on-site at locations indicated in the Drawings, that will not interfere with the progress of the Work and will not damage existing structures. Off site stockpiling is not permitted. Re-handling, if required, shall be the responsibility of the Contractor at no additional expense to the MWRD. Refer to the Drawings for Soil stockpile locations and extent of reuse for soils and salvaged stone materials.
- E. Unfavorable Weather:
 - 1. Freezing Weather:
 - (a) Fill materials shall not be placed on snow, ice, frozen subgrades, or un-compacted frozen soil.

- (b) Fill materials shall not be frozen when placed or be allowed to freeze prior to or after compaction or placement. At the end of each day's Work during freezing weather, the last lift of fill after compaction, shall be rolled by a smooth wheeled roller to eliminate ridges of un-compacted soil. Fill materials shall be covered with insulating tarps or heated during freezing weather. The Contractor shall suspend filling operations when air temperatures are below 30 degrees F if directed by the MWRD.
- (c) Soil bearing surfaces below completed slabs and foundations shall be protected against freezing, before and after concreting. Frost protection shall be provided as soon as possible after foundations or structures are constructed.
- (d) Do not excavate to full indicated depth when freezing temperatures may be expected, unless Work can be completed to subgrade and backfilled the same day. Protect the excavation from frost if placing of concrete is delayed.
- (e) Where footings, slabs or mudmats are exposed to freezing temperatures, they shall be protected to prevent damage to the concrete by freezing or frost penetration into the soil upon which they rest. Where foundations are exposed over the winter during construction, provide at least 2.5 ft. of earth cover above the bottom surface of concrete.

2. Wet Weather:

- (a) If fill material placement, spreading, rolling, or compaction operations are interrupted by rain or other unfavorable conditions, do not resume such operations until ascertaining that the moisture content and density of the previously placed soil are as required by these specifications.

F. Maintenance of Excavations and Slopes:

- 1. Stability of excavations and slopes and job safety are the sole responsibility of the Contractor.

3.3 SUBSURFACE OBSTRUCTIONS

- A. Obstructions are defined as any man-made or man-placed objects encountered below existing ground surface that is in conflict with proposed improvements.
- B. Where obstructions are not cleared by the Contractor's minimum required pre-excavation and pre-augering, the MWRD shall determine whether such obstructions should be removed by further excavation.
- C. When making an excavation for obstruction removal, do not undermine existing structures or utilities or encroach within a 1V:1.5H slope extending downward and outward from the outer edges of the adjacent structure or utility. Any loss of

ground or support for the utility or structure resulting from the Contractor's Work shall be remediated to the satisfaction of the MWRD.

3.4 GENERAL EARTHWORK

- A. Excavate all materials encountered to allow construction of the proposed improvements and structures, utilities and site work as shown on the Drawings and as hereinafter specified.
- B. Prepare subgrades to levels shown for footings, and structures as required to provide working clearance and to allow adequate inspection of subgrades outside of structures as specified herein and as shown on Drawings.
 - 1. The exposed subgrade shall be subjected to vigorous proof-rolling consisting of a minimum 8 to 10 passes with a 5-ton vibratory roller compactor or equivalent. If weak and unstable areas are identified during proof-rolling, they are to be locally removed and replaced to project specifications. Soils which exhibit weaving or instability during the proof-rolling operations as determined by the MWRD or Engineer shall be removed and remediated at no additional cost to the MWRD.
- C. Remove from the site and legally dispose of all screened spoils, debris and other excavated material not needed for, or suitable for, fill except as otherwise specified herein. Remove all materials subject to rot or attack by termites.
- D. In general, the Contractor will be permitted to use machine excavation to the proposed final grades. The final three inches under footings and foundations shall be excavated using a straight blade bucket. If the final three inches cannot be satisfactorily excavated using a straight blade bucket without disturbing subgrades, the Contractor shall use alternative methods, including hand excavations. Alternative methods shall be subject to approval by the MWRD.
- E. Unanticipated Soil Conditions:
 - 1. If unsuitable bearing materials are encountered at the specified subgrade depths, the Contractor shall notify the MWRD. Soil subgrades which are unstable due to inadequate construction dewatering or excessive subgrade disturbance are not deemed unsuitable soils.
 - 2. Fill soil that is not within $\pm 3\%$ optimum moisture for compaction of the particular material in place as determined by the Engineer and is disturbed by the Contractor during construction operations so that proper compaction cannot be reached shall not be construed as unsuitable bearing materials.
 - 3. The Contractor shall follow a construction procedure which permits visual identification of firm natural ground.
- F. Excessive Excavation: If any part of the general or trench excavation is carried, through error, beyond the depth and the dimensions indicated on the Drawings or

called for in the Specifications, the Contractor at his own expense, shall furnish and install remedial measures as directed by the Engineer to bring fill material up to the required level.

3.5 EXCAVATION

- A. Perform the excavation work in accordance with the approved submittals and Contract Documents. Trim bottoms of all excavations to the lines and grades required for the work.
- B. Final excavation and trimming for subgrade shall be accomplished by hand or backhoes with smooth bladed buckets. No excavating equipment shall be operated over the subgrade during or after final excavation. Prepare subgrade by proof rolling to provide a firm surface.
- C. All existing utilities, pavements, structures and trees shall be protected from settlement, movement, undermining, washout and other hazards of earthwork.
- D. All clearing of vegetation and excavation of topsoil shall be performed in accordance with Contract requirements.
- E. Excavation shall follow the sequence shown on the Contract Documents and as described in the submittals approved by the Engineer. If over-excavation occurs it shall immediately be replaced with compacted granular backfill at the direction of the Engineer.
- F. All excess excavated materials beyond the stockpiled material indicated in the Drawings which will not be used as backfill at the site shall be removed from the site and legally disposed of by the Contractor.
- G. No payment shall be made for excess general excavation made inadvertently or for the Contractor's convenience.
- H. Disposal of excavated material of all types is the responsibility of the Contractor. Upon leaving the site, all excavated material becomes the property of the Contractor. The Contractor shall follow all regulations for noise, dust, and traffic over streets within and outside the site.
- I. Stockpiling of excavated materials on the site will be allowed only on MWRD approved areas.
- J. Surface Runoff: Surface water on and around the site shall be collected into local sumps by means of trenches, pipes, etc., and pumped into the storm water system. Use appropriate filtration or sedimentation to prevent pumping of suspended solids into the storm sewers. A permit must be obtained for such pumping.

- K. Dewatering of Trenches and Excavations: Trenches and excavations shall be kept free of standing water at all times. Pumping is to begin as soon as water begins to accumulate and is to continue until water is removed.
- L. Stability of Excavations: Slope sides of excavations or brace as per OSHA requirements. Shore and brace excavation where sloping is not possible because of space restrictions or stability of material excavated. Maintain excavations in a safe condition.
- M. Dust Control: Control of dust is the responsibility of the Contractor.
- N. Compacted Gravel/Subbase Course: Install in compliance with this Section and the Contract Drawings.

3.6 ROCK EXCAVATION FOR REUSE

- A. Perform the excavation work in accordance with the approved submittals and Contract Documents. Trim bottoms of all excavations to the lines and grades required for the work.
- B. Contractor shall perform extraction of all rock encountered on the project in a manner that allows for the retention, stockpiling, and reuse of material in appropriate dimensions to achieve the landscape features included in the Contract Documents.
- C. Location of all stockpiled material and any required staging of extracted material shall be reviewed and approved by the Engineer. Should the extraction of the stone on the site exceed the amount required to achieve the landscape features and elements in the Contract Documents, Contractor shall alert the Engineer.
- D. Contractor shall not remove excess material from the project site without written authorization of the Engineer.
- E. Refer to Section 32 14 40 – Stone.

3.7 PROTECTION OF BEARING SUBGRADES

- A. The Contractor shall be required to maintain stable, dewatered, and frost free subgrades for foundations, pavement areas, utility trenches, and other areas as required.
- B. The Contractor shall take precautions to reduce subgrade disturbance. Such precautions may include diverting storm water runoff away from construction areas, reducing traffic in sensitive areas, thermal protection during cold weather periods, and maintaining an effective dewatering operation.

3.8 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. Provide and maintain pumps, well points, suction and discharge lines and other de-watering system components necessary to convey water away from site.
 - 2. Install a dewatering system as required to keep subgrade dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.9 FILLING AND GRADING

- A. All required backfilling shall be performed as soon as the work permits. Materials used for backfill shall meet the requirements of this Section. Backfill shall be placed in uniform horizontal layers of approximately twelve (12) inches in loose thickness, and compacted with mechanical devices to 95% of the maximum density per ASTM D 1557, unless specified otherwise in other Sections of the Specifications or on the Contract Drawings.
- B. Samples and Testing:
 - 1. All fill materials, and their placement shall be subject to quality control testing. All independent quality control testing shall be paid by the Contractor. Contractor will bear cost of testing materials which fail to conform to Specifications. Test results and laboratory recommendations will be available to Contractor. All sieve analyses for conformance of on-site and off-site fill materials to be used in the Work shall be done by means of a mechanical wet sieve analysis and in accordance with ASTM D-422.
 - 2. Excavated material taken directly from an on-site source that will meet these Specifications may be used as CFill. No such fill material shall be put in place until approved for use by the MWRD.
 - 3. Field density tests shall be made by the Contractor in accordance with the Method of Test for ASTM Designation D1556 or D2922, to determine the adequacy of compaction.
 - 4. The Contractor shall notify the MWRD when and where an area is ready for compaction testing. This notification shall be 48 hours in advance of placing and final compaction.
 - 5. The MWRD or his/her designated representative shall have the right to observe the installation of all controlled compacted fills.
 - 6. Testing of materials as delivered may be made from time to time. Materials in question may not be used, pending test results. Tests of

compacted materials will be made regularly. Remove rejected materials and replace with new, whether in stockpiles or in place.

7. The Contractor shall inform the MWRD of areas of unsatisfactory density which may require improvement by removal and replacement, or by scarifying, aerating, sprinkling (as needed), and re-compaction prior to the placement of the new lift. No additional compensation shall be paid for Work required to achieve proper compaction.
8. In no case will frozen material be allowed for use in fill, backfill, or rough grading material.
9. Stones or rock fragments larger than four inches in their greatest dimension shall not be permitted within the top six inches of subgrade of any fills or embankments.

C. Placing, Spreading and Compacting Fill Material:

1. The fill material shall be placed in uniform 8" horizontal layers and compacted as specified herein.
 - (a) Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer. So far as practicable, each layer of material shall extend the entire length and width of the area being filled plus two additional feet horizontally along each side for every one foot of fill required.
 - (b) Foreign materials (ie, stones, rocks, construction debris, concrete, bricks, waterproofing membrane, glass, roots, etc.) larger than 2/3 of the fill lift height shall be removed off site.
2. All fill material shall be placed and compacted in-the-dry. The Contractor shall dewater excavated areas as required to perform the Work, and in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operation. Prior to terminating operations for the day, the final layer of fill, after compaction, shall be rolled with a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.
3. The Contractor shall not place a layer of compacted fill on soil that was permitted to freeze prior to compaction or on snow or ice. Removal of these unsatisfactory materials will be required as directed by the MWRD.
4. When the moisture content of the fill material is below optimal moisture necessary for compaction as specified herein, water shall be added until the moisture content is as specified.
5. When the moisture content of the fill material is above the optimal moisture necessary for compaction as specified herein, the fill material shall be aerated by blending, mixing, or other satisfactory methods until the moisture content is as specified.
6. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes to ensure that the desired density is obtained. A minimum of four coverages with acceptable compaction equipment described hereinafter is

a requirement. These coverages are to be provided as systematic compactive effort; incidental coverages due to construction vehicle traffic through the area will not be included.

D. Placement of Salvaged Stone Elements: Refer to Section 32 14 40 – Stone.

E. Compaction Requirements:

1. The following table lists minimum compactive efforts which are required for all fill materials. Compaction of each lift shall be completed before placement of the next lift is started. The compaction equipment shall make an equal number of transverse and longitudinal coverages of each lift. The degree of compaction for fill placed in various areas shall be as follows:

Location	Minimum Compaction (see note below)
Beneath and around footings, base slabs	95%
Vehicular pavement, walkways and sidewalks	95%
Landscaped areas	80 – 85% nominal compaction

- (a) Note: Minimum compaction requirements refer to percentages of the maximum dry density determined in accordance with ASTM D1557 (unless otherwise specified).

F. Moisture Control:

1. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-3% to +3%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.
2. Material which does not contain sufficient moisture to be compacted to the specified densities shall be moisture conditioned by sprinkling, discing, windrowing, or other method approved by the MWRD
 - (a) Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.
3. Material containing excess moisture shall be dried to required Optimum Moisture before it is placed and compacted. Excessively moist soils shall be removed and replaced and shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.
4. Materials which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.

5. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, become inundated or excessively moistened shall have excess water removed and soil dried as specified above.

3.10 GRADING

- A. General: Grading shall include the shaping, trimming, rolling and finishing the surface of the sub-base, shoulders, and earth slopes, and the preparation of the subgrade for planting soils, plantings and paved surfaces. Uniformly grade areas to a smooth surface, free from irregular surface changes. Uniformly smooth grades of all areas including excavated and fill sections and adjacent transition areas as sub-grade or base for subsequent work.
 1. The sub-grade shall be reasonably smooth, compacted, and free from irregular surface changes.
 2. Comply with compaction requirements specified and grade to cross sections, lines, and elevations indicated.
 - (a) Provide a smooth transition between adjacent existing grades and new grades.
 - (b) Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
 - (c) The required sub-grade elevation shall be such that when fill, sub-base, and indicated construction are added, the final elevations will be those indicated by the Contract Documents.
- B. Site Grading: Grades not otherwise indicated shall be uniform levels or slopes between such points and existing grades, except that the surface shall be rounded at abrupt changes or slopes. Grade all flat areas so as to prevent low spots and water pockets. The locations and elevations of constructions are indicated by the Contract Documents and unless inconsistencies are brought to the written attention of the Engineer prior to the commencement of work, the Contractor will be held responsible to obtain the proper and approved location(s) and elevations of the completed work.
 1. Provide sufficient grade staking at subgrade to allow for verification of correct lines and grades.
 2. Grading of subgrades for paved areas shall be finished at the required depth below and parallel to the proposed surface within 3/8 inch in 100 inches tolerance.
 3. All areas that cannot be compacted with a self-propelling roller shall be hand-tamped with rammers.
 4. Remove from the sub-grade and subsequent fill layer all debris, foreign materials, and all other undesirable material.
 5. Hollows and depressions that develop under rolling shall be filled with acceptable material, corresponding to layer being rolled, and shall again be rolled. This process of shaping, filling, and rolling shall be repeated until no depressions develop.

6. Compact the sub-grade of all areas unless otherwise indicated with appropriate compacting equipment or by other means to such degree as will insure against settlement of the subsequently constructed work.
- C. Before any crushed stone or planting soils or, as specified in other Sections, paving, or other systems or materials are placed upon the sub-grade or subsequent soil fill layer, verify preparation of graded areas to design line and grade.

3.11 DUST AND EROSION CONTROL

- A. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and onto neighboring properties and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on the site and on paved ways. Provide additional crushed stone where necessary to provide traps or pads for construction vehicles carrying sediment.

3.12 EXPLOSIVES

- A. Do not use explosives.

3.13 EROSION AND SEDIMENTATION CONTROL

- A. Refer to Section 31 25 00 – Erosion Control.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil that is in excess of fill/backfill requirements; waste material, including unsatisfactory soil, trash, obstructions and/or debris; and legally dispose of these materials off of Owner's property.
- B. Remove materials resulting from construction operations as the work progresses and/or at direction of Engineer.

3.15 SITE CLEAN-UP

- A. Remove temporary drainage swales, check dams, siltation sumps, hay bales, siltation fencing and other temporary drainage, erosion and siltation control measures when permanent drainage control measures have been installed. Contractor shall excavate and remove all sediments from siltation sumps prior to backfilling the sumps. Remove erosion control measures when approved by the MWRD.
- B. All damaged paving and surfacing outside project limits shall be restored to their original condition.

END OF SECTION

SECTION 31 23 15

EXCAVATION, BACKFILL, AND COMPACTION FOR BUILDINGS AND STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Notification to authorities for excavation work.
2. Site survey verification prior to backfilling operations.
3. Preparation for excavation.
4. Excavation procedures.
5. Excavation field quality control.
6. Protection during excavation, backfilling and compaction operations.
7. Preparation for backfilling.
8. Backfilling and compaction requirements.
9. Backfill tolerances.
10. Backfill and compaction field quality control.
11. Protection of completed excavation and backfill.
12. Backfill types and compaction requirements schedule.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. Section 31 05 13 – Soils for Earthwork
4. Section 31 05 16 - Aggregates for Earthwork
5. Section 31 05 19 – Geosynthetics for Earthwork
6. Section 31 20 00 – Earthwork
7. Section 32 91 19 – Landscape Earthwork
8. Section 33 05 13 – Manholes and Structures
9. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700,000 kN-m/m³)).
2. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

- B. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Product Data:
 - 1. See requirements in Section 31 05 13 – Soils for Earthwork and Section 31 05 16 – Aggregates for Earthwork.
- C. Test results:
 - 1. ASTM D1557 – Laboratory test reports and analysis for aggregate maximum dry density and optimum water content.
 - 2. ASTM D6938 – Laboratory test reports and analysis for in-place density and water content of soil.

1.4 QUALITY ASSURANCE

- A. Contractor shall confirm that all temporary and required permanent erosion and sediment control measures are in place and working correctly prior to commencement of any excavation work.

1.5 REGULATORY REQUIREMENTS

- A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- B. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- C. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 – PRODUCTS

2.1 SCHEDULE OF BACKFILL

- A. Section 31 05 16 – Aggregates for Earthwork defines “A” designated fill materials and Section 31 05 13 – Soils for Earthwork defines “S” designated fill materials.
- B. Backfill designations identified on Drawings or in the Detailed Specifications shall control backfill types used on projects. If backfill designations are not identified on Drawings or in the Detailed Specifications, this General Specification shall control backfill types used on the project.

1. Foundations:
 - a. Aggregate Type A2 fill, Place materials in continuous loose lifts layers not exceeding seven inch (7") depth, compacted to 95 percent modified Proctor density.
2. Below Grade Slabs:
 - a. Aggregate Type A5 or A7 fill, Place materials in continuous loose lifts layers not exceeding nine inch (9") depth, compacted to 95 percent modified Proctor density.
3. Interior Slab-On-Grade:
 - a. Aggregate Type A1 fill, Place materials in continuous loose lifts layers not exceeding seven inch (7") depth, compacted to 95 percent modified Proctor density.
4. Exterior Slab-On-Grade:
 - a. Aggregate Type A2 fill, Place materials in continuous loose lifts layers not exceeding seven inch (7") depth, compacted to 95 percent modified Proctor density.
5. Foundation Drainage - Stone Cover:
 - a. Aggregate Type A5 fill, Place materials in continuous loose lifts layers not exceeding nine inch (9") depth, compacted to 95 percent modified Proctor density.
6. Site Drainage - Stone Cover:
 - a. Aggregate Type A5 fill, Place materials in continuous loose lifts layers not exceeding nine inch (9") depth, compacted to 95 percent modified Proctor density.
7. Fill to Correct Over-Excavation:
 - a. Aggregate Type A2 fill, flush to required elevation, compacted to 90 percent modified Proctor density.
 - b. Lean concrete to minimum compressive strength of 1000 psi.
5. Fill Below Paved Areas:
 - a. Aggregate Type A1 fill, Place materials in continuous loose lifts layers not exceeding seven inch (7") depth, compacted to 95 percent modified Proctor density.
6. Fill Below Unpaved Areas:
 - a. Beneath Soil Profile A as shown on the Drawings:
 - i. Subsoil Type S1 and S2 fill, to six inches (6") below finish grade. Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to eighty-five percent (85%) modified Proctor density.
 - a. Beneath Soil Profile B as shown on the Drawings:
 - i. Subsoil Type S1 and S2 fill, to a maximum of 8 inches (8") below finish grade as indicated in Soil Profile B as shown on the Drawings. Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to

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- eighty-five percent (85%) modified Proctor density. Coordinate with Drawings for limits of benching/subgrade stepping.
- b. Beneath Soil Profile B as shown on the Drawings:
 - ii. Subsoil Type S1 and S2 fill, to 24 inches (24"). Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to eighty-five percent (85%) modified Proctor density.
7. Fill Within Cook County Department of Transportation and Highways Right-of-Way:
- a. IDOT gradation FA-06. Place material in uniform lifts not exceeding eight inches (8"), loose measurement, compacted to (85%) modified Proctor density.

PART 3 – EXECUTION

3.1 NOTIFICATION TO AUTHORITIES FOR EXCAVATION WORK

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
 - 1. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 EXAMINATION OF BACKFILL MATERIALS

- A. Verify backfill materials harvested from project site that are scheduled to be reused are acceptable and meet the specified requirements. Perform required testing to confirm that the site-harvested backfill material meets specified requirements. Provide certified as-built information for completed work.
- B. Confirm newly delivered backfill materials are verified through testing to meet the specified requirements.

3.3 SITE SURVEY VERIFICATION AND FIELD MEASUREMENTS VERIFICATION

- A. Contractor shall employ a Registered Land Surveyor, registered in the State of Illinois, to perform all survey work related to primary line and grade for project utilities.
- B. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.
- C. Line and grade stakes will be set by Contractor's Land Surveyor, parallel to proposed buried piping and offset there from in a manner that will best serve Contractor's work operations wherever practical.

- D. Contractor shall arrange its work operations in such manner as to avoid interference with establishment of primary lines and grades.
- E. Contractor shall check accuracy of line and grade stakes and shall be responsible for protection and preservation of such stakes.
- F. Contractor shall bear sole responsibility for correct transfer of all construction lines and grades from primary line and grade points and for correct alignment and grade of finished structure.
- G. Property corners will be located and marked by the Contractor, prior to commencing their work.
- H. Contractor shall be solely responsible for protection and/or replacement of all survey corners that exist throughout work area.
- I. A Registered Land Surveyor shall replace damaged corners at Contractor's expense.
- J. Contractor shall immediately bring to the attention of the MWRD any discrepancy in the lines and grades prior to proceeding with the Work.

3.4 SAWING AND BREAKING PAVEMENT

- A. Asphalt surface course and asphalt base course shall be saw-cut full depth before being removed.
- B. Pavements shall be cut evenly along edges of excavation prior to their removal in such a way as to avoid excessive removal or ragged, uneven edges.

3.5 PREPARATION FOR EXCAVATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities. Maintain and protect existing utilities to remain.
- C. Notify utility company to remove and relocate utilities that interfere with Work.
- D. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- E. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Cut out soft areas of subgrade not capable of achieving compaction requirements. Backfill with Type A2 or Type A12 fill or other structural fill approved by the MWRD, and compact to density equal to or greater than requirements for subsequent backfill material.

3.6 DEWATERING

- A. See Section 31 23 19 – Dewatering and Control of Water.

3.7 EXCAVATION PROCEDURES

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate site structures and construction operations.
- C. Excavate to working elevations for piling work. Coordinate special requirements for piling.
- D. Machine slope banks to angle of repose or less, until shored.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Hand trim excavation. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock.
- H. Notify MWRD of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- I. Correct unauthorized excavation at no extra cost to MWRD.
- J. Correct areas over-excavated in error.
- K. Stockpile excavated material in area designated on site and remove excess material not being reused, from site, unless directed otherwise by MWRD.
- L. Excavation of Rock: Where rock, boulders, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, remove or excavate such material by means which will neither cause additional cost to Owner nor endanger buildings or structures on or off the site.
 - 1. Do not use explosives without written permission from MWRD.

3.8 SHEETING, SHORING, AND BRACING

- A. Whenever necessary to prevent caving, erosion, and loss of surrounding subsoil during excavation, and to protect adjacent piping, structures, property, workers, and public, excavations shall be sheeted, shored, and braced.
- B. Sheeting, shoring, and bracing shall be provided as required per Federal (OSHA), State, and local requirements.

- C. Type, design, detail, and installation of sheeting, shoring, and bracing shall be determined by and sole responsibility of Contractor.
- D. When sheeting, shoring, and bracing is required, install to prevent soil from entering excavation below or through sheeting.
- E. Remove sheeting, shoring, and bracing after backfilling, or when approved by MWRD as backfill is being placed.
- F. Remove sheeting, shoring, and bracing in manner not damaging to facility or permitting voids within backfill.
- G. Fill settled areas after sheeting, shoring, and bracing has been removed.

3.9 EXCAVATION FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01 40 00 – Quality Requirements.
- B. Provide for visual inspection of bearing surfaces.

3.10 PROTECTION DURING EXCAVATION, BACKFILL AND COMPACTION OPERATIONS

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

3.11 EXAMINATION PRIOR TO BACKFILLING

- A. Verify fill material to be reused are acceptable.
- B. Verify foundation perimeter drainage installation has been inspected.

3.12 PREPARATION FOR BACKFILLING

- A. Generally, compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of establishing compaction. Backfill with Type A2 fill as specified in Section 31 05 16 – Aggregates for Earthwork, and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Where side wall material is loose or unstable, place geotextile cloth material over sidewall prior to backfilling.

3.13 BACKFILLING AND COMPACTION REQUIREMENTS

- A. Backfill areas to contours and elevations with unfrozen materials.

- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Maintain optimum moisture content of backfill materials to attain required compaction density.
- D. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- E. Backfill simultaneously on each side of unsupported non-basement foundation walls.
- F. Make grade changes gradual. Blend slope into level areas.
- G. Leave fill material stockpile areas completely free of excess fill materials.
- H. Remove surplus backfill materials from site.
- I. Backfill operations within Cook County Department of Transportation and Highways Right-of-Way shall be in accordance with Method 1 per Article 550.07 of the IDOT Standard Specifications.

3.14 BACKFILL TOLERANCES

- A. Top Surface of Backfilling under Paved Areas: Plus or minus one (1) inch from required elevations.

3.15 BACKFILL AND COMPACTION FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 40 00 – Quality Requirements.
- B. Density and Moisture Content Testing: Compacted fill, backfill and embankment fill shall be tested to verify compliance with specified requirements in accordance with ASTM D6938. Frequency of density testing shall be not less than the following:
 1. Expansive Horizontal Areas: One (1) test for each 100 cubic yards of fill placed.
 2. Confined Area and Embankments: One (1) test for every second lift of fill placed.
 3. As determined by Contractor's MWRD Approved Testing Agency.
- C. If tests indicate Work does not meet specific requirements, remove Work, replace and retest at no cost to MWRD.

3.16 PROTECTION OF COMPLETED EXCAVATION BACKFILL

- A. Protect finished Work under provisions of Section 01 50 00 – Temporary Facilities and Controls.
- B. Re-compact fills disturbed by vehicular traffic.

END OF SECTION

SECTION 31 23 16

TRENCH EXCAVATION, BACKFILL, AND COMPACTION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Examination of backfill materials.
2. Site survey and field measurement verification.
3. Sawing and breaking pavement.
4. Preparation for trenching operations.
5. Trench excavation requirements.
6. Trench bedding requirements.
7. Trench backfilling requirements.
8. Backfill tolerances.
9. Mechanical compaction requirements.
10. Required results for compaction.
11. Protection of completed excavation and backfilling.
12. Schedule of backfill.

B. Related Documents:

1. Applicable provisions of Volume 1 shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. Section 02 41 15 – Utility Removal
4. Section 31 05 13 – Soils for Earthwork
5. Section 31 05 16 - Aggregates for Earthwork
6. Section 31 05 19 – Geosynthetics for Earthwork
7. Section 31 20 00 – Earthwork
8. Section 32 91 19 – Landscape Earthwork
9. Section 33 42 11 – Storm Utility Drainage Piping
10. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,70000kN-m/m³)).
2. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

- B. Illinois Society of Professional Engineers (ISPE):
 - 1. Standard Specifications for Water and Sewer Construction in Illinois - Current Edition.
- C. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Product Data:
 - 1. See requirements in Section 31 05 13 – Soils for Earthwork and Section 31 05 16 – Aggregates for Earthwork.
- C. Test results:
 - 1. ASTM D1557 – Laboratory test reports and analysis for aggregate maximum dry density and optimum water content.
 - 2. ASTM D6938 – Laboratory test reports and analysis for in-place density and water content of soil.

1.4 QUALITY ASSURANCE

- A. Contractor shall confirm that all temporary and required permanent erosion and sediment control measures are in place and working correctly prior to commencement of any excavation work.

1.5 REGULATORY REQUIREMENTS

- A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- B. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- C. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 – PRODUCTS

2.1 SCHEDULE OF BACKFILL

- A. Section 31 05 16 – Aggregates for Earthwork defines “A” designated fill materials and Section 31 05 13 – Soils for Earthwork defines “S” designated fill materials.
- B. Backfill designations identified on Drawings or in the Detailed Specifications shall

control backfill types used on projects. If backfill designations are not identified on Drawings or in the Detailed Specifications, this General Specification shall control backfill types used on the project.

1. Utility Trench - Fill to Correct Over-Excavation:
 - a. Aggregate Type A2 fill, flush to required elevation, compacted to ninety percent (90%) modified Proctor density.
2. Utility Trench – Bedding Backfill Material:
 - a. For Plastic, Copper, Centrifugally Cast Fiberglass Reinforced Polymer Mortar (CCFRPM) Pipe, and Electrical Conduits or Ducts:
 - i. Sand Bedding: Aggregate Type A10, Place materials in continuous loose lifts layers not exceeding twelve-inch (12") depth, compacted to ninety-five percent (95%) modified Proctor density.
 - b. For other pipe materials:
 - i. Stone Bedding: Aggregate Type A6 fill, Place materials in continuous loose lifts layers not exceeding six-inch (6") depth, compacted to ninety-five percent (95%) modified Proctor density.
3. Utility Trench – Haunching and Initial Backfill Material:
 - a. For Plastic, Copper, Centrifugally Cast Fiberglass Reinforced Polymer Mortar (CCFRPM) Pipe, and Electrical Conduits or Ducts:
 - i. Aggregate Type A10, Place materials in continuous loose lifts layers not exceeding twelve-inch (12") depth, compacted to ninety-five percent (95%) Modified Proctor density.
 - ii. Aggregate Type A6, Place materials in continuous loose lifts layers not exceeding six-inch (6") depth, compacted to ninety-five percent (95%) Modified Proctor density.
 - b. For other pipe materials:
 - i. Stone Bedding: Aggregate Type A6 fill, Place materials in continuous loose lifts layers not exceeding six-inch (6") depth, compacted to ninety-five percent (95%) Modified Proctor density.
4. Utility Trench – Backfill Below and Within Two (2) Feet of Paved Areas, including Curb and Gutter:
 - a. Aggregate Type A1 or A2, Place materials in continuous loose lifts layers not exceeding eight-inch (8") depth, compacted to ninety-five percent (95%) modified Proctor density.
5. Utility Trench - Backfill Below Unpaved Areas:
 - a. Beneath Soil Profile A as shown on the Drawings:
 - i. Subsoil Type S1 and S2 fill, to six inches (6") below finish grade. Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to eighty-five percent (85%) modified Proctor density.
 - b. Beneath Soil Profile B as shown on the Drawings:
 - i. Subsoil Type S1 and S2 fill, to a maximum of 8 inches (8") below finish grade as indicated in Soil Profile B as shown on the Drawings. Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to eighty-five percent (85%) modified Proctor density. Coordinate with

Drawings for limits of benching/subgrade stepping.

- c. Beneath Soil Profile B as shown on the Drawings:
 - ii. Subsoil Type S1 and S2 fill, to 24 inches (24"). Place materials in continuous loose lifts layers not exceeding 6 inch (6") depth, compacted to eighty-five percent (85%) modified Proctor density.
- 6. Utility Trench - Backfill Within Cook County Department of Transportation and Highways Right-of-Way:
 - a. IDOT gradation FA-06. Place material in uniform lifts not exceeding eight inches (8"), loose measurement, compacted to (85%) modified Proctor density.

PART 3 – EXECUTION

3.1 NOTIFICATION TO AUTHORITIES FOR EXCAVATION WORK

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
 - 1. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 EXAMINATION OF BACKFILL MATERIALS

- A. Verify backfill materials harvested from project site that are scheduled to be reused are acceptable and meet the specified requirements. Perform required testing to confirm that the site-harvested backfill material meets specified requirements. Provide certified as-built information for completed work.
- B. Confirm newly delivered backfill materials are verified through testing to meet the specified requirements.

3.3 SITE SURVEY VERIFICATION AND FIELD MEASUREMENTS VERIFICATION

- A. Contractor shall employ a Registered Land Surveyor, registered in the State of Illinois, to perform all survey work related to primary line and grade for project utilities.
- B. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.
- C. Line and grade stakes will be set by Contractor's Land Surveyor, parallel to proposed buried piping and offset there from in a manner that will best serve Contractor's work operations wherever practical.

- D. Contractor shall arrange its work operations in such manner as to avoid interference with establishment of primary lines and grades.
- E. Contractor shall check accuracy of line and grade stakes and shall be responsible for protection and preservation of such stakes.
- F. Contractor shall bear sole responsibility for correct transfer of all construction lines and grades from primary line and grade points and for correct alignment and grade of finished structure.
- G. Property corners will be located and marked by the Contractor, prior to commencing their work.
- H. Contractor shall be solely responsible for protection and/or replacement of all survey corners that exist throughout work area.
- I. A Registered Land Surveyor shall replace damaged corners at Contractor's expense.
- J. Contractor shall immediately bring to the attention of the MWRD any discrepancy in the lines and grades prior to proceeding with the Work.

3.4 SAWING AND BREAKING PAVEMENT

- A. Asphalt surface course and asphalt base course shall be saw-cut full depth before being removed.
- B. Pavements shall be cut evenly along edges of excavation prior to their removal in such a way as to avoid excessive removal or ragged, uneven edges.

3.5 PREPARATION FOR TRENCHING OPERATIONS

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities. Maintain and protect existing utilities to remain.
- C. Notify utility company to remove and relocate utilities that interfere with Work.
- D. Protect plant life, lawns, rock outcropping, and/or features remaining as a portion of final landscaping.
- E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- F. Cut out soft areas of subgrade not capable of achieving compaction requirements. Backfill with Type A2 or Type A12 fill or other structural fill approved by the MWRD, and compact to density equal to or greater than requirements for subsequent backfill material.

3.6 DEWATERING

- A. See Section 31 23 19 – Dewatering and Control of Water.

3.7 TRENCH EXCAVATION

- A. Excavate subsoil required for installation of utility.
- B. Excavate trenches at top of pipe to a maximum width based on dimension of outside diameter of pipe plus eighteen inches (18") to enable installation of pipe and to allow inspection.
- C. Width at top of pipe may be increased with prior approval of the MWRD to allow for stringers and sheeting when required.
- D. Pipe to be laid in open-cut trench shall have six inch (6") minimum clearance between outside face of pipe barrel and face of sheathing or sidewall of trench or as specified on drawings.
- E. Maximum width of trench at ground surface shall not exceed width of trench at top of pipe by more than two feet (2') without prior approval from the MWRD, unless it is specifically allowed on Drawings.
- F. Excavated material stored along trench excavation shall be placed a minimum distance back from edge of trench. Said distance shall be determined by angle of repose of trench material to prevent surcharging of trench wall material leading to potential shearing of trench wall and collapse of trench.
- G. Excavated material to be used for trench backfilling shall be stored so that it will cause no interference to:
 - 1. Public travel.
 - 2. Adjacent property owners or tenants.
 - 3. Other Contractors.
- H. Excavated material, which is not to be used as trench backfill, shall be used elsewhere on site as suitable fill in accordance with the Contract by Contractor, unless directed otherwise by Contract Documents or the MWRD.
- I. Contractor shall maintain all finished excavations free of water or sewage during Work.
- J. Hand trim excavation. Remove loose matter.
- K. Remove lumped subsoil, boulders, and rock.
- L. Correct unauthorized excavation and over-excavated areas at no cost to MWRD.
- M. No more trench shall be excavated in advance of completed pipe laying operations than

can be completed and backfilled by end of workday.

- N. Excavation of Rock: Where rock, boulders, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, remove or excavate such material by means which will neither cause additional cost to Owner nor endanger buildings or structures on or off the site.
 - 1. Do not use explosives without written permission from MWRD.

3.8 SHEETING, SHORING, AND BRACING

- A. Whenever necessary to prevent caving, erosion, and loss of surrounding subsoil during excavation, and to protect adjacent piping, structures, property, workers, and public, trenches shall be sheeted, shored, and braced.
- B. Sheeting, shoring, and bracing shall be provided as required per Federal (OSHA), State, and local requirements.
- C. Type, design, detail, and installation of sheeting, shoring, and bracing shall be determined by and sole responsibility of Contractor.
- D. When sheeting, shoring, and bracing is required, install to prevent soil from entering excavation below or through sheeting.
- E. Remove sheeting, shoring, and bracing after backfilling, or when approved by MWRD as backfill is being placed.
- F. Remove sheeting, shoring, and bracing in manner not damaging to facility or permitting voids within backfill.
- G. Fill settled areas after sheeting, shoring, and bracing has been removed.

3.9 TRENCH BEDDING

- A. Trench bottom shall be free of water prior to placement of bedding and laying of pipe.
- B. Place and shape bedding material to pipe, to a minimum depth of five inches (5") under bell and six inches (6") under spigot.
- C. Support pipe during placement and compaction of bedding material.
- D. Bring bedding and cover material over top of pipe to a minimum loose depth of twelve inches (12"), compact to specified density.
- E. Where sand is used for cover material, sand shall be compacted with portable plate compactor to a depth of twelve inches (12") in two (2) lifts of six inches (6") each for initial compaction over pipe.

3.10 TRENCH BACKFILLING

- A. Backfill trenches with materials and to contours and elevations shown on Drawings.
- B. Place specified backfill in loose lift layers. Use compaction equipment that will achieve desired compaction requirements.
- C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- D. Employ a placement method that does not disturb or damage pipe in trench.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Remove surplus backfill materials from site.
- G. Leave fill material stockpile areas completely free of excess fill materials.
- H. Backfill operations within Cook County Department of Transportation and Highways Right-of-Way shall be in accordance with Method 1 per Article 550.07 of the IDOT Standard Specifications.

3.11 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one inch (1") from required elevations.

3.12 MECHANICAL COMPACTION

- A. Backfill shall be mechanically compacted by means of a tamping roller, sheepsfoot roller, pneumatic tire roller, vibrating roller, or other mechanical tampers. Impact, free-fall, or "stomping" type compaction equipment shall not be allowed.
- B. Flooding or jetting of backfill for compaction purposes shall not be allowed.
- C. Contractor shall furnish written notification to the MWRD prior to start of work as to size and type of mechanical compaction equipment to be used.
- D. Material for mechanically compacted backfill shall be placed in lifts, which, prior to compaction, shall not exceed thickness specified below for type of compaction equipment used:
 - 1. Vibratory equipment including vibratory plate, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers: maximum lift thickness two feet (2').
 - 2. Rolling equipment, including sheepsfoot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels: maximum lift thickness one foot (1').
 - 3. Hand-directed mechanical tampers: maximum lift thickness of six inches (6").

3.14 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 40 00 – Quality Requirements.

- B. Density and Moisture Content Testing: Compacted fill, backfill and embankment fill shall be tested to verify compliance with specified requirements in accordance with ASTM D6938. Frequency of density testing shall be not less than the following:
1. One (1) test per lift for every 100 linear feet of trench.
 2. As otherwise determined by Contractor's MWRD Approved Testing Agency.
- C. If tests indicate Work does not meet specific requirements, remove Work, replace and retest at no cost to MWRD.

END OF SECTION

SECTION 31 23 19

DEWATERING AND CONTROL OF WATER

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Design of dewatering and surface water control systems, including in-stream diversions.
2. Dewatering and surface water control systems operation and maintenance.
3. Dewatering and surface water control systems removal.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.
2. USACE Section 404 permit
3. IDNR permit

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
3. Section 01 12 16 – Sequence of Work
4. Section 01 13 10 – Coordination and Meetings
5. Section 01 17 00 – Execution Requirements
6. Section 01 70 00 – Closeout Requirements
7. Section 01 78 39 – Project Record Documents
8. Section 31 20 00 – Earthwork
9. Section 31 23 15 – Excavation, Backfill, and Compaction for Buildings and Structures
10. Section 31 23 16 – Trench Excavation, Backfill, and Compaction
11. Section 31 25 00 – Erosion Control
12. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 DEFINITIONS

A. Dewatering includes the following:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations.
2. Reducing piezometric pressure within subsurface strata to prevent failure or heaving of excavations, and to address quick soil conditions.
3. Removing water from saturated soils or sediment.
4. Removal of ground water necessary for in-stream work to occur in the dry.
5. Discharge of removed water.

- B. Surface Water Control includes the following:
 - 1. Removal of surface water within open excavations.
 - 2. Temporary diversion of streams, channels, swales, ditches, and related landforms that convey concentrated flows.
 - 3. Installation of watertight enclosures (cofferdams).
 - 4. Removal of surface water from active work areas.
 - 5. Removal of surface water necessary for in-stream work to occur in a dry condition.
 - 6. Discharge of removed water.

1.3 REFERENCES

- A. Illinois Environmental Protection Agency (IEPA):
 - 1. National Pollutant Discharge Elimination System (NPDES)

1.4 SYSTEM DESCRIPTION

- A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable ground.
- B. Furnish backup equipment stored at Project site and ready for immediate use upon failure of primary dewatering and surface water control systems equipment.

1.5 PERFORMANCE REQUIREMENTS

- A. Provide dewatering systems to:
 - 1. Lower water table to permit Work to be completed on dry and stable ground.
 - 2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
 - 3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
 - 4. Prevent loss of fines, quick condition, or softening of subgrade.
 - 5. Maintain stability of sides and bottoms of excavations and trenches.
 - 6. Remove excess water from soils or sediments.
- B. Provide surface water control systems to:
 - 1. Collect and remove surface water and seepage entering excavation.
 - 2. Bypass flows around work area without causing an increase in water surface elevation on surrounding properties, without causing erosion or sedimentation, and without causing impacts to natural resources.
 - 3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
 - 4. Not cause flooding on adjacent property or at the project site.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 - Submittal Procedures.
- B. In-Stream Work Plan:
 - 1. Submit In-Stream Work Plan for activities in Midlothian Creek to the Will-South Cook

- Soil and Water Conservation District for review and approval.
2. Include construction plans and a detailed narrative describing dewatering and surface water control system methods.
 - a. Indicate layout, pump sizes and locations, pipe sizes and capacities, surface water control devices, coffer dams, size and capacity of diversion channels, temporary erosion and sediment control measures, and water discharge method and location.
 - b. Indicate primary and standby power system location and capacity.
 - c. Include description of dewatering and surface water control monitoring and maintenance.
 - d. Include description of emergency procedures to follow when problems arise, including storm-related flood events.
 - e. Include elevations critical to the operation of surface water control systems.
 3. Submit copy of approved In-Stream Work Plan and approval letter from Will-South Cook Soil and Water Conservation District to MWRD for record.
- C. In accordance with federal, state, and local regulations provide calculations and design documents signed and sealed by a Structural Engineer registered in the State of Illinois for any structural components of dewatering and surface water control systems.

1.7 CLOSEOUT SUBMITTALS

- A. Submit in accordance with Section 01 70 00 - Closeout Requirements.
- B. Section 01 78 39 - Project Record Documents: Record locations and depths of capped wells and piping abandoned in place, if any.

1.8 QUALITY ASSURANCE

- A. Comply with authorities having jurisdiction for the following:
 1. Drilling and abandoning of wells used for dewatering systems.
 2. Water discharge from pumping operations.
- B. Obtain and comply with National Pollutant Discharge Elimination System (NPDES) permit from Illinois Environmental Protection Agency. Contractor shall be responsible for submitting fees associated with the NPDES permit.
- C. Comply with Section 404 Permit from U.S. Army Corps of Engineers, Section 401 Permit from Illinois Environmental Protection Agency, Illinois Department of Natural Resources Permit, and all other applicable regulations and permits.

1.9 SEQUENCING

- A. Section 01 12 16 – Sequence of Work: Requirements for sequencing.
- B. Obtain all required permits and approvals from regulatory agencies and the MWRD prior to commencement of dewatering or surface water control operations.

1.10 COORDINATION

- A. Convene pre-installation in accordance with Section 01 13 10 – Coordination and Meetings prior to installation of surface water control systems in Midlothian Creek. Notify the Will-South Cook Soil and Water Conservation District of meeting a minimum of ten (10) days in advance.
- B. Coordinate work to facilitate construction operations to be completed on dry stable substrate.
- C. Coordinate required inspections with regulatory agencies before, during, and after implementation of dewatering and surface water control systems and their removal.

PART 2 – PRODUCTS

2.1 DEWATERING AND SURFACE WATER CONTROL EQUIPMENT AND MATERIALS

- A. Select dewatering and surface water control equipment and materials to meet specified performance and regulatory requirements.

PART 3 – EXECUTION

3.1 NOTIFICATION TO AUTHORITIES FOR EXCAVATION WORK

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
 - 1. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 EXAMINATION

- A. Complete site verification and preparation in accordance with Section 01 12 16 – Sequence of Work and Section 01 17 00 – Execution Requirements.
- B. Conduct additional borings and investigations to supplement existing information as required to design dewatering and surface water control systems.

3.3 BYPASSING

- A. Maintain maximum practical flow capacity at all locations where bypassing occurs. Plan

safe stabilized overflows for when flows exceed bypassing capacity.

- B. Contractor shall familiarize themselves with flow conditions to be encountered at all locations where bypassing is used.
- C. The bypass hoses or pipes crossing traffic lanes or trails shall have crossing ramps placed over hoses or pipes or shall be installed in shallow trench adequately filled to withstand traffic loads.
- D. Intake hoses shall be placed on a stable surface or floated to prevent sediment from entering the hose.
- E. When pumping is in operation, all engines shall be equipped in a manner to keep the pump noise to a minimum and shall comply with the local noise ordinances.
- F. Sediment and debris deposited in the structures, open channels, reservoir, and sewers due to the bypassing activity shall be removed by the Contractor.
- G. Contractor shall verify all local connections and provide flow bypassing and pumping as required to complete the project.

3.4 PUMPING AND BAILING

- A. Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and properly dispose of water entering work area, and keep said excavations as dry as possible until Work is permanently stabilized.
- B. Discharge water pumped or drained from the Work without causing erosion or sedimentation, and without damage to adjacent property, sewers, pavements, electrical conduits, or other work or properties. Plan safe stabilized overflows for when flows exceed pumping capacity.
- C. Contractor shall construct and maintain any temporary dams, bulkheads, or other structures necessary to prevent water from entering the Work under this Contract, from adjacent sections of sewer or channels, and shall completely remove same when ordered by the MWRD where emergency by-passing is required.
- D. Include expenses incident to or caused by flood conditions or by such interruption of the Work in lump sum prices. No additional compensation will be allowed.

3.5 DEWATERING SYSTEM

- A. Install and maintain dewatering system in accordance with approved submittals.
- B. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.
- C. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and

adjacent buildings, structures, trails, and improvements.

D. Operate pumps in accordance with manufacturer's instructions.

3.6 SURFACE WATER CONTROL SYSTEM

A. Install and maintain surface water control system in accordance with approved submittals.

B. Divert surface water and seepage water within Work areas into sumps and pump water into drainage channels, storm sewers, settling basins, or as otherwise approved.

C. Provide ditches, non-erodible coffer dams, pumps, and other surface water control devices to divert and drain surface water from Work area. Earthen cofferdams are not permissible.

D. Cofferdams shall be constructed from the upland area and no equipment may enter flowing water at any time. If installation of the cofferdam cannot be completed from shore and access is needed to reach the area to be coffered, other measures, such as the construction of a causeway, will be necessary to ensure that equipment does not enter the water. Once the cofferdam is in place and the isolated area is dewatered, equipment may enter the coffered area to perform the required work.

E. During dewatering of the coffered work area, all sediment-laden water must be filtered to remove sediment. Options for sediment removal include baffle systems, anionic polymers systems, dewatering bags, or other appropriate methods. Water shall have sediment removed prior to being re-introduced to the downstream waterway. A stabilized conveyance from the dewatering device to the waterway must be identified in the In-Stream Work Plan. Discharge water is considered clean if it does not result in a visually identifiable degradation of water clarity.

F. Work in the Midlothian Creek waterway shall be timed to take place during low flow conditions. Low flow conditions are flow at or below the normal water elevation. In Midlothian Creek, the normal low flow is approximately 10 cubic feet per second (cfs) according to the USGS stream gage at Oak Forest.

G. The Midlothian Creek In-Stream Diversion shall be designed to allow for the conveyance of the 2-year peak flow past the work area without overtopping the cofferdam. Existing conditions 2-year peak flows and water surface elevations in Midlothian Creek are shown in the table below.

Location	2-Year Peak Flow (cfs)	2-Year Water Surface Elevation (ft)
Downstream of 139 th Street Culverts	216	596.27
Upstream of 137 th Street Culverts	218	595.20

H. Restore and stabilize areas disturbed by construction activities to proposed or pre-construction conditions prior to accepting flows.

- I. Locate system components to allow continuous surface water control operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, trails, and improvements.
- J. Operate pumps in accordance with manufacturer's instructions.

3.7 DEWATERING AND SURFACE WATER CONTROL SYSTEMS OPERATION AND MAINTENANCE

- A. Conduct daily observation of dewatering and surface water control systems. Make required repairs and perform scheduled maintenance.
- B. Operate pumps in accordance with manufacturer's instructions.
- C. Refill fuel tanks before tanks reach 25 percent capacity.
- D. Start back up equipment at least once each week to verify operating condition.
- E. When dewatering and surface water control systems cannot control water within Work area, notify the MWRD and stop Work in affected area.
 - 1. Supplement or modify dewatering and surface water control systems and provide other measures to control water in affected area.
 - 2. Demonstrate dewatering system operation complies with performance requirements before resuming Work.
- F. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, or adjacent property.

3.8 WATER DISCHARGE

- A. Discharge water so as not to cause erosion, sedimentation, flooding, water quality impacts, or other damages to the project site or adjacent properties.
- B. Discharge water pumped or drained from the Work without causing erosion or sedimentation, and without damage to adjacent property, sewers, pavements, electrical conduits, or other work or properties. Plan safe stabilized overflows for when flows exceed pumping capacity.
- C. A filter bag shall be used on all pump discharge lines. Pump discharges shall only be allowed on a non-erodible surface. The water quality of all pump discharges shall be as clean as or cleaner than the receiving waters.
- D. Discharge water shall meet all local, state, and federal quality requirements.

3.9 DEWATERING AND SURFACE WATER CONTROL SYSTEM REMOVAL

- A. Remove dewatering and surface water control systems after they are no longer needed.
- B. Repair damage caused by dewatering and surface water control systems or resulting from

failure of systems to protect the Work or adjacent property.

3.10 FIELD QUALITY CONTROL

- A. After dewatering and surface water control systems are installed, perform pumping test to determine adequate pumping rate.
- B. Adjust pump speed, discharge volume, or both to ensure proper operation of each pump. Monitor discharge flow rate for each unit until steady state conditions occur.
- C. Monitor water discharge for sediment content. Provide supplemental sediment control measures such as application of polyacrylamide polymer to reduce sediment when required for permit compliance.
- D. Monitor discharge for contamination while performing pumping in vicinity of potentially contaminated sites.
- E. Monitor weather forecasts and adjust or remove dewatering and surface water control systems as necessary in anticipation of flood events.
- F. Inspect and repair dewatering and surface water control systems during and after flood events.
- G. Include expenses incidental to or caused by flood conditions or by such interruption of the Work in lump sum prices. No additional compensation will be allowed.

END OF SECTION

SECTION 31 25 00

EROSION CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary measures employed during construction to control erosion and sedimentation.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Section 31 23 19 – Dewatering and Control of Water.
3. Section 31 20 00 - Earthwork
4. Section 32 91 13 – Planting Soils
5. Section 32 91 19 – Landscape Earthwork
6. Section 32 93 00 – Planting and Fine Grading.
7. Applicable provisions of MWRD General Conditions, General Specifications, and Detailed Technical Specifications utilized for this project.
8. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

B. The Urban Committee of the Association of Illinois Soil and Water Conservation Districts:

1. Illinois Urban Manual.

C. Illinois Environmental Protection Agency (IEPA)

1. National Pollutant Discharge Elimination System (NPDES) permit.

1.3 SUBMITTALS

- ###### A. Section 01 33 00 - Submittal Procedures.

1.4 REGULATORY REQUIREMENTS

- ###### A. Contractor shall comply with all local, state, and federal regulations applicable to Work of

this Section.

- B. Contractor shall comply with the Urban Committee of the Association of Illinois Soil and Water Conservation Districts - Illinois Urban Manual.
- C. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- D. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 – PRODUCTS

2.1 TEMPORARY SOIL EROSION AND SEDIMENT CONTROL PRODUCTS

- A. Inlet protection shall be a manufactured storm sewer insert such as Catch All by Marathon Materials, Dandy Bag by Dandy Products, or approved equal, or as shown on the Drawings.
- B. Stone for stabilized construction entrance shall meet the requirements of CA1 in the IDOT Standard Specifications. Geotextile fabric for the stabilized construction entrance shall be a non-woven needle punched polypropylene meeting the requirements of Article 1080.03 for gradation 4 or 5 of the IDOT Standard Specifications.
- C. All other materials shall comply with Article 280.02 of the IDOT Standard Specifications, the Illinois Urban Manual, and are subject to approval by the MWRD and regulatory agencies.
- D. Temporary seed shall conform to the requirements of Article 1081.15(g) of the IDOT Standard Specifications.
- E. Temporary ditch checks shall be as specified on the Plans or approved equal.
- F. Flocculent shall be an anionic polyacrylamide (PAM) polymer.
- G. Pump filter bag shall be Dandy Dewatering Bag by Dandy Products or approved equal.
- H. Acceptable products for erosion control blankets include but are not limited to:
 - 1. “Erosion Control Blankets”,
BOOM Environmental Products (regional distributor)
32 Scotland Blvd., Bridgewater, MA 02324
800-770-2666
100% jute, coir, straw, or coconut fiber erosion control blanket
 - 2. “GeoCoir/DeKoWe”,
Belton Industries

3613 Roswell Road; Atlanta, GA 30350
800-225-4099
100% coir fiber waste woven erosion control fabric

3. “GeoJute”, Belton Industries
3613 Roswell Road; Atlanta, GA 30350
800-225-4099
100% virgin jute woven erosion control fabric
4. “Landlok BonTerra C2, CF4, CF7, CF9, CS2, ENS2, or S1”,
Synthetic Industries Inc.
6025 Lee Highway; Chattanooga, TN 37421
800-621-0444
100% coconut, coir, or wheat straw fiber erosion control blanket
5. “Slopetame” , Invisible Structures, Inc
20100 E. 35th Drive; Aurora, CO 80011-8160
800-233-1510 or 303-373-1234
100% recycled HDPE erosion control fabric
6. “Geoweb”, Bowman Construction Supply
2310 South Syracuse Way; Denver, CO 80231
303-696-8960
100% post consumer recycled plastic honeycomb soil containment
7. “Wellman Non-Wovens”, Bonded Fiber Products, Inc.
2748 Tanager Avenue; Commerce, CA 90040
323-726-7820
97% post-consumer PET non-woven erosion control fabric

I. Straw Bales:

1. Type: Straw, 99 percent free of weeds or obnoxious plants, wirebound or string-tied.
2. Weight Range: Minimum of 40 lbs. to maximum 120lbs.
3. Anchoring: Nominal 2 in. sq. x min. 36 in. long wood stakes.

J. Temporary Cover: Use one of the following:

1. Organic Mulches: Use Mulch, as described in this Section.
2. Synthetic Covers: Erosion control blankets and mats designed and manufactured specifically for soil retention, as approved by Landscape Architect.

K. Silt Fences:

1. Silt fence stakes and posts:
 - a. Use either wooden stakes or steel posts for fence construction.
 - b. Wooden stakes: Min 2 in. sq. cross-section when oak is used and min. 4 in. sq. cross-section when pine is used; min. 5 ft. length.

- c. Steel posts: Standard U or T-section, min. 1.33 lbs. per linear foot; min. 5 ft. length.
2. Filter Cloth:
- a. Comply with ASTM D4439, consisting of polymeric filaments formed into stable network such that filaments retain relative positions.
 - b. Use filament, consisting of long-chain synthetic polymer, composed of min. 85 percent by weight of ester, propylene, or amide, with stabilizers and/or inhibitors added to base plastic to make filaments resistance to deterioration due to ultraviolet and heat exposure.
 - c. Ensure synthetic filter fabric contain ultraviolet ray inhibitors and stabilizers to provide min. 6 months of expected usable construction life at temperature range of 0 to 120 deg. F.
 - d. Grab Tensile: ASTM D4632, min. 100 lbs.
 - e. Elongation: Max. 30 percent.
 - f. Trapezoid Tear: ASTM D4533, min. 245N.
 - g. Permittivity: ASTM D4491, 0.2 sec-1 AOS (U.S. STD Sieve) ASTM D4751, 20-100.

2.2 GEOCELL SOIL REINFORCEMENT

- A. Provide a geocell system that consists of an assembly of factory perforated H.D.P.E sheet strips connected in series, using full-depth ultrasonic spot-welded seams, aligned perpendicular to the longitudinal axis of the strips. No splicing will be allowed. The geocell structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. When expanded, the interconnected strips form the walls of a flexible, three-dimensional cellular confinement structure into which the specified infill materials can be placed. The systems shall include an anchoring system and cell infill materials.
- B. Geocell Base Material
- 1. Polyethylene used to make strips for geocell sections shall have a density of 58.4-60.2 lb/cu.ft tested per ASTM D 1505.
 - 2. Polyethylene used to make strips for geocell sections shall have an Environmental Stress Crack Resistance (ESCR) of 3000 hour tested per ASTM D 1693.
 - 3. Allowable Strength of 5 is based on reduction factors for installation damage, durability, and creep. The minimum reduction factor for durability shall be 1.1 for polyethylene and the minimum reduction factor for installation damage shall be 1.1. The reduction factor for creep shall be based on testing performed in accordance with ASTM D 5262 at a strain of 10.
 - 4. Carbon black shall be used for ultra-violet light stabilization. Carbon black content shall be 1.5% - 2% by weight through the addition of a carrier with a certified carbon black content. The carbon black shall be homogeneously distributed throughout the material. The Manufacturer shall certify the percentage of carbon black meets a UV resistance of 70% after 500 hours per the requirements of ASTM D 4355.
- C. Geocell Dimensions and Placement Related Requirements
- 1. The geocell sheet sections shall be fabricated using strips of sheet polyethylene each having a length of 11.8 ft. Polyethylene strips shall be connected using full-depth ultrasonic spot-welds aligned perpendicular to the longitudinal axis of the strip. Weld

spacing shall be 17.5 in +/- 0.10 in. The ultrasonic weld melt-pool width shall not exceed 1.0 in.

2. The geocell sections shall be 6" deep, 8 cells long and 6 cells wide for an expanded dimension of 8.67 ft. long x 5.25 ft. wide.
3. The coefficient of interaction for pull-out resistance of the proposed geocell in a soil of similar gradation and texture to the material that will be used for fill in the reinforced zone shall be 0.85 per ASTM D 6706.
 - a. Use either wooden stakes or steel posts for fence construction.
 - ii. Stake Anchors
 1. Geocell sheets shall be anchored with rows of stakes securely capped with high strength polyethylene clip anchors that bear against and hook over the cell walls no less than 1" on both sides of the geocell wall joints where they are to be positioned, without damaging the geocell wall in any way.
 2. The stakes shall consist of straight (#4) steel reinforcing rods a minimum of 36" in length that do not extend beyond the top of the clip anchors, and which have been ground free of any burrs prior to placing the clip.

D. Soil Backfill

1. The geocell infill material shall be Aquatic Planting Soil per Section 31 23 00.

2.3 BENTHIC MESH

- A. The purpose of the benthic mesh is to provide benthic surface protection from human walking, carp or other benthic disturbers, and otherwise generally assist with knitting emergent plants to the substrate soils. This mesh cannot at any time float above the benthic surface. This is best accomplished with the product having a specific gravity heavier than water. If this attribute is not available, the minimum specific gravity that will be considered is 0.94 and the amount of product anchoring will need to be adjusted as necessary to prevent the product from floating.
- B. In response, the Contractor is to provide a profile geonet manufactured by extruding two sets of polyethylene strands to form a three-dimensional structure; is inert to biological attach and naturally encountered chemicals (alkalis and acids); and is resistance to UV light exposure.
- C. The benthic mesh shall be free of defects or flaws that significantly affect its physical properties. The edge of the benthic mesh shall be finished to prevent the outer fiber from pulling away from the larger sheet. Strand orientation should be 90 degrees and strand spacing should be no less than 1" and no greater than 1.5", creating a diamond mesh grid sheet. The delivered rolls should consist of a continuous product, with no pre-cut slits or openings.
- D. Benthic mesh shall meet or exceed the requirements specified in Table 1. Where applicable, Table 1 property values represent minimum average roll values (MARV) in the weakest principal direction.

TABLE 1
UM PHYSICAL REQUIREMENTS FOR BENTHIC MESH

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
SPECIFIC GRAVITY	UNITLESS	1.01*	ASTM D 792
CARBON BLACK	%	1-5	ASTM D 4218
THICKNESS	IN.	0.18	ASTM D 5199
ROLL WEIGHT	LBS./SF	0.12	
OPENING SIZE	IN.	1 X 1	
ROLL WIDTH	FT.	5	
ROLL LENGTH	FT.	100	
COLOR		BLACK	

- E. An acceptable product, “Benthic-Mesh,” is available from the following manufacturer’s representative: Dan Salsinger, Hanes 630-279-0915.
- F. Anchors: Provide #3 rebar in 36” lengths, with top 6” bent to form a 30” “J” hook that will be used to secure the benthic mesh in place as shown in the Drawings.

PART 3 – EXECUTION

3.1 NOTIFICATION TO AUTHORITIES FOR EXCAVATION WORK

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to, have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
 - 1. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to “Julie, Inc.” (800-892-0123) or, within the City of Chicago, to “Digger” (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statute relative to Excavator's Work.

3.2 GENERAL

- A. Prior to the commencement of land disturbing activities, the Contractor must
 - 1. Submit a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) in compliance with NPDES requirements.
 - 2. Attend an on-site pre-construction meeting to review soil erosion and sediment control requirements.
- B. The Contractor shall prepare their own soil erosion and sediment control plan, including

in-stream work plans, based upon their construction sequencing, means, and methods. The Contractor shall provide soil erosion and sediment control measures as necessary at all times to ensure compliance with all local, county, state, and federal pollution control regulations. The Work shall not be construed as compliant if the MWRD does not direct the Contractor to provide additional measures. Compliance shall be determined solely by the regulatory agencies responsible for enforcement of any such regulations.

- C. Contractor's means, methods, and sequencing of vegetation removal, demolition, earthwork, in-stream work, and other land disturbing activities shall be such as to minimize soil erosion and sedimentation.
- D. Fills shall be placed and compacted in such a manner that sliding and erosion is minimized.
- E. All work shall be conducted in such a manner as not to divert water outside of the project limits, including adjoining property, without written authorization from the MWRD.
- F. The Contractor shall maintain all temporary soil erosion and sediment control measures in good working order throughout the duration of the work until such time as permanent stabilization has been achieved. Contractor shall remove any accumulated sediment and properly dispose of same prior to removing temporary soil erosion and sediment control measures.
- G. All variations from the soil erosion and sediment control plans shall be in compliance with the Illinois Urban Manual, all applicable regulations, and subject to review by MWRD.

3.3 INLET PROTECTION

- A. Inlet protection shall be installed as required to prevent sediment from construction operations from entering storm sewers.
- B. Inlet protection shall be maintained in good condition at all times, including periodic removal of accumulated sediments necessary for proper functioning.
- C. Inlet protection shall be removed and properly disposed of upon project completion unless otherwise directed by the MWRD.

3.4 STABILIZED CONSTRUCTION ENTRANCE

- A. Install stabilized construction entrances at the locations indicated on the Plans or as approved by the MWRD.
- B. If the Contractor utilizes other locations for construction access, a stabilized construction entrance must be installed at all points of construction enters and exits onto public rights-of-way, streets, or any paved surface. Any such additional construction entrances must be approved by MWRD prior to their construction. The cost of any additional construction entrances shall be incidental to the stabilized construction entrances shown on the Plans.
- C. Rock must be underlain by geotextile fabric.

- D. Stabilized construction entrance shall be no less than 50 feet in length and 14 feet in width for one-way traffic. Increase width for two-way traffic.
- E. Any sediment reaching public rights-of-way, streets, or any paved surface shall be removed immediately.
- F. The Contractor shall maintain the stabilized construction entrance in good working condition, including but not limited to replacement of rock and removal of accumulated sediment, throughout the duration of Work until removal.
- G. Stabilized construction entrances shall be removed by the Contractor when they are no longer needed or as otherwise approved by the MWRD. Ground beneath stabilized construction entrance and any incidental disturbed areas shall be restored to the satisfaction of the MWRD upon removal of the stabilized construction entrance.

3.5 SILT FENCE

- A. Install silt fence as shown on the Plans, as directed by the MWRD, and elsewhere as determined necessary by regulatory agencies with authority in such matters.
- B. Bottom of silt fence shall be trenched in.
- C. Silt fence shall be maintained in an upright and good condition at all times.
- D. Remove and properly dispose of accumulated sediment trapped by silt fence.

3.6 TEMPORARY COFFER DAM

- A. Contractor shall be responsible for the design of temporary cofferdams.
- B. Refer to Section 31 23 19 – Control of Water for cofferdam requirements.

3.7 DEWATERING, SURFACE WATER CONTROL, AND TEMPORARY DIVERSIONS

- A. The Contractor shall make their own calculations and shall plan their work accordingly. Dewatering, surface water control, and temporary diversions shall be used to facilitate work “in the dry.” Work shall not be allowed in wetlands, flowing water, or in standing water that can discharge directly to Waters of the U.S.
- B. Dewater via pumping or other means approved by the MWRD and regulatory agencies.
- C. A pump filter bag shall be used on all pump discharge lines. Pump discharges shall only be allowed on a non-erodible surface. The water quality of all pump discharges shall be as clean as or cleaner than the receiving waters.
- D. The pump intake shall be configured so as to minimize sediment intake via the use of a floating intake, perforated bucket, or other such method approved by the MWRD.
- E. Temporary diversions may be utilized in lieu of pumping where gravity flow is possible.

Temporary diversion channels must be stabilized to the satisfaction of the MWRD and regulatory agencies prior to diverting water into them. All temporary diversions shall be subject to the review and approval of the MWRD and regulatory agencies.

- F. The Contractor must obtain approval of their in-stream work plan(s) from the MWRD prior to commencing work.
- G. Coordinate with work of Section 31 23 19 – Control of Water.

3.8 INTERNAL HAUL ROUTES

- A. Contractor shall be responsible for establishing internal haul routes throughout the site. Haul routes shall be subject to the MWRD's review and approval.
- B. The Contractor shall not drive vehicles or construction equipment across existing trail bridges.
- C. Haul routes shall be kept as short and direct, and through work areas, if possible to minimize damages to site. Contractor shall repair all damages including but not limited to compaction, rutting, and vegetation removal resulting from haul routes to the satisfaction of the MWRD.
- D. Contractor shall comply with all local and county requirements pertaining to the use of public streets during completion of the Work.
- E. The Contractor shall not drive through, across, or within any wetlands or Waters of the U.S. except where specifically allowed on the plans or approved by the MWRD. Any fines or penalties imposed upon MWRD as a result of unauthorized excursions into regulated wetlands or Waters of the U.S. by the Contractor shall be deducted from the amount owed the Contractor.
- F. Construct and maintain temporary stream crossings as shown on the Plans or as approved by the MWRD and regulatory agencies. Temporary crossings shall be removed when no longer needed. Restore disturbed area to same or better condition as before crossing was installed.

3.9 TEMPORARY SEEDING

- A. Any disturbed portion of the site that shall remain active for 14 days or more shall be stabilized with temporary seeding and/or other methods approved by the MWRD and regulatory agencies.
 - 1. Temporary seeding shall be initiated within one (1) day of cessation of ground disturbing activities.
 - 2. Temporary seeding shall be completed within 14 days of initiation.
- B. Additional stabilization measures including but not limited to hydromulch and/or erosion control blanket may be required in addition to temporary seeding based upon time of year (e.g. seed not expected to germinate immediately due to heat or cold) and/or site conditions (e.g. area of concentrated flow).

3.10 TEMPORARY DITCH CHECKS

- A. Temporary ditch checks shall be installed as shown on the plans or as directed by the MWRD.
- B. Contractor shall remove and properly dispose of ditch checks off-site after achieving permanent stabilization or as directed by the MWRD.

3.11 TEMPORARY SLOPE PROTECTION

- A. Contractor shall provide temporary protection of excavated channel slopes as directed by the Engineer. Channel slopes shall be stabilized with temporary seeding or erosion control blankets as described in Part 2.
- B. Contractor shall coordinate installation and removal of temporary slope protection with planned final seeding and stabilization planned at the site.

3.12 PLACEMENT AND ANCHORING OF GEOCELL SECTIONS

- A. Placement: Geocell sections shall be expanded uniformly into position over the foundation soil as shown on the Drawings and submitted Shop Drawings. The orientation of expanded sections shall be as indicated on the Drawings. Accommodation of non-linear alignments may require non-uniform expansion of individual geocell sections in order form tapered or curved elements.
- B. Seam Connections
 - 1. The edges of adjacent sections of geocell shall be inter-leaved or butt-jointed according to which side-wall profiles abut. In all cases, the upper surfaces of adjoining geocell sections shall be flush at the joint. Inter-leaf side connections between expanded geocell sections. Welded edge seams should be overlapped and aligned when stapling. Abut end connections between geocell sections. The longitudinal centerlines of abutting external cells should be aligned and stabled at the cell wall contact point.
- C. Crest Anchorage
 - 1. The geocell system shall be anchored at the crest of the slope and expanded down the slope surface and/or laid parallel to the mean water line.
 - 2. Temporarily anchor the geocell sections along the perimeter of the designated trench as described in the Drawings. The geocell sections can be held in the expanded position with the anchor stakes, or by partially filling selected outer cells with the specified infill material.
- D. Anchor System
 - 1. The geocell sections shall be permanently anchored with the specified stake anchors in the prescribed pattern shown on the Drawings. At each anchor location, place the clip against the upslope cell wall and drive the stake until clip arm is over the cell wall.
- E. Placement of Geocell Infill
 - 1. Within one day following inspection and approval by the Engineer of the anchored geocell materials, the specified infill material shall be placed into the expanded cells with suitable materials handling equipment such as a backhoe, a front-end loader, or bobcat. In call cases, the maximum drop height into the cells shall be limited to a maximum of 3 ft to avoid damage or displacement of the cell walls. A minimum of

- 24in. of soil shall be maintained between construction equipment with ground pressures greater than 7 psi and the geocell.
2. Infill materials must be dry and without clods. Filling shall proceed from the top of the slope to the toe of the slope to minimize displacement of the geocell sections. Geocell walls may not be damaged or crushed as part of infill process. Overfill geocells with specified topsoil between 1-2 inches and lightly tamp or roll to leave the soil flush with the top edge of the cell walls. Repeat this step until geocells are fully compacted. The geocell surface is then to have a final and uniform, properly compacted overburden of 2". The entire geocell infill cross section is to be compacted to 95% Standard Proctor.
- F. Temporary Erosion Control: Temporary Erosion Control shall be placed over the installed geocell slope protection system as directed by the Engineer if the finished soil surface is to be left exposed prior to planting for more than two weeks.
 - G. Penetrations into or any cutting of the geocell units are not allowed.

3.13 INSTALLATION OF BENTHIC MESH

- A. The benthic mesh shall be placed over all below mean water level planting beds, as indicated in the Drawings and specified herein. The surface to receive the benthic mesh shall be prepared to a smooth condition free of obstructions, depressions, and soft or low-density pockets of material. All finish grades in the areas of benthic mesh application are to be 0.08 +/- from those indicated on the grading plans.
- B. The benthic mesh shall be laid smooth and hand-pulled tight. The mesh shall be secured with "J" hooks, placed on an average 5' o.c. in a grid layout. The hooks shall be hammered in place, hooking an intersection of the mesh, until flush with grade. Overlap mesh rolls 6: on both sides. Additional hooks, regardless of location shall be installed as necessary to prevent any slippage of the mesh and to secure all edges within 3" of the perimeter of any mesh roll.

3.14 FLOCCULANTS

- A. Flocculants may be necessary to reduce suspended sediment, particularly clays, from stormwater runoff, pumped dewatering operations, and other construction site runoff.
- B. Contractor shall utilize PAM blocks, floc logs, and related flocculant systems as required for permit compliance.

3.15 DUST CONTROL

- C. The Contractor shall be responsible for controlling the dust and air-borne dirt generated by their construction activities.
- D. The MWRD may require the implementation of dust control procedures if wind and soil conditions reduce visibility on adjacent roads and property. Concerns for health and safety to the public using adjacent facilities will be grounds for the MWRD to request implementation of a dust control plan.
- E. Dust control measures indicated in the Contractor's Dust Control Plan, or as directed by the MWRD, shall be readily available for use on the project site.

- F. Sample techniques that may warrant consideration include, but are not necessarily limited to, the following measures:
 - 3. Minimize track out of soil onto nearby paved surfaces.
 - 4. Reduce vehicle speeds on unpaved surfaces.
 - 5. Cover haul vehicles.
 - 6. Apply chemical dust suppressants or water to exposed surfaces, particularly to surfaces on which construction vehicles travel.

3.16 STREET SWEEPING

- A. Any sediment or soil reaching a paved parking area, alley, street, or public right-of-way shall be removed by the Contractor by scraping or street cleaning as accumulations warrant, not less than at the end of each day's operations, at other times as conditions warrant, or as directed by the MWRD.
- B. Sediment and soil removed from such paved areas shall be properly disposed of by the Contractor. Sediment and soil shall not be dumped, swept, or otherwise deposited into storm sewers, roadside swales, wetlands, streams, or other such areas.
- C. Additional stabilized construction entrance methods may be required if excessive or repeated track-out of sediments occurs.

3.17 TEMPORARY SOIL STOCKPILE MANAGEMENT

- A. Erosion and sediment control measures are required for soil stockpiles to remain in place for more than 24 hours.
- B. Soil stockpiles shall be located a minimum of 25 feet from any wetland, stream, creek, ditch, swale, water conveyance system, lake, pond, etc.
- C. Perimeter sediment control, such as a silt fence, shall be installed on the down slope side of the stockpile prior to its creation. Perimeter protection shall be placed a minimum of 8 feet from the toe of the stockpile slope.
- D. Provide erosion and sediment control measures in accordance with Illinois Urban Manual Practice Standard 927.

END OF SECTION

SECTION 31 37 00

RIP RAP

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Contract Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. Section Includes:
 - 1. Excavation for stone placement
 - 2. Geotextile fabric
 - 3. Placement of riprap for erosion control
- B. Related Documents:
 - 1. Applicable provisions of Division 01 shall govern work of this specification section.
- C. Related Sections:
 - 1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
 - 2. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
 - 3. Section 31 05 13 – Soils for Earthwork.
 - 4. Section 31 05 16 – Aggregates for Earthwork.
 - 5. Section 31 05 19 – Geosynthetics for Earthwork.
 - 6. Section 31 20 00 – Earthwork.
 - 7. Section 31 23 16 – Trench Excavation, Backfill, and Compaction,
 - 8. Section 32 91 13 – Planting Soils.

1.2 REFERENCES

- A. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

1.3 SUBMITTALS

- A. Section 013300 – Submittal Procedures.

1.4 QUALITY ASSURANCE

- A. Section 01 40 00 – Quality Requirements.
- B. Perform the work in accordance with the IDOT Standard Specifications.

1.5 REGULATORY REQUIREMENTS

- A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- B. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing, and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

PART 2 – PRODUCTS

2.1 STONE

- A. STONE RIPRAP: Riprap shall be in accordance with Article 281.02(a) of the IDOT Standard Specifications with the following modifications:
 - 1. The riprap shall be RR5 or D50 (12”) as indicated on the Drawings.
 - 2. Furnish each material from single source throughout the Work.
 - 3. Riprap shall be Quality A.
 - 4. Minimum thickness of the riprap shall be twenty-four inches (24”) unless otherwise specified on the plans.
 - 5. Bedding shall be required.
 - a. Bedding thickness shall be eight inches (8”).
 - b. Bedding shall be Class A1 conforming to the requirements of Article 281.02(a) of the IDOT Standard Specifications.
 - i. 100% three inch (3”) diameter or less.
 - ii. 53% +/- 23% one and a half inch (1.5”) diameter or less.
 - iii. 8% +/- 8% three-sixteenths inch (3/16”) diameter or less.

PART 3 – EXECUTION

3.1 STONE RIPRAP REQUIREMENTS

- A. Excavate soil to proper depth for placement of bedding and stone riprap at specified depths and finished grades as indicated on the Plans and as directed by the Engineer.
- B. Install geotextile fabric as required per Section 31 05 19 – Geosynthetics for Earthwork.
- C. Install specified stone as per Article 281.03 through 281.04 of the IDOT Standard Specifications, except as specifically modified in this specification and on the Plans.

END OF SECTION

SECTION 32 01 00

PROTECTION AND REPAIR OF PAVEMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pavement materials and controls.
2. Protection of streets and traffic.
3. Repairing paved streets and sidewalks.
4. New pavements, gutters, curbs, and walkways.
5. Precast concrete parking bumper blocks.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRD General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. Section 01 55 26 – Traffic Control
4. Section 31 05 16 – Aggregates for Earthwork
5. Section 32 11 23 – Aggregate Base Course
6. Section 32 12 16 – Asphalt Paving
7. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).
2. Illinois Supplement to the National Manual on Uniform Traffic Control Devices (MUTCD).

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit replacement pavement product information and pavement mix design.

C. Traffic Control Plan: Submit traffic control in accordance with Section 01 55 26 – Traffic

Control.

- D. Certification: Provide Manufacturer's Certification Report that indicates Products and Materials meet or exceed all specified requirements.

1.4 QUALITY ASSURANCE

- A. Provide traffic control in accordance with Section 01 55 26 – Traffic Control.

PART 2 – PRODUCTS

2.1 PAVEMENT MATERIALS AND CONTROLS

- A. Traffic Control Devices shall conform to the requirements of Article 1106.02 of the IDOT Standard Specifications.
- B. Gravel base course shall be in accordance with Type A1 or A2 as specified in Section 31 05 16 – Aggregates for Earthwork.
- C. Gravel base course shall be installed and compaction tested in accordance with Section 32 11 23 – Aggregate Base Course.
- D. Asphalt pavement shall be provided in accordance with Section 32 12 16 – Asphalt Paving.
- E. Precast concrete bumper blocks shall be formed with 5,000 psi strength concrete and reinforced along its length with a #3 rebar. Size shall be for handling passenger cars, with 7-5/8" bottom width, 5" nominal height, and 4" top width. Length shall be as shown on the Drawings. Unit shall have two 3/4" diameter mounting holes. Mount into pavement with two #4 reinforcing rods, 18" long.

PART 3 – EXECUTION

3.1 PROTECTION OF STREETS AND TRAFFIC

- A. Contractor shall make safe provisions; so far as is practicable, at all cross street and private driveways for free passage of vehicles and pedestrians.
- B. Where such provisions are impracticable or unnecessary, in the opinion of the MWRD, Contractor shall make arrangements, satisfactory to the MWRD and proper authorities, for diversion of traffic and shall provide all materials and signage and perform all work necessary for construction and maintenance of roadways and bridges for diverted traffic.
- C. Where openings are made in or adjacent to any street, alley, or public place, Contractor shall, at their own expense, provide such material and equipment, provide such watchmen, and take such other precautionary measures as are necessary for protection of persons or property.
- D. Material excavated and materials or plant used in construction of the Work shall be so

placed as to safeguard the Work and allow free access to all fire hydrants, water valves, gas valves, manholes, electric, telegraph and telephone conduits, and fire alarm and police call boxes in the vicinity.

- E. After completion of the Work, Contractor shall remove all equipment, and material that were created by their operations, and shall leave the Work area and adjacent premises in a clean and orderly condition.
- F. Contractor shall comply with provisions of MUTCD and any regulations for all traffic control devices erected on MWRD construction projects.

3.2 REPAIRING PAVED STREETS AND DRIVEWAYS

- A. Contractor shall repair or replace road pavements, storm ditches, culverts, gutters, curbs, crosswalks, and sidewalks destroyed or damaged by Contractor, in activities under this Contract, without extra cost to MWRD and in compliance with Local, State and Federal requirements.
- B. If destruction or damage is due to settlement caused by Contractor's operations, bring ground surface to its original elevation and replace damaged pavement, storm ditches, culverts, gutter, curb, crosswalk, or sidewalk immediately with new material at Contractor's expense.
- C. If destruction or damage is due to work in open cut trenches or pits, then immediately after trench or pits have been backfilled, Contractor shall temporarily restore and maintain pavement, storm ditches, culverts, curb, crosswalk, or sidewalk, in as near original condition as possible, using old materials at hand or such new materials as necessary to keep street safe for traffic until it is permanently re-paved or curbs, gutters, crosswalks, or sidewalks are permanently reconstructed.
- D. Asphalt items identified under this Section shall be provided in accordance with Section 32 12 16 – Asphalt Paving.
- E. Aggregate base course, road shoulders, aggregate roadways and driveways shall be provided in accordance with Section 32 11 23 – Aggregate Base Course.

3.3 NEW PAVEMENTS, GUTTERS, CURBS, AND WALKWAYS

- A. Contractor shall obtain consent of MWRD and appropriate municipal, county, or state authority having jurisdiction, before constructing permanent pavements, gutters, curbs, crosswalks, and sidewalks in place of those destroyed or damaged.
- B. Contractor shall construct new pavements, gutters, curbs, crosswalks, and sidewalks in a careful and thorough manner of like character to that destroyed or damaged, or of such other material as MWRD shall order, provided use of such other materials will involve no additional expense to Contractor.
- C. Use of old material, including crushed gravel, pulverized asphalt and Portland cement concrete salvaged from the Work shall be subject to inspection and approval of MWRD

prior to use of any recycled material.

- D. Correct any deficiency with new material of approved quality.
- E. Asphalt items identified under this Section shall be provided in accordance with Section 32 12 16 – Asphalt Paving.
- F. Aggregate base course, road shoulders, aggregate roadways and driveways shall be provided in accordance with Section 32 11 23 – Aggregate Base Course.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate materials.
2. Subgrade preparation.
3. Test rolling equipment and procedures.
4. Aggregate base course installation.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. Section 31 05 13 – Soils for Earthwork
4. Section 31 05 16 – Aggregates for Earthwork.
5. Section 31 22 13 – Rough Grading
6. Section 32 12 16 – Asphalt Paving
7. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

B. ASTM International (ASTM):

1. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbs/ft³).
2. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Contractor shall submit source information and written documentation from Supplier that materials comply with the requirements of this Section for approval prior to delivery and placement.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

- A. Aggregate Material: Type A1, A2, A5 and A11 as specified in Section 31 05 16 – Aggregates for Earthwork.
- B. Materials shall be in accordance with IDOT Standard Specifications Article 1004.04.
- C. Reference schedule at end of the section, for aggregate material use designations for base course and road shoulder development.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify substrate is dry and has been inspected, and gradient and elevation are correct.

3.2 SUBGRADE PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, re-shaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 TEST ROLLING EQUIPMENT AND PROCEDURES

- A. Test rolling shall be used to verify stability and uniformity of subgrade. Perform this Work in presence of MWRDGC Engineer.
- B. Use test rolling equipment conforming to following description:
 - 1. Tandem axle, dual wheel dump truck.
 - 2. Tire pressure shall be no less than 90 percent of manufacturer's recommended maximum inflation.
 - 3. Minimum gross weight of loaded truck shall be 60,000 pounds.
 - 4. Provide weigh slip to MWRDGC Engineer.
- C. Perform test rolling procedure as follows:
 - 1. Operate equipment at a rate not to exceed three (3) mph to five (5) mph or a comfortable walking pace.
 - 2. Adjust speed to allow MWRDGC Engineer to measure any deflections and areas of rutting.
 - 3. Operate test rolling equipment in a pattern so that affected areas are loaded with at least

one (1) pass.

4. After test rolling, check subgrade for conformance to drawings, and correct any surface irregularities. Re-shape subgrade within tolerances specified.

D. Test Rolling Evaluation:

1. Rutting up to one (1) inch is acceptable.
2. Rutting in excess of one (1) inch but not more than six (6) inches, shall be considered a failure and requires reworking soil and compaction to required density.
3. Deflection, (pumping) up to one (1) inch is acceptable.
4. Deflection in excess of one (1) inch but not more than two (2) inches shall be acceptable if there is not substantial cracking or lateral movement of soil.
5. Deflection in excess of two (2) inches but not more than six (6) inches shall be considered a failure, and requires reworking soil and compaction to required density.
6. Rutting and deflection in excess of six (6) inches will require review and recommendation for corrective action by MWRDGC Engineer.
7. After remedial work is performed, a final test roll shall be performed upon completion of work.
8. If remedial work is performed as directed, second test roll may be waived at discretion of MWRDGC Engineer.

3.4 AGGREGATE INSTALLATION REQUIREMENTS

- A. Aggregate base course shall be placed with a paver box or other method approved by MWRDGC Engineer to ensure uniform width, depth, crown, and final surface smoothness. Placement of the aggregate base shall closely follow the horizontal alignment as staked in the field. The paver box operator shall possess sufficient skills and experience to perform the work.
- B. Spread aggregate over prepared sub-grade to a total compacted thickness as indicated on Drawings.
- C. Place aggregate in maximum six inch (6") loose lifts and compact to specified density.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.5 AGGREGATE ROAD SHOULDER INSTALLATION

- A. Install aggregate shoulders to elevations and typical sections shown on Drawings, except for minor modifications needed to conform to other work.
- B. Use equipment that does not damage or mar pavement surface, curbs, or appurtenances.
- C. Place aggregate directly on shoulder area between pavement edge and outer shoulder

limits.

- D. Recover uncontaminated material deposited outside limits and place within limits.
- E. Do not deposit aggregate on pavement during placement, unless the MWRDGC Engineer specifically allows. Do not leave aggregate on pavement overnight.
- F. After placing shoulder aggregate, keep pavement surface free of loose aggregate.
- G. Spread and compact aggregate in compacted layers of six inches (6") or less.
- H. Compact aggregate until there is no appreciable displacement, either laterally or longitudinally, under compaction equipment.
- I. Route hauling equipment uniformly over previously placed base. Compact each layer before placing a subsequent layer.
- J. If gravel material is too dry to readily attain required compaction, add water as necessary to achieve compaction.
- K. After final compaction, shape shoulders to remove all longitudinal ridges to ensure proper drainage.

3.6 TOLERANCES

- A. Flatness: Maximum variation of one-half inch (1/2") measured with ten foot (10') straight edge.
- B. Scheduled Compacted Thickness: within one-half inch (1/2").
- C. Variation from Design Elevation: within one-half inch (1/2").

3.8 FIELD QUALITY CONTROL

- A. Perform compaction testing in accordance with ASTM D1557, ASTM D6938, and Section 01 40 00 – Quality Requirements.
- B. Perform moisture content testing in accordance with ASTM D6938 and Section 01 40 00 - Quality Requirements.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- D. Frequency of Tests: One test per lift per 100 square yards.

3.9 PAVEMENT BASE COURSE AND ROAD SHOULDER SCHEDULE

- A. Section 31 05 16 – Aggregates for Earthwork defines "A" designated base course materials.

- B. Under Asphalt Pavement:
 - 1. Aggregate Type A1 or A2 or as indicated on the Drawings, compact to 95 percent modified Proctor density.

- C. Under Concrete Pavement, Sidewalk and Curb and Gutter:
 - 1. Aggregate Type A1 or A2 or as indicated on the Drawings, compact to 95 percent modified Proctor density.

- D. Under Porous Pavement:
 - 1. Lower Layer: Aggregate Type A12 or as indicated on the Drawings, compact to 95 percent modified Proctor density.
 - 2. Upper Layer: Aggregate Type A5 or as indicated on the Drawings, compact to 95 percent modified Proctor density.

- E. Under Paver Units:
 - 1. Sub-Base: Aggregate Type A1 or as indicated on the Drawings, compact to 95 percent modified Proctor density.
 - 2. Sand Base: Aggregate Type A11 or as indicated on the Drawings, compact to 95 percent modified Proctor density.

- G. Aggregate Shoulder or Gravel Pavement:
 - 1. Aggregate Type A1 or as indicated on the Drawings, compact to 95 percent modified Proctor density.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt pavement materials and installation.
2. Pavement markings.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.

C. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
2. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
3. Section 31 05 13 – Soils for Earthwork
4. Section 31 05 16 – Aggregates for Earthwork
5. Section 31 22 13 – Rough Grading
6. Section 32 11 23 – Aggregate Base Course
7. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current Edition, including Supplemental Specifications (Standard Specifications).

B. ASTM International (ASTM):

1. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbs/ft³).
2. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. AASHTO: American Association of State Highway and Transportation Officials

1.3 SUBMITTALS

A. General:

1. Submit Product Data in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package. Partial submittals are unacceptable.
- B. Asphalt Mix Design, including aggregate gradation, and IDOT mix design approval letter.
- C. Test Results of Quality Assurance Testing.
- D. Submit in accordance with Section 01 33 00.
- E. Submit name of pavement marking subcontractor. Pavement marking subcontractor to be on current IDOT list of approved pavement marking contractors.

1.4 QUALITY ASSURANCE

- A. Asphalt supplier shall have a minimum of 5 years of experience producing asphalt mixes for the Department of Transportation.
- B. Do not commence placement of asphalt until mix design has been reviewed and approved by Engineer.
- C. Perform the following testing during asphalt mix production and placement:
 1. Aggregate Gradation in accordance with AASHTO T 27
 2. Asphalt Content in accordance with AASHTO T 308.
 3. Air Voids by calculation in accordance with AASHTO T 269.
 4. Voids in Mineral Aggregate (VMA) by calculation in accordance with AASHTO R 35.

PART 2 - PRODUCTS

2.01 PAVEMENT MATERIALS

- A. Aggregate:
 1. Furnish coarse aggregate from local Department of Transportation approved sources.
 2. Aggregate for Bituminous Base:
 - a. Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.
 - b. Uncrushed gravel may be used in base course mixture if required to suit local material availability.
 - c. Gradation: Well graded between limits specified and shall conform to IDOT Specs Article 1004.04, Type A, Gradation CA 6.
 3. Aggregate for Bituminous Binder:
 - a. Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.

- b. Gradation: Well graded between limits specified and shall conform to IDOT Specs Article 1004.03 for HMA Binder Course, IL-19.0.
4. Aggregate for Bituminous Surface:
 - a. Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.
 - b. Sand prepared from stone, blast-furnace slag, gravel, or combinations thereof may be used if required to suit local material availability.
 - c. Gradation: Well graded between limits specified and shall conform to IDOT Specs Article 1004.03 for HMA Surface Course, IL-9.5.
 5. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D242.
- B. Bituminous Materials:
1. Asphalt Cement: Performance Grade PG 64-22 or PG 58-28 in accordance with ASTM D946.

C. Mix Design:

Mixture Use	Surface Course	Binder Course
Asphalt Binder	PG 64-22 or PG 58-28	PG 64-22 or PG 58-28
Design Air Voids	4.0 @ N50	4.0 @ N50
Mixture Composition (Gradation Mixture)	IL 9.5	IL 19.0
Friction Aggregate	Mix "D"	N/A
Unit Weight	112 lbs/square yard/inch	112 lbs/square yard/inch

D. Prime Coat and Tack Coat

1. Bituminous material meeting one of the types listed in IDOT Standard Specifications, Article 406.02.

E. Recycled Asphalt Pavement

1. Stockpile recycled asphalt pavement separately from virgin materials and list each as individual job mix formula components.
2. Conform to the following maximum allowable percent binder replacement (ratio of recovered binder to total binder) in accordance with Article 1031.06 of the IDOT Standard Specifications:

HMA Mix	Maximum Allowable Percent of Asphalt Binder Replacement	
	Surface Course	Binder Course
50	15	25
70	10	15

3. Use of recycled asphalt pavement shall be in accordance with Section 1031 of the IDOT Standard Specifications.

2.02 PAVEMENT STRIPING AND MARKINGS

- A. Cook County Department of Transportation and Highways Right-of-Way
 1. Modified urethane pavement markings in accordance with Section 1095.09 of the IDOT Standard Specifications.
- B. Other Areas
 1. Parking striping and pavement markings shall be thermoplastic pavement markings complying with Section 1095.01 of the IDOT Standard Specifications. Pavement markings and striping shall be white or as approved by the Owner. Reflective glass beads are not required.

PART 3 - EXECUTION

3.01 WEATHER LIMITATION

- A. Apply tack coat when ambient temperature is above 35 degrees Fahrenheit. Do not apply when base is wet or contains standing water.
- B. Place asphalt material when atmospheric temperature is above 35 degrees Fahrenheit and rising, and when base is dry.
- C. Do not place asphalt material on frozen subgrade or base.

3.02 PREPARATION

- A. Prepare aggregate base in accordance with Section 32 11 23.
- B. Prime Coat: Apply in accordance with IDOT Article 406.05.

3.03 DELIVERY, STORAGE, AND HANDLING

- A. Transport asphalt materials in covered trucks during rainy weather and when air temperature falls below 65 degrees F.
- B. Adjust weight, type, capacity, haul routes, and method of operation of hauling vehicles such that no damage results to existing streets, subgrade, or base course.

C. Owner has final authority to designate haul routes, procedures, and operation times.

3.04 PLACING ASPHALT MIX

A. Place asphalt mixture on prepared surface, spread, and strike-off.

B. Place using a self-propelled paver to ensure uniform spreading and strike-off of mix. Provide a smooth mixture free of tearing and segregation. Place mixture to required grade, cross-section, and compacted thickness.

C. Place inaccessible and small areas by hand. Place mixture to required grade, cross-section, and compacted thickness.

D. Joints: Place asphalt continuously to limit the number of joints. Make joints between old and new pavements and between successive days' work, to ensure continuous bond between adjoining work. Clean contact surfaces and apply tack coat. Construct joints to have same texture, density, and smoothness as other sections of asphalt pavement.

E. Tack Coat: Apply in accordance with IDOT Article 406.05.

3.05 COMPACTION

A. Provide compaction in accordance with IDOT Article 406.07.

B. In small areas not accessible by a roller, compact using mechanical tampers.

3.06 FIELD QUALITY CONTROL

A. Pavement Testing:

1. Test completed surface course in accordance with IDOT Article 406.11. Surface variations shall not exceed 3/16 inch.

END OF SECTION

SECTION 32 13 13
CONCRETE SIDEWALKS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section includes, but is not limited to, exterior cement concrete pavement for the following:
 - 1. Concrete Sidewalks.
 - 2. Detectable Warning Plates.

1.3 RELATED SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 03 30 00 – Cast-in-Place Concrete.
 - 2. Section 31 20 00 – Earthwork.
 - 3. Section 31 05 13 – Soils for Earthwork.
 - 4. Section 31 05 16 – Aggregates for Earthwork.
 - 5. Section 31 25 00 – Erosion Control.
 - 6. Section 32 91 13 – Planting Soils.
 - 7. Section 32 92 00 – Turf and Grasses.
 - 8. Section 32 92 19 – Seeding.
 - 9. Section 32 93 00 – Planting and Fine Grading.
- B. Contract work subject to Specifications not in Project Manual:
 - 1. Standard Specifications of the State of Illinois Department of Transportation.

1.4 REFERENCES

- A. Standards: The following referenced standards and standard specifications, referred to thereafter by designation only, form a part of this Section:
 - 1. ACI: American Concrete Institute.

2. American Society for Testing and Materials (ASTM) C33: Concrete Aggregates.
 3. ASTM C94: Ready Mix Concrete.
 4. ASTM C150: Portland Cement.
 5. ASTM C260: Air-entraining admixtures for Concrete.
 6. ANSI: American National Standards Institute.
 7. AASHTO: American Associations of Highway Transportation Officials.
 8. FS: Federal Specifications.
- B. American Concrete Institute (ACI):
1. ACI 301 "Specification for Structural Concrete for Buildings."
 2. ACI 302 IR "Recommended Practice for Concrete Floor and Slab Construction."
 3. ACI 303.1 "Standard Specification for Cast-In-Place Architectural Concrete."
 4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete."
 5. ACI 305R "Recommended Practice for Hot Weather Concreting."
 6. ACI 306R "Recommended Practice for Cold Weather Concreting."
- C. American Society of Testing and Materials (ASTM):
1. ASTM C309 "Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete."
 2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."

1.5 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for Submittals.
- B. Statements of Qualifications: Submit to identify and exhibit qualifications as specified in this Section.
1. For firms indicated in “Quality Assurance” Article 1.7 of this Section, including list of completed projects.
- C. Product Data: Provide manufacturer’s data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements. For each type of manufactured material and product indicated submit manufacturer’s literature describing products, installation procedures and routine maintenance. Work includes but is not limited to:
1. Bond Breaker Material.
 2. Expansion Joint Material.
 3. Concrete Products.
 4. Curing compound.
 5. Detectable Warning Plates.

- D. Manufacturer's color charts showing full range of colors available.
1. Detectable Warning Plates.
- E. Samples: Prior to ordering the below listed materials, submit representative samples to Engineer for selection and approval as follows. Do not order materials until Engineer's approval has been obtained. Delivered materials shall closely match the approved samples. Submit duplicate samples of each material listed below showing full range of color variation, finish and texture that can be expected in the permanent work:
1. Bond Breaker Material, 12" square.
 2. Expansion Joint Material, 12" length.
 3. Detectable Warning Plates: Two (2) plate samples minimum 6"x6" of the kind proposed for use.
- F. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.
- G. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with requirements indicated, based on comprehensive testing of current materials.
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
 2. Detectable Warning Surface Tiles: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast in Place Detectable/Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24-month period.
- H. Material Certificates: Signed by manufacturers certifying that each of the materials complies with requirements:
1. Cementitious materials and aggregates.
 2. Steel reinforcement and reinforcement accessories.
 3. Admixtures.
 4. Curing compounds.
 5. Applied finish materials.
 6. Bonding agent or adhesive.
 7. Expansion Joints.
 8. Certifications cited in this Section in paragraph 1.07, Quality Assurance.
- I. Concrete Mix Design- Submit certified mix designs or each concrete pavement mix at least three weeks prior to the beginning of work in accordance with ACI 301 for each class of concrete. Include alternate mix designs when characteristics

of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Include the following information:

1. Results of testing or test data used to establish mix proportions.
 2. Test to verify total chloride in content.
 3. Certificates of compliance for:
 - (a) Contractor's design laboratory and ready mix concrete suppliers certificate of plant inspection.
 - (b) Cement.
 - (c) Aggregates, each type.
 - (d) Admixtures.
 - (e) Air entrainment.
 - (f) Curing compounds.
 - (g) Form Coating.
 4. Reinforcement: Submit certified mill test reports for metal reinforcement and welded wire fabric.
- J. Minutes of preinstallation conference.
- K. Field quality-control test reports in accordance with Section 01 40 00.
- L. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

1.6 EXAMINATION OF CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
- B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Engineer's and Owner's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

1.7 QUALITY ASSURANCE

- A. Comply with the requirements of ACI 301.
- B. Manufacturer Qualifications:
 1. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - (a) Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

2. Manufacturer of with 10-years experience in manufacture of specified products.
- C. Source Limitations:
1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
 2. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- D. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- E. Workmanship: The Contractor is responsible for correction of concrete work that does not conform to the specified requirements, including strength, tolerances, grading and finishes.
- F. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.
 2. Notify Engineer seven (7) days in advance of dates and times when mockups will be constructed.
 3. Obtain Engineer's approval of mockups before starting construction.
 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 5. Demolish and remove approved mockups from the site when directed by Engineer.
 6. Approved mockups may become part of the completed Work if approved by the Engineer and undisturbed at time of Substantial Completion.
- G. Pre-installation Conference: One week prior to placement of concrete, a meeting shall be held to discuss the Project and application methods. Conduct conference at Project site to comply with requirements in Division 01.
1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - (a) Engineer
 - (b) General Contractor's superintendent.
 - (c) Independent testing agency responsible for concrete design mixtures.
 - (d) Ready-mix concrete producer.
 - (e) Concrete pavement subcontractor.

(f) Owner

- H. Notification: Engineer shall be notified at least 1-week before start of Work.
- I. Concrete Testing: Testing shall be provided by Contractor in accordance with Section 01 40 00 and this Section.
- J. Layout and Grading: After staking out the work, and before beginning final construction, obtain the Engineer's approval for layout and grades.
 - 1. The Engineer reserves the right to make adjustments to layout and grade without the Contractor submitting claims for extra compensation.
 - 2. The Contractor shall not proceed with the work of this Section without obtaining the Engineer's written acceptance of layout and grading.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Product Delivery, Storage, and Handling: In accordance with the provisions of Division 1.
- B. Cement: Store in weather tight enclosures and protect against dampness, contamination, and warehouse set.
- C. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration data, as applicable.
- D. Store the products in a location protected from damage, construction activity, and precipitation in strict accordance with the manufacturer's recommendations.
- E. Aggregates
 - 1. Stockpile to prevent excessive segregation or contamination with other materials or other sizes of aggregates.
 - 2. Use only one supply source for each aggregate stockpile.

1.9 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
- C. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
- D. Allowable Concrete Temperatures.
 - 1. Cold weather: Maximum and Minimum, ACI 301, Paragraph 7.6.1.
 - 2. Hot weather: Maximum 90 degrees F, ACI 301, Paragraph 7.6.2.

- E. Comply with professional practices described in ACI 305R and ACI 306R.
- F. All concrete paving shall meet requirements of Section 03 30 00 – Cast-in-Place Concrete.

PART 2 PRODUCTS

2.1 BASE COURSE

- A. Compacted dense-graded aggregate used for pavement base shall be in accordance with Section 31 05 16 – Aggregates for Earthwork.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Forms to be of suitable size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removed.
 - 1. Use flexible spring steel forms or laminated boards or curved forms for all curves.
 - 2. Where possible, use recycled forms for initial placement and recycle forms used as work proceeds.
- B. Form-Release Agent: Coat forms with a commercially formulated 100% soy-based biodegradable form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Provide a form-release agent with zero-VOC biodegradable for release agent. Acceptable manufacturers:
 - 1. Bio-Form”, Leahy-Wolf Company
1951 N. 25th Avenue; Franklin, IL 60131
888-873-5327 or 847-455-5700
 - 2. “Enviroform”, Conspec Marketing and Manufacturing Co., Inc.
636 South 66th Terrace; Kansas City, KS 66111
913-287-1700 or 800-348-7351
 - 3. “Soy Form Away”, Natural Soy Products
2 Liberty Street; Watkins, IA 52354
888-655-0039 or 319-227-7418
 - 4. “Soy Form Away”, Midwest Biologicals, Inc.
P.O. Box 384; Woodburn, IN 46797
219-632-4003
 - 5. or approved equal.

2.3 REINFORCEMENT MATERIALS

- A. General:
 - 1. Unless otherwise indicated, all reinforcing shall be epoxy-coated steel.

2. Certified copies of mill reports for all reinforcing shall be submitted before reinforcing is placed.
 3. Bars shall be correctly rolled to section and free from surface defects.
 4. Splices in reinforcing shall be as specified in Part 3 Article "Placing Reinforcement".
- B. Epoxy-Coated Welded Wire Fabric: Comply with ASTM A884/A884M, Class A, plain steel epoxy coated. Wire fabric shall have a minimum ultimate strength of 70,000 psi.
- C. Epoxy-Coated Reinforcement Bars: Comply with ASTM A775/A775M; and with ASTM A615/A615M, Grade 60 (Grade 420), deformed new billet steel bars.
- D. Epoxy-Coated Wire: Comply with ASTM A884/A884M, Class A coated, plain steel.
- E. Epoxy-Coated Joint Dowel Bars: Comply with ASTM A775/A775M; and with ASTM A615/A615M, Grade 60 (Grade 420), plain steel bars, epoxy coated.
- F. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.
- G. Reinforcement Accessories:
1. Tie wire, plastic coated, for use with epoxy coated reinforcing.
 2. Mechanical Reinforcing Bar Connectors: Comply with ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar. Coat connectors in accordance with the same requirements as reinforcing bars.
 3. Chairs shall be plastic tipped.
 4. The top wire of all spacers, bolsters and chairs shall be corrugated.
 5. Other accessories, at the option of the Contractor, may be zinc coated, except on exposed surfaces which have plastic tipped accessories.
- H. Reinforcement shall be kept clean from oil, dirt and loose mill scale or other coating.

2.4 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement Concrete: Materials and mixing for all concrete work, unless otherwise specified, shall conform to ACI 301.
1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.

2.5 ADMIXTURES

- A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

2.7 BONDING AGENT

- A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 RELATED MATERIALS

- A. Expansion Joint material shall be Homex 300 Expansion Joint Filler, 3/8" thickness or as shown on the Drawings as manufactured by the Homasote Company, West Trenton, New Jersey, 800.257.9491.
- B. Impervious or Pervious Sheeting Materials for Curing Concrete: Provide sheeting, mats, or other acceptable material for wet curing concrete as approved for curing methods and conditions of use.
- C. Sleeves: For penetrations through concrete of conduits and pipes, sleeves shall be PVC Schedule 40 conforming to provisions of ASTM D1785.
- D. Joint Dowel Bars: ASTM A615, Grade 60, plain steel bars. Cut bars true to length with ends square and free of burrs.
- E. Hook Bolts: ASTM A307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in

position during concreting operations, and to permit removal without damage to concrete or hook bolt.

2.9 CONCRETE MIXTURES

- A. Refer to Section 03 30 00 for Concrete Mixtures.
- B. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by laboratory trial mixes.
- C. Contractor shall make trial batches and have necessary tests performed as directed by the MWRD at no cost to MWRD.
- D. Testing shall be repeated as required until proposed mix is approved by the Engineer.
- E. Concrete mixes shall, at all times, be subjected to modification by the MWRD on basis of the character or work in which concrete mix is to be used, variation in aggregates, subsequent tests, and inspection of concrete work performed.
- F. Proportion mixes to provide normal-weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Seven-day compressive strength of moist-cured laboratory samples: 2400 psi.
 - 2. Twenty-eight day compressive strength of moist-cured laboratory samples: 4000 psi.
 - 3. Air content: 6.5%, plus or minus 1.0%.
 - 4. Maximum Water – Cementitious Ratio: 0.44
 - 5. Slump range: Refer to Section 03 30 00.
 - 6. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

2.11 DETECTABLE WARNING PLATES

- A. Refer to Contract Drawings for shapes and dimensions. Radial sections shall be custom cut to match the curb and paving profiles.
- B. Detectable Warning Plates shall be cast iron plates as manufactured by Neenah Foundry (800.558.5075), www.nfco.com.
- C. Detectable Warning Plates shall be ADA Compliant.

- D. Finish shall be powder-coated. Color to be selected by the Engineer from the manufacturer's full range of available colors.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

- A. Examination: Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2 GENERAL

- A. Particular care shall be used when starting a concrete pour to maintain the continuity of appearance. Use all means necessary to avoid blemishes, imperfections, or changes in the finish.
- B. Note that the appearance of exposed concrete surfaces depends upon uniform color and texture within any one area and between adjacent areas and exercise strict batching, mixing, placing, curing, etc. controls to achieve this end.
- C. Cutting and/or patching made necessary by failure or delay in complying with these requirements shall be at no additional expense to the Owner. No cutting or patching of exposed concrete shall be done without Engineers approval.
- D. All concrete work shall comply with the tolerances specified in ACI 117.

3.3 PREPARATION

- A. Preparation of subgrade shall be in accordance with Section 31 20 00 – Earthwork.
- B. Contractor to prepare aggregate base in accordance with Section 32 11 23. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- C. Remove loose material from compacted subbase surface immediately before placing concrete.
- D. For concrete placed on soil, the subgrade shall be thoroughly wetted prior to placing.

- E. Confirm in writing that the Engineer has accepted the layout and grades for walkways.
- F. Review layout and location of construction, expansion and contraction joints with the Engineer. Confirm in writing that the Engineer has accepted the layout of all joints. Clear away debris and excess water from areas where concrete will be placed. Remove any material from in-place concrete or steel which will impair bond.
- G. Sandblast or waterblast all construction joints and under baseplates to clean and roughen the entire surface of the joint, exposing coarse aggregate solidly embedded in mortar matrix. Roughen concrete surface while concrete is still green where possible. Do not leave laitance, loosened particles of aggregate or damaged concrete at surface. Forms and reinforcing shall be cleaned of drippings.
- H. Dampen contact surfaces of construction joints, leaving them free of standing water, before placing fresh concrete.
- I. Form clean-out openings and removable sections shall be placed and secured only after inspection of forms.

3.4 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.
- C. All concrete edges for all pavement, foundations, curbs and other below grade work shall be formed or contained to prevent over pouring of concrete. Excess concrete shall be removed as directed by the Engineer.
- D. Notify the Engineer at least 72 hours before placement of concrete for review of forms, form liners, and reinforcement. No concrete shall be placed without this review and acceptance.

3.5 JOINTS AND OPENINGS

- A. General: Construct construction, expansion, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 2. Provide tie bars at sides of pavement strips where indicated.
 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 4. Review location of construction joints with the Engineer.
- C. Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Contractor to provide a plan showing location of expansion joints to Engineer for Approval before Concrete is placed. Review patterning with Engineer when formwork is in place but before concrete is placed. If pattern cannot be achieved, or is unclear, consult with Engineer before placing concrete. Do not proceed with concrete placement without approval from Engineer on patterning. Do not proceed in uncertainty.
 2. Extend expansion joint the full width and depth of joint. Set top of expansion joint flush with finish grade.
 3. Chemically fasten one side of expansion joint materials to one side of materials requiring separation. Fasten with "Liquid Nail", or equivalent, using formula appropriate to materials being fastened.
 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
- D. Control Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Drawings. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 2. Contractor to provide a plan showing location of control joints to Engineer for approval before Concrete is placed. If pattern cannot be achieved, or is unclear, consult with Engineer before placing concrete. Mark control joints on the forms. Do not proceed with concrete placement without approval from Engineer on patterning.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 PLACING REINFORCING

- A. General: Wherever embedded items interfere with placing of reinforcement notify the Engineer and obtain approval before placing any concrete. Do not bend or field cut bars around openings or sleeves.
- B. Placing:
 - 1. Do not exceed the tolerances specified in ACI 117.
 - 2. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No 3 bars (minimum) shall be added to provide proper support and anchorage.
 - 3. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- C. Field bending or straightening in accordance with section 3.3.2.8 of ACI 301
- D. Spacing of Reinforcing: Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to ACI318 Section 7.6.
- E. Concrete Cover: Place reinforcement to obtain as a minimum the coverages for concrete protection specified in section 3.3.2.3 of ACI 301.
- F. Splicing: Make splices only at those locations shown on the Drawings or as accepted by the Engineer. Stagger splices in adjacent bars wherever possible. Splicing shall conform to the requirements of ACI 310 and specified provisions.
- G. Reinforcing Supports:
 - 1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. The use of wood supports and spacers inside the forms is not permitted.
 - 2. Support reinforcement supported from the ground on precast concrete reinforcement supports.
 - 3. Do not use reinforcing supports or reinforcing to support concrete conveying equipment and similar construction loads.
- H. Tying:
 - 1. Reinforcing shall be rigidly and securely tied with steel tie wire. Tie wires, after cutting, shall be bent in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.
 - 2. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 - 3. Reinforcing in concrete members that have one or more surfaces exposed, whether painted or unpainted finish shall be tied with galvanized wire. Uncoated tie wire in exposed members will not be accepted.

- I. Install deformed bar anchors in accordance with the manufacturer's recommendations.
- J. Install mechanical splices and reinforcing couplers in accordance with manufacturers' recommendations.
- K. Installation of manufactured products as per Part 2 of this specification and according to manufacturers' recommendation.
- L. Cleaning:
 - 1. Clean reinforcement to remove loose rust and mill scale, earth and other materials which might reduce or destroy bond with concrete.
 - 2. Where there is a potential of rust staining adjacent finish surfaces, take necessary steps to prevent staining.

3.7 MIXING CONCRETE

- A. Ready Mix and Site Produced Concrete
 - 1. Comply with ASTM C 94.
 - 2. The batching plant shall be equipped with an electric metering device capable of determining moisture content of sand.
 - 3. The addition of water at the site is contingent upon full time inspection of the process by the owners testing laboratory and the acceptance of the Inspector, Comply with ACI 301, section 4.3.2.1.
 - 4. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.

3.8 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement without approval from the Engineer and Owner's testing agency.

- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-Textured Broom Finish: Horizontal surfaces of concrete surfaces which will be exposed shall be given a medium broomed finish, with direction of grooves in concrete surface perpendicular to line of traffic or travel. Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across the surface to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation. Immediately following finishing operations, arises at edges and both sides of expansion joints shall be rounded to a 1/4- inch radius.
 - 2. Sidewalks, walkways, accessible routes, and ramps shall be constructed and finished in accordance with the Americans with Disabilities Act (ADA) and state and local requirements.
 - 3. Bases: Provide a smooth trowel finish to inhibit bonding between the base slab and finish pavement overlay.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Curing wax shall be installed as per manufacturer's installation instructions (Scofield Application instructions A-513 for colorwax), or

approved equal. Pavement shall be carefully protected from the drying effects of the sun and wind, traffic, or other causes by means of suitable guards and coverings, and shall be kept moist for period of three days. No dusting of cement, or sprinkling or fogging with water shall be permitted. Do not cover with plastic.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 EXPANSION JOINTS

- A. Expansion joints shall be 1/2 inch wide and located where shown on the Drawings. Expansion joints shall be troweled in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab and full length of the expansion joint.
 1. For concrete walks, pavements, and pads, depth of joint filler shall be placed to form a recess as required for sealant and backer rod below finished concrete surface.
 2. Use of multiple pieces to make up required depth and width of joint will not be permitted.

3.12 CONSTRUCTION JOINTS

- A. Construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.
 1. Butt joint with dowels or use a thickened edge joint if construction joints occur at control joint locations.
 2. Keyed joints with tie-bars shall be used if the joint occurs at any other location.

3.13 CONTROL JOINTS

- A. Control joints shall be sawcut into the concrete slab, in pattern as generally shown on the Drawings, approved Shop Drawings or otherwise approved by Engineer.
 1. Sawcut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks. Control joints shall be sawcut into slab surface at least 1 inch, but in no case not less than 25 percent of slab depth.

3.14 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 1. Elevation: 1/8 inch.
 2. Thickness: Plus 3/8 inch, minus 1/4 inch.

3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed 1/8 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/16 inch, no minus.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
 4. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in

pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.16 DETECTABLE WARNING PLATE INSTALLATION

- A. During Cast in Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. Prior to placement of the Cast in Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.
- C. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.
- D. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast in Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast in Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.
- F. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates

any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

- H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast in Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.
- I. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.
- J. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.
- K. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.
- L. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- M. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.
- N. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.
- O. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction

adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the sound on cane audible properties of the Armor-Tile system as required in various jurisdictions.

3.17 REPAIRS

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
 - 1. Damaged concrete shall be removed to a full joint and replaced. Partial patching within the sidewalk shall not be accepted. Engineer shall determine extent of removal and replacement.
- B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

3.18 PROTECTION OF FINISHED WORK

- A. Protect finish work under provisions of Division 01.
- B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.
- D. Protect pavement surface from damage until final inspection and acceptance by Engineer and Owner.
- E. Refer to Division 01 for closeout procedures.

END OF SECTION

SECTION 32 14 40

STONE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but are not limited to the following:
 - 1. Stone Armoring
 - 2. Channel Drop Stone Facing
 - 3. Stone Placement at Landings
 - 4. Stone Placement at Stone Riffles
 - 5. Geotechnical Fabric
- B. Related Documents:
 - 1. Applicable provisions of Division 01 shall govern work of this specification section.
 - 2. Geotechnical Baseline Report included in Volume 3.
- C. Related Sections:
 - 1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
 - 2. Section 31 05 13 – Soils for Earthwork
 - 3. Section 31 05 16 – Aggregates for Earthwork
 - 4. Section 31 05 19 – Geosynthetics for Earthwork
 - 5. Section 31 20 00 – Earthwork.
 - 6. Section 31 37 00 – Rip Rap
 - 7. Section 32 91 13 – Planting Soils.
 - 8. Section 32 93 00 – Planting and Fine Grading.
 - 9. Applicable provisions of MWRDGC General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
 - 10. In the event of a conflict between this section and any of the General Specifications, this section shall prevail.

1.3 REFERENCES

- A. Illinois Department of Transportation (IDOT):

1. Standard Specifications for Road and Bridge Construction, Current edition, including Supplemental Specifications (Standard Specifications).

1.4 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
- B. Submit qualification data for firms and persons specified in the “Qualifications” Article of this Section to demonstrate their capabilities and experience.
- C. Provide a list of not less than three (3) successfully completed stonework projects including name and current contact information of owners.
- D. The Contractor to review Geotechnical Report and shall demonstrate ability to excavate on site stone and stockpile adequate supply to perform the work represented in the Drawings.
- E. Contractor shall prepare Shop Drawings for Stone Reuse Locations. Separate Shop drawings are required for each of the following Landscape Features and shall be stamped by an Engineer registered in the State of Illinois and shall include any and all mechanical fasteners deemed appropriate by the Engineer and as required to align with the Drawings:
 1. Stone Armoring at Waterline
 2. Stone Armoring at Steep Slope
 3. Channel Drop Stone Facing
 4. Stone Placement at Landings
 5. Stone Placement at Stone Riffles
- E. For geotextile fabrics, refer to Section 31 05 19 – Geosynthetics for Earthwork.
- F. Use of any product other than specified requires the submittal of samples and complete manufacturers specifications to the Engineer for approval.

1.5 REGULATORY REQUIREMENTS

- A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- B. Contractor shall comply with the Urban Committee of the Association of Illinois Soil and Water Conservation Districts - Illinois Urban Manual.
- C. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- D. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

E. Conform to applicable code for environmental requirements.

F. Coordinate Work with utility companies.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Closeout Requirements.

1.7 QUALITY ASSURANCE

A. Section 01 40 00 – Quality Requirements.

B. Perform Work in accordance with the IDOT Standard Specifications.

1.8 QUALIFICATIONS

A. Contractor Qualifications:

1. Contractor shall have a minimum of (5) years experience on comparable projects.
2. Contractor shall be familiar with the MWRDGC standards and specifications.
3. Contractor's Field Supervision: Require Installer to maintain an experienced fulltime supervisor on the Project site during times that Stone Armoring, Stone Facing, and Stone Prospect Construction is in progress. Use experienced crews.
4. The work described in this section requires specialized knowledge, experience, skills, and equipment to successfully complete. The Contractor shall possess the full capability to execute the work as specified, including trained, experienced, and skilled personnel and possession of or access to the required equipment.

1.9 SITE CONDITIONS

A. Project Environment:

1. Operations will be suspended or delayed whenever conditions are unfavorable for such work or as directed by the Engineer.

B. Contractor Equipment:

1. Equipment of a type, size, capacity or condition unsuited for obtaining first class work and expedition of the job shall be replaced with proper equipment.
2. Limits of operation shall be restricted to areas designated by the Engineer.

1.10 COORDINATION

A. Section 01 13 10 – Coordination and Meetings.

B. Coordinate the Work with installation of, including but not limited to, pavements, utilities, soils, and planting specified under other sections as the Work of this Section proceeds.

1.11 PRE-INSTALLATION MEETING

A. Section 01 13 10 – Coordination and Meetings.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 – Product Requirements.
- B. Excavate and stockpile materials on the project site in a manner that reduces the potential damage to the excavated stone prior to reuse on the project site.
- C. Store and handle the stone and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes.
- D. Do not use pinch or wrecking bars.
- E. Lift with wide-belt-type slings where possible; do not use wire rope or ropes containing tar or other substances that might cause staining.

1.13 FIELD QUALITY CONTROL

- A. Contractor shall construct a six-foot (6') sample of each element, including Stone Facing, the Stone Armoring, Channel Drops, Stone Placement at Landings, and Stone Riffles for the Engineer review and approval prior start of construction of any individual section. All constructed elements shall match the approved sample.

PART 2 – PRODUCTS

2.1 STONE ARMORING

- A. On site salvaged stone retained for use at the Stone Armoring Locations shall have a minimum and maximum dimension as denoted below. Refer to the Drawings for specific size requirements. The stone shall be from:
 - 1. Minimum Dimension: 6" x 1'-6" x 1'-6"
 - 2. Maximum Dimension: 12" x 3'-0" x 3'-0"
 - 3. Finish: Natural / Split Face
 - 4. Contractor shall select stones for surface quality and reuse characteristics that enable stacking in slope areas. Stones to be used in Waterline Armoring conditions shall be evaluated for ability to incorporate pining as indicated in Drawings.
- B. If it is determined that on-site stone salvage is not possible in the specified sizes and/or quantity, contractor shall supply additional stone to the project from one of the following sources:
 - 1. Lafarge Fox River Decorative Stone Quarry (tel: 847.888.6133)
 - 2. Stagecoach Trails Limestone Quarry (tel: 815.541.4342)
 - 3. Hahn Quarry (tel: 815.777.8907)
 - 4. Oakfield Stone Quarry (tel: 920.922.8744)
 - 5. Eden Stone Company (tel: 920.477.2521)

2.2 CHANNEL DROP STONE FACING

- A. On site salvaged stone retained for use at the Channel Drop Location shall have a minimum and maximum dimension as denoted below. Refer to the Drawings for specific size requirements. The stone shall be from:
1. Minimum Dimension: 3" x 1'-6" x 2'-0"
 2. Maximum Dimension: 12" x 4'-0" x 4'-0"
 3. Finish: Natural / Split Face
 4. Contractor shall select stones for surface quality and reuse characteristics that enable stacking and facing. Stones to be used in Waterline Armoring conditions shall be evaluated for ability to incorporate pining as indicated in Drawings.
- B. If it is determined that on-site stone salvage is not possible in the specified sizes and/or quantity, contractor shall supply additional stone to the project from one of the following sources:
1. Lafarge Fox River Decorative Stone Quarry (tel: 847.888.6133)
 2. Stagecoach Trails Limestone Quarry (tel: 815.541.4342)
 3. Hahn Quarry (tel: 815.777.8907)
 4. Oakfield Stone Quarry (tel: 920.922.8744)
 5. Eden Stone Company (tel: 920.477.2521)

2.3 STONE PLACEMENT AT LANDINGS

- A. On site salvaged stone retained for use at site landings shall have a minimum and maximum dimension as denoted below. Refer to the Drawings for specific size requirements. The stone shall be from:
1. Minimum Dimension: 1'-0" x 1'-0" x 1'-6"
 2. Maximum Dimension: 4'-6" x 4'-6" x 2'-6"
 3. Finish: Natural / Split Face
 4. Contractor shall select stones for surface quality and reuse characteristics that enable stacking and facing.
- B. If it is determined that on-site stone salvage is not possible in the specified sizes and/or quantity, contractor shall supply additional stone to the project from one of the following sources:
1. Lafarge Fox River Decorative Stone Quarry (tel: 847.888.6133)
 2. Stagecoach Trails Limestone Quarry (tel: 815.541.4342)
 3. Hahn Quarry (tel: 815.777.8907)
 4. Oakfield Stone Quarry (tel: 920.922.8744)
 5. Eden Stone Company (tel: 920.477.2521)

2.4 STONE RIFFLE PLACEMENT

- A. On site salvaged stone retained for use at the Stone Riffles shall have a minimum and maximum dimension as denoted below. Refer to the Drawings for specific size requirements. The stone shall be from:
1. Minimum Dimension: 1/2" x 1/2" x 1/2"
 2. Maximum Dimension: 18" x 18" x 18"
 3. Finish: Natural / Split Face
 4. Contractor shall select stones for surface quality and reuse characteristics that enable stacking and facing.

- B. If it is determined that on-site stone salvage is not possible in the specified sizes and/or quantity, contractor shall supply additional stone to the project from one of the following sources:
1. Lafarge Fox River Decorative Stone Quarry (tel: 847.888.6133)
 2. Stagecoach Trails Limestone Quarry (tel: 815.541.4342)
 3. Hahn Quarry (tel: 815.777.8907)
 4. Oakfield Stone Quarry (tel: 920.922.8744)
 5. Eden Stone Company (tel: 920.477.2521)

2.5 GEOTEXTILE FABRIC

- A. Geotextile fabric shall conform to Section 31 05 19 – Geosynthetics for Earthwork.

2.6 AGGREGATE BASE AND BACKFILL (WHEN REQUIRED)

- A. Aggregate backfill and bedding material shall be Aggregate Type A5 conforming to Section 31 05 16 – Aggregates for Earthwork.

PART 3 – EXECUTION

3.1 NOTIFICATION

- A. Contractor shall notify the Engineer a minimum of one (1) week prior to placement of stone.

3.2 EXAMINATION

- A. Section 01 13 10 – Coordination and Meetings.
- B. Contractor shall carefully inspect all prior work and existing conditions, and shall notify the Engineer immediately of all conditions that would impair proper execution of the work.
1. Confirm notification with the Engineer in writing.
 2. Failure to notify at start of work constitutes acceptance of existing conditions.
- C. Stonework layout shall be approved by the Engineer via Shop Drawings prior to construction.

3.3 PREPARATION

- A. All existing topsoil in the work area which is subject to grading and construction of the stone features shall be stripped and stockpiled. The subgrade and retained fill at the work area shall be cut, filled and otherwise shaped to create the required lines, grades and batter / angle as shown on the Drawings. The subgrade at the base of the stone elements shall be excavated to form a trench to assure the proper burial depth of the first course of stone. The trench shall be of adequate depth to accommodate any required aggregate base. The subgrade at the stone elements base trench and retained fill shall be undisturbed

clay soil or compacted to a minimum of ninety-five percent (95%) density based on a Standard Proctor (ASTM D-698). If the required compaction density cannot be achieved due to the presence of unsuitable material or conditions the Contractor shall immediately inform the Engineer to determine the appropriate method to achieve the required subgrade conditions.

3.4 GEOTEXTILE FABRIC AND AGGREGATE BASE (WHEN REQUIRED)

- A. Place and secure the geotextile fabric where indicated in the Drawings. Aggregate backfill shall be placed and compacted in the subgrade trench to the depths and dimensions shown on the Drawings. Compact the material in uniform lifts of a maximum loose thickness of six (6) inches. Elevations at the top of the finished aggregate base shall be such that proper burial depths of the first stone course are achieved.

3.5 AGGREGATE BACKFILL AND DRAIN PIPE (WHEN REQUIRED)

- A. Place the drain pipe as shown on the Drawings, assuring that no part of the pipe is crushed, deformed or disconnected. Assure that the pipe outfall is properly located, functional and free of debris. Aggregate backfill shall be placed as shown on the Drawings and in proper relationship to the geotextile fabric.

3.7 STONE PLACEMENT

- A. The Contractor and the Engineer shall meet at the work site prior to the start of construction to verify the finished appearance desired by the Engineer.
- B. The stonework shall be executed by skilled operators, and employ skilled stone fitters at the site to do the necessary field cutting as stones are set.
- C. The Contractor shall place the stone to accurately reflect the dimensions, grades and batter angle as shown on the Drawings.
- D. Replace to the Engineer's satisfaction broken, chipped, stained, or otherwise damaged stones:
 - 1. Broken, chipped, stained, or otherwise damaged stone shall be replaced until the methods and results are acceptable to the Engineer.
 - 2. Stones and joints not matching the approved samples.
 - 3. Stonework not complying with other requirements indicated.
- E. The bottom row of stone elements shall be placed on the prepared leveling base as shown on the Drawings. Care shall be taken to ensure that the stones are aligned properly, levelled from side to side and front to back and are in complete contact with the base material.
- F. The stones above the bottom course shall be placed in a random pattern such that the arrangement provides the design batter (i.e. setback) of the stone element face. Successive courses shall be placed to create a random pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it.

- G. The stone elements shall be swept clean before placing additional levels to ensure that no dirt, concrete or other foreign materials become lodged between successive lifts.
- H. In locations where the stone armoring is subject to impacts from water movement, Contractor shall incorporate stainless steel pins between representative courses and layers to ensure stability of the installation. Pins shall not be placed within six inches of the stone edge and shall be placed in such a manner so as to not compromise the integrity of the stone. One half of the pin shall be grouted into the receiving stone and the other half shall be greased so as to be allowed to engage the adjacent coursing.
- I. The Contractor shall check the level of individual modules with each lift to ensure that no gaps or voids are formed between successive lifts.

3.8 PROTECTION AND MAINTENANCE

- A. Protection: Contractor shall take measures to prevent damage to areas of work in accordance with Section 01 70 00 – Closeout Requirements and as follows;
 - 1. Damage resulting from erosion, traffic, or any other cases shall be repaired by filling with topsoil and seeding with the originally specified seed mixture by the Contractor.
 - 2. Care shall be taken to ensure that the selected stones are not cracked, broken or damaged during handling and placement.

3.9 CLEANING

- A. Perform cleaning of the work area during installation of the work and not less than two (2) days upon completion of the work, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage the stone.
- B. Remove from the site excess materials, packaging, debris, and equipment associated with work of this Section upon completion of the work.

END OF SECTION

SECTION 32 15 40

DECOMPOSED GRANITE PAVING

PART 1 – GENERAL

1.1 SUMMARY

1. Section Includes:
 1. Decomposed granite paving materials
 2. Decomposed granite installation
2. Related documents:
 1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detail Specifications shall govern work of this specification section.
- C. Related Sections:
 1. Applicable provisions of Division 01 – General Requirements shall govern work of this specification section.
 2. Applicable provisions of MWRDGC General Conditions, General Specification sections, and Detailed Technical Specifications utilized for this project.
 3. Section 31 05 13 – Soils for Earthwork
 4. Section 31 05 16 – Aggregates for Earthwork.
 5. Section 31 22 13 – Rough Grading
 6. In the event of a conflict between this section and any of the General Specifications, General Specifications – Concrete, or General Specifications – Sewers, this section shall prevail.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 1. AASHTO T96-77 – Standard Method of a Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 2. AASHTO T89-81 – Standard Method for Determining the Liquid Limit of Soils
- B. ASTM International (ASTM):
 1. ASTM C 136 – Method for Sieve Analysis for Fine and Coarse Aggregate

1.3 SUBMITTALS

- A. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.
 1. Decomposed Granite, including sieve analysis.
 2. Stabilizer.

1. Material Samples: Once product information has been approved and prior to ordering the below listed materials, submit representative samples to Engineer for selection and approval as follows. Do not order materials until Engineer's approval has been obtained. If initial material samples are not approved, resubmit materials as necessary to obtain Engineer's approval. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work. Submit duplicate samples, each of the size or quantity indicated below:
 1. Crushed Granite, 5-lb bag of specified color (duplicate samples)
 2. Stabilizer, one 1-pint bag.

1.4 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 1. Premature wear and tear, provided the material is maintained in accordance with manufacturer's written maintenance instructions.
 2. Failure of system to meet performance requirements.
- C. Warranty Period: Contractor shall provide warranty for the performance of the product. The Contractor shall warranty the installation of product for the time of one year from the date of final acceptance.
- D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs of the stabilized surfacing as required.

PART 2 - PRODUCTS

2.1 SUBBASE

- A. Aggregate Type A1 per Section 31 05 16 – Aggregates for Earthwork.

2.2 DECOMPOSED GRANITE PAVEMENT

- A. Aggregate stone for paving shall conform to the following:
 1. Clean, hard, durable particles or fragments of 1/4" minus select crushed stone. Fines shall be evenly mixed throughout the aggregate. When produced from gravel, 50 percent, by weight, of the material retained on a No.4 sieve shall have one fractured face.
 2. The portion retained on the No.4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77.
 3. The portion passing a No.40 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89-81 and AASHTO

T90-81, respectively.

4. Size shall be 3/8" to No.200 crushed granite screenings conforming to the following crushed stone sieve analysis for percentage of weight passing a square mesh sieve, ASTM C 136 – Method for Sieve Analysis for Fine and Coarse Aggregates:

Sieve Designation	Range of % Passing
No. 3/8"	100%
No. 4	95 – 100%
No. 8	75 – 80%
No. 16	55 – 65 %
No. 30	40 – 50%
No. 50	25 – 35%
No. 100	15 – 20%
No. 200	10 – 15%

5. The crushed aggregate screenings shall be free from clay lumps, vegetative matter and deleterious material.
6. Colors: Starlite Black Granite
7. Acceptable Aggregate Supplier:

Kafka Granite LLC
101 S. Weber Ave.
Stratford, WI 54484 USA
Telephone: 800.852.7415
FAX: 715.687.2395
www.kafkagranite.com
email: kafka@kafkagranite.com

Or approved equivalent.

2.3 STABILIZER

- A. Stabilizer binder for paving shall conform to the following:
 1. Binder shall be a natural, non-toxic, non-staining, environmentally safe, organic binder that is a colorless, odorless concentrated powder specifically manufactured to bind crushed granite or crushed aggregate, consisting of 95% Psyllium with a 70% mucillioid content. The powder shall be of a size that not more than 10% is retained on a U.S. Standard #40 mesh sieve.
 2. Acceptable Stabilizer Manufacturer:

Stabilizer Solutions, Inc.
33 South 28th Street
Phoenix, Arizona 85034 USA
Telephone: 602.225.5900 International
800.336.2468 USA
FAX: 602.225.5902 USA
www.stabilizersolutions.com

Or approved equal.

- B. Mix Ratio: The estimated ratio for crushed granite pavement shall be a minimum of 14.5 lbs of stabilizer per ton of compacted aggregate screenings. Ratio to be confirmed by supplier based on material analysis.
- C. Provide Owner's authorized representative with the following excess material for use in future decomposed granite surfacing repair: one 50 lb. bag of the aggregate paving blended dry with the proper amount of stabilizer.
 - 1. Provide Owner with written formula for decomposed granite, including size, color and source of stone; stabilizer supplier; ratio of stone: stabilizer mix.

PART 3 – EXECUTION

3.1 DECOMPOSED GRANITE PAVEMENT

- A. Thoroughly pre-mix stabilizer with crushed aggregate at the rate specified. A 9 cubic foot concrete drum mixer may be used or a clean concrete transit mix truck equipped with the proper internal mixing blades to discharge the material or a mobile mixer with a modified metering unit for stabilizer may be used for larger installations. The aggregate must be damp before mixing but not wet. In the 9 cy. ft. mixer begin to shovel the aggregate into the mixer as it is turning and gradually keep adding stabilizer. The adding of the aggregate and the stabilizer should end almost simultaneously when the capacity of the mixer is reached. In the transit mixer, preload the drum; then as the drum is rotating add the stabilizer slowly and uniformly to the discharge opening. Mix for a minimum of 15 minutes prior to placing. The mobile mixer has an internal mixing device which will discharge the material properly mixed.
- B. Drop-spreading of stabilizer over preplaced stone screening and mixing by rototilling is not acceptable.
- C. Stabilizer shall not be applied during, prior to, or immediately following rainfall or when the temperature is 40 degrees Fahrenheit and falling. Inclement weather and cold to freezing temperatures will cause an unsatisfactory installation.
- D. Install stabilized decomposed granite paving in two equal lifts. Install and compact each lift as specified herein.
- E. After pre-blending, place the stabilized crushed aggregate screenings on prepared subgrade and rake smooth using a steel tine rake to desired grade and cross section. Place to avoid segregation, in one layer. Do not apply deeper than 3 inches in one lift. Ex. For a 4 inch thickness, apply in two 2-inch lifts (allowing each layer after compaction to dry out.) Compact the material with a one-ton minimum compactor as specified above making 3 to 4 passes (do NOT use vibratory unit). Hand tamp edges around benches, signposts, etc.
- F. Water lightly but thoroughly to achieve full depth moisture penetration of the mix. Watering is best accomplished using a garden hose with spray nozzle set to a light spray; pressure should not disturb leveled surface. Water activates stabilizer, consequently, it is essential that the full depth of stabilized paving material is saturated.

- G. When the water sheen has disappeared and the surface looks damp roll it again. If by chance the surface lifts (too wet) rake the area to a depth of 1 to 2 inches, level with the back of the rake and reroll. Plan your operation so that you will always be working out of the installed Stabilized surface course and not over it. After completion do not allow any traffic of any kind on the finished surface course until it is completely dried through, about 2 to 3 days. This is dependent upon weather. The stabilized crushed stone paving must completely dry out one time before it can be put into service.
- H. Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Dried, cured, compacted pathway shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface initially. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.
- I. Loose gravel on the surface, or unconsolidated crushed aggregate screenings below the surface, is evidence of improper bonding due to poor mixing or insufficient watering. Test the loose material for adequate stabilizer by wetting, then tamping, and allowing it to dry. If the material is still unconsolidated, stabilizer did not get mixed adequately throughout the crushed aggregate screenings. If the material is now solid, initial watering was insufficient. In either case, the Contractor shall be responsible for repairs as described below.
- J. Repairs: Unconsolidated areas shall be dug out, and be replaced with new crushed aggregate screenings meeting the grading requirements in this Section, mixed with stabilizer per the procedures listed above. Patched areas then shall be wetted thoroughly and rolled smooth. Patching shall be completed prior to any paving smoothing required. Any significant irregularities shall be smoothed out prior to final acceptance of work. Smoothing shall be accomplished by rewetting/saturating rough areas thoroughly, and then rolling the paving again with a heavy roller (2000 lbs, minimum) powered walkbehind or small rider. Wackers are not recommended.
- K. Maintenance: Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.
1. If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8" – 10" hand tamp plate.
 2. The Contractor shall return to the site during the spring season of the warranty period and redistribute loose material, water thoroughly to a depth of 1" and recompact with a power roller of no less than 1000 lbs.

END OF SECTION

SECTION 32 91 13
PLANTING SOILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but are not limited to the following:
 - 1. Evaluation of rough subgrade water infiltration.
 - 2. Testing and analysis for specification conformance.
 - 3. Inspection and testing of subgrade for preparation of subgrade.
 - 4. Preparation of mixes and testing for conformance.
 - 5. Installation and placement of soils.
 - 6. Final in-place testing of soils.
 - 7. Coordination with other Contractors.
 - 8. Clean-up.

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. Carefully examine all of the Contract Documents for the requirements that affect the work of this Section. Other specification Sections that directly relate to the work of this Section include, but are not limited to, the following:
 - 1. Section 01 56 39 – Temporary Tree and Plant Protection.
 - 2. Section 32 92 00 – Turf and Grasses.
 - 3. Section 32 92 19 – Seeding.
 - 4. Section 32 93 00 – Planting and Fine Grading.
 - 5. Section 32 96 00 – Transplanting.

1.4 QUALITY ASSURANCES / DEFINITIONS

- A. CONTRACTOR EXPERIENCE

1. Candidate Contractor shall submit written documentation of at least five (5) years of contracting and landscape construction experience completing projects of similar scope, complexity and value, including designed soil mixes.
2. Candidate Contractor shall submit at least three (3) project references including the following information:
 - A. Project address, description and dollar value
 - B. Owner's name, email and phone number
 - C. Landscape Architect's name, email and phone number
 - D. Soil scientist's name and phone number

B. DEFINITIONS:

1. **Compaction:** Compaction of the soil fabric is any force applied to the soil that reduces porosity and where 90 percent of all compaction can be accomplished with only three applications of force under optimum soil moisture conditions.
2. **Dry Soil:** The condition of the soil at or below the wilting point of plant available water in which the soil is powdery and subject to blowing.
3. **Frozen Soil:** The point at which the soil water has frozen, and the soil has become very hard and cloddy. Ice crystals can be seen in the pore spaces of the soil.
4. **Field Capacity:** The percentage of water remaining in a soil two or three days after having been saturated and after free gravimetric drainage has ceased.
5. **Moist Soil:** The condition of the soil in where it can be formed into a ball and maintain its shape. Deformation of the soil is difficult with hand pressure. Free water is not visible and is usually considered the point at between the wilting point and field capacity of the soil.
6. **Saturated:** meaning that all the pore space within a soil is filled with water and the remaining water is under gravitational forces to drain through the profile.
7. **Scarification:** The loosening of the surface of a soil lift by mechanical or manual means to alleviate compaction of the soil surface. Depth of scarification is dependent on material and extent of compaction. Depths are noted within the specifications or on the Drawings.
8. **Subgrade:** The in-situ soil material that the planting soil will be installed upon.
9. **Topsoil:** The mineral surface layer of soil that exhibit obliteration of all or much of the original rock structure and must show the following: (1) an accumulation of humified organic matter closely mixed with the mineral fraction and not dominated by properties characteristic of subsurface horizons; (2) has reasonable tilth (biological, chemical and physical properties) to support plant growth; and have two or more of the following:
 - a. A bulk density of less than 1.5g/cc installed
 - b. less than 15 percent by weight coarse fragments greater than 2mm
 - c. identifiable structure between clods called peds, no massive structure
 - d. no contamination (ie. Toxic weeds, chemicals, heavy metals, construction debris)
10. **Unsuitable Topsoil:** Topsoil that does not meet the Specification requirements in this Section.

11. Wet Soils: Soils that are considered wet will easily be deformed by hand pressure, maintain their shape, and free water will be visible within the pore spaces. The water content at this soil condition is considered at field capacity or wetter.
- C. Analysis and Testing of Materials: For each type of packaged material required for the work of this Section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards and procedures of the following:
1. American Society of Testing Materials (ASTM)
 2. American Society of Agronomy
 3. Soil Science Society of America
 4. Association of Official Agricultural Chemists.
- D. Installer Qualifications: A qualified landscape installer whose work has resulting in successful establishment of exterior plants in designed soil mixes.
1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.
 2. The Landscape Contractor shall have experience in the proper and safe transportation and installation of soil material, including designed soil mixes.
 3. The Landscape Contractor shall prepare and present to the Engineer required soil submittals, and their associated specified test results four months prior to the scheduled soil and plant installation.
 4. The Landscape Contractor shall have a minimum of 5 years experience in installing designed soil mixes.
- E. Soil Mixing Contractor Qualifications:
1. The Soil Mixing Contractor shall have a minimum of 5 years experience in preparing and mixing designed soil mixes.
 2. Shall be able to provide soil mixes that meet the specifications within tolerances assigned.
 3. Shall be able to produce enough consistently uniform soil material for the project to meet the scheduled demands.
 4. The soil mixing Contractor shall be engaged at least four months prior to scheduled soil installation to allow for sufficient time for material searches and initial planting mix approval.
- F. Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
1. Employ a qualified independent testing and inspection laboratory acceptable to the Engineer to perform tests and certifications indicated. It is the responsibility of Landscape Contractor to submit material for the soil tests. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from ASTM, EPA, and/or Methods of Soil Analysis, Soil Science Society of America.

G. Quality Assurance:

1. Work and materials shall meet the standards of the following references:
 - a. International Society of Arboriculture
 - b. American Society for Testing Materials (ASTM)
 - c. Environmental Protection Agency (EPA)
 - d. Illinois State Department of Environmental Protection (IDEP)
2. Planting Soil Quality Assurance (General): During the placement of planting soils, sample every defined planting area of each layer of the planting soil mix delivered to the job site. Keep these samples on site for review by the Engineer during the construction process. Label each sample with the Soil Supplier (if applicable), planting soil layer, date of delivery, general location of where it was placed, and any other notations that would be relevant such as if it was raining that day or the planting soil was too wet or dry. If there are questions or concerns with a certain mix, the Engineer will require the QA sample to be tested.
3. In-place Designed Soil Testing:
 - a. General planting soil installation for planting beds and lawns shall be tested using a cone penetrometer with a $\frac{3}{4}$ " cone or equivalent for approximately one point every 100 ft² at installation and again after complete soil profile installation. The planting soil penetration resistance shall be uniformly increasing in density with depth, not exceeding 250 lbs/in² to a depth of 30 inches. There shall not be any compacted dense layers within the soil profile.
 - b. In-place Density Tests for soils prescribed under sidewalks and pervious paving surfaces shall be conducted for at least three tests of surface soil density per segment as noted on the drawings. The surface that is to support pavement construction is to be tested. Density testing shall conform to ASTM standards using either ASTM D1556-07 or ASTM D6938-10 and shall be at 95% of Standard Proctor measured at below optimum moisture content (Do not compact planting soils at moisture contents above the "Optimum" line)
4. Planting Soil and Compost Submittal Acceptance: Submittals for planting soil approval must have complete test results attached as specified for each soil, results shall be clearly marked for their corresponding soil layer, clearly labeled with the soil supplier's name (if applicable), and receipt of soil samples by the Engineer before review of the submittal can take place. Incomplete test results will not be reviewed delaying the approval process.
5. Soil Installation Acceptance: Notify the Engineer at least 10 days in advance of date of soil placement. Inspection of the soil installation shall take place during placement of the topsoil.
6. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted at the option of the Engineer only if the area to be inspected for acceptance is large, well defined and easily described. The Engineer is not obligated to provide partial acceptance of the work.

7. Final Acceptance: Final acceptance shall be defined as the date after which the Engineer determines that all work, including Punch List items, has been satisfactorily completed.

1.5 SUBMITTALS AND TESTING

- A. Certificates: Provide certificates required by authorities having jurisdiction, including any composted materials containing sewage sludge. Approval as EPA Type 1 “exceptional quality” is required as well as standards for application of composted organic material by the State of Illinois.
- B. Qualifications: Submit for approval qualifications for the following:
 1. Soil Mixing Contractor (if additional off-site soils are required)
 2. Installer/Landscape Contractor including qualifications of full-time on site supervisor
 3. Testing Laboratories
- C. All imported soils and soil mixes brought on site shall be tested for compliance with the Illinois Environmental Protection Agency (IEPA) Residential Direct Contact Cleanup Criteria (latest revision).
- D. Testing Intervals for Planting Soil Mixes and Subgrade: Testing is required at the following intervals:
 1. Permeability of the subgrade shall be tested for at least one location within each defined planting area. Contractor shall submit a plan for review by the Engineer specifying the locations of all permeability testing. Use the single ring infiltrometer method of a cylinder that can contain about 1 gallon of water that is driven into the subgrade and water fall from the filled cylinder over one hour will produce the infiltration rate.
 2. Should off-site soils be required to complete the project, during the placement of off-site sourced planting soils, test every 500 cubic yards (or one test for every batch of soil mix whichever is larger) of planting soil mix delivered to the job site. Tests shall be for soil mix quality assurance to maintain adherence to particle size distribution, pH, organic matter, salts, and Ammonium. Report organic matter content on a percent by weight basis.
 3. In-place planting soil testing shall follow methods specified in Part 1 of this Section for the layers and intervals noted following the specific ranges and limits noted within Part 2 of this section. Incomplete test results shall not be reviewed. Resubmission of incomplete submittals shall not be considered as an acceptable reason for delays to the project schedule.
- E. Test Procedures and Reporting: Submit certified report for each test required. Each test report shall have its associated soil layer clearly marked along with the name of the soil supplier (if applicable) and soil material product name or designation. Only complete submittals with all corresponding test results and samples as list within Part 1 will be reviewed.

1. NOTE: No off-site soil component material or planting soil mix shall be brought on site until certified test reports by an approved chemical testing laboratory have been received and approved by the Owner for compliance with the “Residential Direct Contact Health Based Criteria and Soil Remediation Standards” as established by the IEPA.
2. Topsoil: Testing shall be performed and reported for particle size requiring percent of gravel (>2.0 mm), very coarse sand (2.0 – 1.0 mm), coarse sand (1.0 – 0.5 mm), medium sand (0.5 – 0.25 mm), fine sand (0.25 – 0.10 mm), very fine sand (0.10 – 0.05 mm), silt (0.05 – 0.002 mm) and clay (< 0.002 mm). Saturated conductivity, bulk density, pH, total porosity, salt content, Ammonium content and organic matter percentage on a dry weight basis shall also be tested as specifically noted below:
 - a. Particle size distribution by ASTM F1632-03 for all soil layers and topsoil. Fines passing the #270 sieve are to be measured using the hydrometer method as outlined in ASTM F1632. If any alternate method is used such as ASTM D422, the results still must be reported at the specified particle size breaks listed below or by plotting as a particle size distribution curve on a five cycle semi-log graph.
 - b. Organic matter content by ASTM F 1647-02a, commonly known as loss on ignition.
 - c. Salts and Ammonium test using Woods End Research Laboratory # 104 Soluble Ion Test or 1:2 soil/water extract test as specified in Methods of Soil Analysis, Part 3 and must be tested and made available to the Engineer within two weeks of planned soil installation.
 - d. Plant available Phosphorous, Potassium, Magnesium, Calcium and Cation Exchange Capacity shall be tested. Quality Assurance samples shall also be completed for these tests.
3. Soil Physical and Chemical Testing Agencies: The following firms are acceptable testing agencies for the various soil components. Alternate soil testing agencies shall require the Engineer’s approval

- a. PHYSICAL

A McNitt Co.
143 Dogtown Rd.
Centre Hall, PA 16828
Tel: 814.364.2792
Fax: 814.364.2792
Email: <mailto:aaaslab@psu.edu> asm4@psu.edu

- b. University or Illinois Extension Soil Testing Labs:
<https://web.extension.illinois.edu/soiltest/>
- c. Or Approved Equal.

d. CHEMICAL

Agricultural Analytical Services Laboratory
Penn State University
Tower Road
University Park, PA 16802
tel: 814.863.0841
fax: 814.863.4540
Email: aaslab@psu.edu

Woods End Research Laboratory
P.O. Box 297
Mount Vernon, ME 04352
tel: 201.293.2457
fax: 201.293.2488

e. University or Illinois Extension Soil Testing Labs:
<https://web.extension.illinois.edu/soiltest/>

f. Or Approved Equal.

4. Density Tests: ASTM D1556 Density of soil and rock in place using Sand Cone Method" or ASTM D6938-08a Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth). Optimal moisture content and maximum dry density values must be obtained by ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

a. In-place density tests shall be carried out at a rate of one test per each bed or separate tree planting location for each type of material placed. Outside of beds, the in-place density tests shall be carried out at a rate of one test per 2,000 square feet for each type of material placed.

5. In-place percolation tests shall be performed using Turf-Tec IN2-W Infiltrometer utilizing manufacturer's operating instructions, or approved alternate. Turf-Tec IN2-W Infiltrometer as manufactured by Turf Tec International, 1471 Capital Circle NW, Suite #13, Tallahassee, FL 32303. Order Line 800-258-7477, Phone 850-580-4026, Fax 850-580-4027.

a. In-place infiltration tests shall be carried out at a rate of one test per area (minimum) at a rate of one test per 1,000 square feet for each type of material placed.

F. Sources for Soil Components and Planting Soil Mixes (if off-site soils are required to meet the soil needs of the project): Submit information identifying sources for all soil components and the Contractor responsible for mixing of planting soil mixes if listed soil supplier is not engaged.

1. MWRDGC or Engineer shall have the right to reject any soil supplier.

2. Soil mix supplier shall have a minimum of five (5) years of experience at supplying custom planting soil mixes.
 3. Submit supplier name, address, telephone and fax numbers and contact name.
 4. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project. Indicate quantity and type of material from each supplier.
 5. Soil Suppliers that may provide required planting soil mixes.
- G. Samples: Prior to ordering the listed materials, submit representative samples of the same organic batches and soil mixes that will be used by the Engineer for selection and approval. Do not order materials until the Owner's approval has been obtained. Schedule at least 4 months for soil ingredient search and initial submittal approval. Delivered materials shall closely match the approved samples.
1. Organic amendment: duplicate samples of 1 quart.
 2. Soil Mix: duplicate samples of 1 quart for each soil layer after mixing organic material and soil. The Soil Mix shall match the material being placed as closely as possible.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.
- B. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Owner. Deliver soil materials only after preparations for placement of planting soil have been completed.
- C. Prohibit vehicular and pedestrian traffic on or around stockpiled topsoil and/or planting soil.
- D. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than six feet high. If soil stockpiles greater than six feet high are to be stored for more than two weeks, the Contractor shall break down and disperse soil so that mounds do not exceed the six-foot height restriction or thoroughly mix the stockpile once a month.
 1. The Engineer shall have access to inspect soil stockpiles at anytime to check on conformance to the storage criteria listed herein.
- E. Vehicular access to the site is restricted. Prior to construction the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access which shall include, but not limited to equipment movements and staging locations
- F. Soil materials shall be covered at least two weeks prior to installation to prevent excess moisture from saturating the soil stockpile. Test for the moisture content of the soil mix using the gravimetric oven dry method as described in Soil Science Society of America,

Methods of Soil Analysis, Part 1, 1986 at least two days prior to scheduled soil installation.

1. Locate soil materials so that they are easily accessible in order to perform moisture testing.
 2. Roughly, This procedure is to take the weight of a known sample and dry it in an oven at 105°C (+/- 5°C or 221°F +/- 41°F) for a period of about 8 hours, then weigh the sample as soon as possible after removed from the oven. Divide the wet soil weight by the weight of the dry soil and multiply by 100 to get the percent moisture.
- G. Soil materials shall not be handled or hauled, placed or compacted when it is wet, as after a heavy rain, nor when frozen. Soil shall be handled only when the moisture content is less than 10 percent by volume.

1.7 ACCEPTANCE AND MAINTENANCE

- A. Soil Installation Acceptance: Notify the Engineer at least 10 days in advance of date of soil placement. Inspection of the soil installation shall take place during placement of the topsoil layer, but within one (1) week of the subgrade preparation.
- B. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted at the option of the Engineer only if the area to be inspected for acceptance is large, well defined and easily described. The Engineer is not obligated to provide partial acceptance of the work.
- C. Final Acceptance: Final acceptance shall be defined as the date after which the Engineer determines that all work, including Punch List items has been satisfactorily completed.

PART 2 - PRODUCTS

2.1 SOIL LAYERS (HORIZONS):

- A. General
 1. All planting soil material shall fulfill the requirements as specified and be tested to confirm the specified characteristics.
 2. If required by the Engineer, subsoil, topsoil, samples of individual components of plant mixes for blended plant mixes including mulch materials shall be submitted by the Contractor for testing and analysis to the approved testing laboratory.
 3. Samples of blended plant mixes (if required for the project) including mulch materials shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. If a soil supplier is necessary to complete the project and requires assistance in meeting the planting soil specifications, follow the procedure listed below. Include verification testing of on-site sub soils. Comply with specific materials requirements specified.

- a. No base soil component material or planting soil mix shall be brought on site until certified test reports by an approved chemical testing laboratory have been received and approved by the Owner for compliance with the “Residential Direct Contact Health Based Criteria and Soil Remediation Standards” as established by the IEPA Standards.
 - b. No base component material or soil components for plant mixes shall be used until certified test reports by an approved agricultural chemist have been received and approved by the Engineer.
 - c. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.
3. The Engineer may request additional testing by the Contractor for confirmation of mix quality and/or soil mix amendments at any time until completion.
- B. Soil layer: Subsoil / Subgrade – refer to Section 31 05 13 – Soils for Earthwork.
- C. Soil layer: Topsoil from On-site Sources:
1. Excavated and reused material.
 2. Soil shall be free of roots, twigs, stones, subsoil, debris, weeds, and foreign matter larger than 1/2 inch. Contractor shall be responsible for all screening operations required to adhere with soil texture and uniformity.
 3. Topsoil shall be evaluated in accordance with ASTM D5268.
 4. Contractor shall provide 10 lb sample of excavated and reused material to laboratory for soil classification analysis as defined herein.
- D. Topsoil from Off-Site Sources:
1. Imported borrow.
 2. If additional off-site topsoil is required to meet the needs of the project, Contractor shall notify the Engineer no less than three (3) months in advance of project need to ensure sourcing and testing requirements.

2.2 SOURCE QUALITY CONTROL

- A. Testing and analysis of subsoil material shall conform to Section 01 40 00 – Quality Requirements.
- B. When tests indicate materials do not meet specified requirements, consult Engineer.
- C. Furnish materials of each type from same source throughout the Work.

2.3 SOIL PROFILES

- A. GENERAL: Soil profiles are as indicated on the Drawings.

- B. Should additional off-site topsoil be required for the project, Contractor shall make efforts to secure soils in a manner that allows for the establishment of soil profile consistency throughout the project site.

PART 3 - EXECUTION

3.1 COORDINATED PLANTING SOIL SECTIONS

- A. See other Sections to best coordinate installation of planting soils with other trades to limit damage and provide a viable growth media. Ensure that all planting soil handling procedures are followed.

3.2 MIXING OF TOPSOIL

- A. The planting soil shall be mixed in a ball mill, tromel or tub mill fitted with proper screening and paddles. Windrowing or bucket mixing the materials is not acceptable, as it does not produce uniform mixing of the components.

3.3 SUBGRADE

- A. All construction debris shall be removed from the planting areas prior to placement of the soil layers. Care shall be taken to avoid working the soil when it has 8 percent moisture content or above.
 - 1. *Subgrade pitch:* All subgrades shall be pitched toward the underdrainage (where applicable) with an average between ½ to 1 percent or about 1 inch fall per 10 feet.
 - 2. *Subgrade Terraces/Benching:* Slopes over 3:1 shall have subgrade terraced with a 12 inch riser and a minimum of 24 inch treads. The tread widths will be sized based on the final grade slope shape of the area. The subgrade shall be compacted to 95% of Standard Proctor on earthen material.
 - a. Care must be taken not to induce dense interfaces within any of the soil that follow the slope.
- B. Earthen Subgrade: Refer to Section 31 20 00 - Earthwork.

3.4 PLACEMENT OF PLANTING SOIL

- A. Examination of Subgrade: The subgrade shall be examined by the Contractor prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner in writing prior to acceptance of the subgrade by the Contractor:
- B. Planting Soil Placement:
 - 1. General Soil Placement Requirements: The following items shall apply to all areas of the project:

- a. Complete all hardscape construction after establishment of rough grade and prior to the preparation of the subgrade to receive the placement of topsoils. Do not place topsoils or planting soils in areas subjected to continued construction traffic to reduce compaction remediation extents.
- b. Limit all traffic during construction to areas designated for hardscape placement.
- c. Installation of topsoil / planting soils shall be accomplished with small tracked equipment with less than 8 lbs/in² ground pressure. Back-blading is strictly forbidden as it will overly compact the planting soil. If planting soil has been kept dry and the subgrade is not saturated, installation of the designed planting soil can continue the day after a rain event assuming the topsoil stockpile has been protected from excess moisture content as noted herein, unless the subgrade is considerably saturated or has standing water.
- d. The scarification of the subsoils and topsoil / planting soils interface shall be such that care is taken not to damage the hardscape.
- e. The depth of the scarification shall be 3 to 4 inches. Deeper loosening may be required if compaction is extensive. Test with cone penetrometer.
- f. Ensure that the soil is evenly spread to eliminate dense areas that settle unevenly.
- g. After hardscape construction is complete, the subsoils shall be scarified to loosen compacted areas adjacent to where construction occurred. Penetration resistance shall not exceed 250 lbs/ft² except where noted. Resistance shall be uniformly increasing with depth.
- h. Scarify any other areas that have been compacted prior to topsoil / planting soil placement.
- i. The Contractor shall place barricades as required to prevent any unnecessary compaction of the topsoil / planting soil from vehicles, equipment, or pedestrian traffic during construction and vegetation establishment. Any additional compaction of the topsoil / planting soil must be loosened satisfactorily to meet penetration resistance specifications. Contractor shall be responsible for coordinating this protection work with the construction logistics plan for any and all adjacent work by other Contractors / Trades.
- j. Penetration resistance shall not exceed 250 lbs/ft² within the subgrade and the resistance for the topsoil shall be less than 120 lbs/ft² except where otherwise noted. The soil profile shall be uniformly increasing in density with depth. There shall not be any compacted layers within the soil profile that show a 50 lbs/in² increase or greater resistance.
- k. The soil shall be worked at moisture content below soil field capacity, or between 5 and 10 percent moisture by weight. The soil is too wet if it clumps in large clods or has surfaces with a polished appearance when tillage equipment is used. Topsoil / planting soils shall never be moved or worked when wet or frozen.

- l. Remove all organic and coarse fragments over 1 inch in diameter in the topsoil / planting soil surface.
 - m. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or compacted due to subsequent construction operations or weather conditions.
2. Aquatic Planting Soil:
 - a. Aquatic Planting Soil Fill shall consist of two distinct zones. The lower 16 inches shall be 100% Clay Fill. The upper 8 inches shall be prepared by combining 3 parts Clay Fill with 1 part Topsoil fill mixed off-site. The material shall be blended until a uniform mixture of the parts is achieved. The Contractor shall prepare this mixture in a dry state and shall take caution to maintain the natural aggregate stability. The Engineer must approve the mixed soils upon arrival, placement and prior to compacting this final list and finish grading.
 - b. Aquatic Planting Soil Fill shall be placed in lifts not to exceed 8 inches in depth prior to compaction. The material shall be compacted to 95 percent of Standard Proctor density by ASTM D 6938 and shall occur not less than every 1,000 square feet of placed material. Material exceeding the maximum compaction shall be decompacted by excavation and recompacted to a density meeting the specification.
 3. Typical Tree Planting:
 - a. Adjust the dimension of the tree pit to accommodate placement of large trees (rootball depths of 36 inches and deeper). Place trees with approval of the Engineer.
 - 1) There shall be a pedestal of compacted subgrade under each of the rootballs. Compact this area to 90 percent of standard Proctor at below optimum moisture content then lightly scarify the pedestal surface. The tree pedestal shall be slightly higher in elevation than the surrounding subgrade to allow drainage away from beneath the rootball.
 - 2) Root flare of the tree shall be positioned relative to finish grade as indicated in the Drawings.
 - b. Place the topsoil in 6 inch lifts to the depth shown on the drawings. Scarify the surface of each layer and lift.
 - c. Contractor shall anticipate local topsoil settlement and topdress as required until final acceptance.

3.5 PROTECTION AND REPAIRS

A. General:

1. Protect newly graded areas from traffic, freezing and erosion. Keep free of trash, debris or construction materials. Contractor shall be the only personnel allowed on areas where planting soil has been installed.
2. Observe newly installed planting soil areas for concentrated flow and erosion. Use 9" Mulch Filter Socks and/or erosion netting within these areas

(depending on severity of flow). To prevent sheet erosion, an application of 1" of the composted shredded bark mulch for a Composted Bark Mulch Blanket (CBMB) on the bare soil surface is applied for protection of the Topsoil / Planting Soil awaiting planting. Remove mulch and/or till in before seeding turf or seed meadow grasses directly into the mulch

3. Where settling occurs, before sidewalk construction and final soil installation acceptance, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.
4. When providing water to plants, provide adequate water directly to the rootballs of all plants using watering gators or drip irrigation directly on the rootballs. Monitor the rootballs and not the surrounding soils for moisture until plant establishment.
5. Within the installation warranty period repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or compacted due to subsequent construction operations or weather conditions.

3.6 POST INSTALLATION SOIL MANAGEMENT

- A. Where settling occurs, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.
 1. Any post installation changes or amendments to previously approved soils without the Engineer's consent are the responsibility of the Owner.
- B. Fertilization and/or application of Biologic Amendments of planting areas shall be completed based on soil tests taken by the Contractor 10 days after planting to determine the optimum types and rates. Amend soils only based on post installation soil tests.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
 - 1. Review of conditions and materials affecting lawns.
 - 2. Seeded lawns.
 - 3. Coordination with other trades.
 - 4. Testing.
 - 5. Clean-up.
 - 6. Restoring all lawn areas within the limit of work that are disturbed by the work of the Contract.

1.3 RELATED SECTIONS

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 31 20 00 – Earthwork.
 - 2. Section 31 05 13 – Soils for Earthwork.
 - 3. Section 31 25 00 – Erosion and Sediment Control.
 - 4. Section 32 93 00 – Planting and Fine Grading.

1.4 LIMITS OF WORK

- A. All areas within the limits of work that have been disturbed and are not otherwise indicated to be improved shall be grassed. All areas beyond limits of work shall be restored to the satisfaction of the Owner and the Engineer. Refer to the Drawings.

1.5 LINES AND GRADES

- A. The Contractor shall verify that the subgrade and finish grade lines and grade are consistent with the Drawings and acceptable to the Engineer. The Contractor shall make adjustments as necessary to establish finish grades.
- B. Grades: If present, protect and maintain grade stakes and location stakes until removal is acceptable to Engineer and all parties involved in this project. If grade stakes are not present, establish grade stakes to ensure that grades shown on the Drawings are being met.
- C. The location and limits of lawns shall be located prior to planting.

1.6 SUBMITTALS

- A. The planting soil shall meet the specifications noted in this Section and in Section 32 91 13 – Planting Soils.
- B. Product Information: Provide manufacturer’s data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements. Work includes but is not limited to:
 - 1. Seed Mix.
 - 2. Lime, if necessary and approved by the Engineer.
 - 3. Fertilizer.
 - 4. Erosion Control.
 - 5. Miscellaneous materials.
- C. Certificates: Submit inspection certificates required by authorities having jurisdiction. Provide certifications stating that materials comply with requirements for the following products:
 - 1. Seed: Certify species and source, Certification shall clearly indicate deviations from the specified seed mix and any proposed substitutions.
 - 2. Soil amendments and fertilizers.
- D. Samples: Before ordering the below listed materials, submit representative samples to Engineer for selection and approval as follows. Do not order materials until Engineer approval has been obtained. Delivered materials shall closely match the approved samples.
 - 1. Duplicate one (1) lbs. seed mix samples for verification by Engineer.
- E. Maintenance Instructions: Provide clear, concise typewritten maintenance instructions and recommendations for year-round care of all work provided under this Section.
 - 1. Maintenance Instructions shall include the following information plus any special instructions deemed necessary by the Contractor, Engineer, and Village of Robbins Representative:
 - (a) Title and location of project; date of project; name, address, and telephone/ fax number of Landscape Contractor and Engineer.

- (b) Lawn areas covered by the maintenance instructions.
- (c) Identify by calendar month the maintenance requirements for fertilizing, irrigation, pest/ disease control, mowing, and general maintenance. Indicate type and quantity of fertilizer to be used, which pests/ diseases can be anticipated for lawns, and quantity of water needed.

1.7 QUALITY ASSURANCE AND DEFINITIONS

- A. Analysis of Materials: For each type of packaged material required for the work of this Section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards of the Association of Official Agricultural Chemists.
- B. Testing laboratory Qualifications: An independent laboratory with the experience and capability to conduct the testing indicated and that specializes in the types of tests to be performed.
 - 1. Employ at Contractor's expense an independent testing agency acceptable to the Engineer to perform tests and certifications indicated. Tests shall be made in strict compliance with the standards of the Association of Official Agricultural Chemists.
- C. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of turf on at least three projects of similar size and complexity. Minimum experience for Foreman and Installer shall be five years.
 - 1. Installer shall have experience with the installation and handling of manufactured planting soils.
- D. Inspection: The Engineer reserves the right to re-inspect seeding at any time and to reject unsatisfactory materials and/or installation at any time during the progress of the work even if previously inspected and approved. The Contractor shall replace rejected materials at no change in Contract Amount.
 - 1. The Engineer shall have the right to reject any seed source if he/ she determines, before, during or after inspecting or receipt of seed, any of the following:
 - (a) The seed does not meet quality standards set forth herein.
 - (b) The seed will not meet the intended visual characteristics of the lawn as determined by the Engineer.
 - (c) The seed supplier cannot supply the specified seed or acceptable substitute species.
 - (d) The seed supplier's cultural practices or maintenance procedures do not meet specified standards.
 - 2. The Engineer has endeavored to locate sources for the seed indicated. However, the Engineer makes no claim that the materials will be available at the sources researched. The Contractor shall submit to the Engineer any questions regarding the source of seed.

1.8 STANDARDS AND SPECIFICATIONS

- A. Materials and methods of construction shall comply with the following standards:
 - 1. ASTM: American Society for Testing and Materials.
 - 2. ANLA: American Nursery & Landscape Association. (Formerly: AAN – American Association of Nurserymen.
 - 3. ANSI: American National Standards Institute
 - 4. AOAH: Association of Official Agricultural Chemists.
 - 5. International Society of Arboriculture.
 - (a) Also refer to Section 32 93 00 – Planting and Fine Grading.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Handle all seed materials in strict compliance with supplier's / manufacturer's instructions and recommendations. Protect all materials from damage, injury, and theft.
- B. Sequence deliveries to avoid delay. Deliver materials and seed only after preparations for seeding have been completed and accepted, including but not limited to: subdrainage system, irrigation, rough grading, utilities, decompaction or remediation of soils. The Engineer shall determine if the site is acceptable for seeding.
- C. Prohibit vehicular and pedestrian traffic on or around areas to be seeded.
- D. Vehicular access to the site is restricted. Prior to construction, the Contractor shall submit for approval a plan showing proposed routing for deliveries and access to the site.

1.10 PROJECT CONDITIONS AND COORDINATION

- A. Utilities: Determine and mark the location of below grade utilities before project staking. The Contractor shall field locate all utilities before starting work. Hand excavate as necessary to avoid damage. Repair all damage and restore items to their original condition as approved by the Engineer and authorities having jurisdiction at no change in Contract Amount.
- B. Concealed Conditions: Notify Engineer before planting when below grade conditions detrimental to proper plant growth are encountered. Do not proceed with seeding without specific written instructions from the Engineer.
- C. Sequence of Installation: Sequence installation so that trees and shrubs are installed before lawns, unless otherwise approved by the Engineer. Restore damaged lawns and groundcover beds if tree and shrub planting is delayed. Complete planting work as quickly as possible on portions of the site as they become available for planting.
 - 1. Coordinate installation of seeded areas with installation of planting soils.

- D. Verify that irrigation work is installed and available for watering at time of installation. Do not proceed with work until irrigation is available. If water service is discontinued, for any reason, before final acceptance, provide water as needed to maintain seeded areas in a healthy condition. Provide all accessories required for watering. Watering and equipment shall be included in the base bid.
- E. Painting: Do not paint vegetation or lawns for any reason.

1.11 PLANTING SEASONS

- A. Planting season for seed shall be as described below. The actual planting of the seed, however, shall be done only during periods within this season that are normal for such work as determined by weather conditions and by accepted practice in this locality. At his option and on his responsibility, the Contractor may plant sod under unseasonable conditions without compensation but subject to Engineer’s approval as to time and methods:

<u>Plant Material</u>	<u>Planting Seasons</u>
Lawn Seed	1 March to 15 May and 15 August to 1 Oct

1.12 ACCEPTANCE AND MAINTENANCE

- A. Request for Acceptance: In writing, request Engineer’s inspection for acceptance at least 10 days in advance of preferred inspection date. Do not request inspection for acceptance until work is 100% complete (not including maintenance) and in compliance with the Contract requirements.
 - 1. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted, at the Owner’s option, if the area to be inspected for acceptance is large, well defined, and easily described. The Owner and Engineer are not obligated to provide partial acceptance of the work.
 - 2. Final Acceptance is defined as the time at which all work has been performed and accepted by the Engineer including any work noted on the “Punch List”.
- B. Acceptance Criteria for Lawn Areas: Create an acceptable lawn which is defined to mean a uniform, smooth lawn with well established, close stands of grass, with no bare or dead spots over 3" in maximum dimension, with not more than one bare spot for each square yard of lawn area. Seeded lawn shall have an average of at least 6 thriving grass plants per square inch. To be acceptable, the lawn shall be free from weeds, disease, and detrimental insect infestation.
- C. Lawn Maintenance: Refer to lawn maintenance and warranty requirements in Section 32 93 00 – Planting and Fine Grading.
 - 1. Length of Maintenance Required: Refer to lawn maintenance and warranty requirements in Section 32 93 00 – Planting and Fine Grading.
- D. Lawn Replacement: Refer to lawn replacement requirements in Section 32 93 00 – Planting and Fine Grading.

1. Replacement Planting Seasons: Refer to replacement planting season requirements in Section 32 93 00 – Planting Fine Grading.

1.13 WARRANTY

- A. Provide written warranty agreeing to remove and replace work that exhibits defects in materials or workmanship for the specified periods. "Defects" is defined to include, but is not limited to, death, unsatisfactory growth, failure to adequately root into soil, disease, abnormal foliage density, abnormal size, abnormal color, failure to thrive, and other unsatisfactory characteristics.
 1. Lawn Replacement: Replace defective lawn with new lawn of same species, character, and quality of originally accepted work. If a replacement is unacceptable during its warranty period, the Contractor shall provide another replacement or, when approved by the Engineer, equivalent cash payment.
- B. Warranty Period for Lawns: Refer to lawn maintenance and warranty requirements in Section 32 93 00 – Planting Fine Grading.

PART 2 PRODUCTS

2.1 LAWN SEED

- A. Fescue Lawn Seed: Mixture to include the following percentages of seed by weight.
 1. 80% Tall fescue blend (3 – 5 cultivars)
 2. 10% Kentucky bluegrass (minimum of 3 cultivars)
 3. 10% perennial ryegrass
- B. Or Approved Equivalent.

2.2 PLANTING SOIL MIXTURE

- A. Soil Mix: Refer to Section 32 91 13 - Planting Soils. The Contractor shall strictly adhere to soil specification composition for each section of the Work.
- B. Coordinate installation of soil mixes and plants to meet requirements of Section 32 91 13 – Planting Soil and Section 32 93 00 - Planting and Fine Grading.

2.3 SOIL ADDITIVES

- A. Refer to Section 32 91 13 - Planting Soils for all additives and amendments to the planting soils.

2.4 CHEMICALS AND INSECTICIDES

- A. Herbicides, pesticides and related chemicals for weeds, fungus and pest control are expressly prohibited.

2.5 MISCELLANEOUS MATERIALS

- A. Soil and Pavement Protection. The driving of vehicles over planted areas is expressly prohibited. Protect sub-grade, planting soils and pavements using one of the following:
 - 1. Plywood: Provide 3/4" Grade C or better plywood for use as planking when driving vehicles or moving equipment over areas to be planted.
 - 2. Oriented Strand Board (OSB): Two (2) Layers of 3/4" OSB on top of 6" mulch. Provide Filter Fabric under mulch layer.

PART 3 EXECUTION

3.1 INSPECTION AND ACCEPTANCE

- A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and notify the Engineer in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not commence work associated with the installation of Lawns until all work in adjacent areas is complete and accepted by the Engineer. The Contractor shall confirm that:
 - 1. Subgrade is accepted.
 - 2. Subdrainage is installed and accepted.
 - 3. Subsoil Amendments have been installed and accepted.
 - 4. Utilities have been installed and accepted.
 - 5. Area is free of invasive species of the type and to the extent described in Article 3.6 of this Section.

3.2 PREPARATION

- A. Provide and set sufficient grade stakes, as determined by the Engineer, to insure correct line and grade of finish grade.
- B. Immediately before placing planting soils, any sticks, stones, or foreign material three inches or greater shall be removed from the subgrade. Large stones and/or boulders shall be buried eighteen inches below finished grade.
- C. Harrow or otherwise loosen the surface of the subgrade to a depth of 3-4 inches.
- D. In areas that have been severely compacted, as determined by the Engineer, scarify to a depth of 12 inches by approved methods. Perform percolation tests to confirm soils have been de-compacted to create an acceptable free draining condition for the lawn soils.

- E. Protect new existing site improvements from damage due to planting operations. Repair all damage and restore items to their original condition as approved by Engineer at no change in Contract Amount.

3.3 PLACING TOPSOIL / PLANTING SOIL

- A. Refer to Section 32 91 13 – Planting Soils.
- B. Place and spread approved topsoil / planting soil from site stockpiles or newly furnished materials over approved areas to a depth sufficiently greater than the depth required for sod areas so that after natural settlement and light rolling, the completed work will conform to the lines, grades and elevations indicated, and shall assure proper drainage in an uninterrupted pattern free of hollows and pockets.
- C. After approved topsoil / planting soil has been spread, prepare it carefully by scarifying or harrowing and raking. Remove all stiff clods, lumps, litter and other foreign material and stones over 1 inch in diameter and dispose of legally off the site. Areas of planting soil shall also be free of smaller stones in excessive quantities as determined by the Engineer. Roll the entire surface with a hand roller weighing approximately 100 per foot of width. During the rolling fill all depressions caused by settlement with additional planting soil and then regrade and roll until the surface presents a smooth, even and uniform finish and is up to the required grade.
- D. No subsoil or loam shall be handled in any way if it is in a wet or frozen condition. Excess planting soil, if any, shall be stockpiled on site where directed.
- E. Maintain at all times during the planting operations at least one stockpile of each type of plant soil mixture, as specified in 32 91 13 – Planting Soils and as approved by the Engineer.

3.4 APPLICATION OF PLANTING SOIL ADDITIVES / SOIL TREATMENTS

- A. Refer to Section 32 91 13 – Planting Soils for application of additives, amendments, and treatments to the planting soil.

3.5 LAWN INSTALLATION

- A. General: Limit of seeding shall be as shown on the Drawings. All areas on the plan are to be seeded only after written approval of the finished grading or as directed by the Engineer.
- B. Perform Examination of previous work including previous Milestone Activity.
 - 1. Ensure Contractor is authorized to begin seeding operations.
- C. Limit of seeding shall be as shown on the Drawings.

1. Verify with the Engineer the extent and distribution of seeding. Do not proceed with installation until limits of seed distribution have been approved by the Engineer.
2. Adhere to planting installation dates as defined in Part I of this Section.
3. Seed only when areas are in a friable condition and neither hard, muddy, wet, or frozen.
4. Do not seed when wind velocity exceeds 5 mph.
5. Hydraulic mulch seeding (hydroseeding) is acceptable for Cover Crop application. Hydroseeding equipment shall be cleaned prior to use on this project site and shall be cleaned as necessary to ensure even and proper distribution of seed mix. Review Hydroseed application procedures with Engineer prior to beginning work. Provide Hydroseeding best management practices and applicability to project site.
6. Just prior to seeding, the entire surface of the lawn seed bed shall be raked parallel to the site contours to create small depressions that hold the seed in place. Before beginning work, the Contractor shall discuss the method of preparation with the Engineer.

3.6 INVASIVE SPECIES CONTROL

- A. Inspect all seeded areas, disturbed areas and areas throughout the site and within 1,500 linear feet of all edges of the Limit of Work which are accessible to the Contractor every two weeks during the construction and establishment period to check for the presence of invasive or weedy species. Remove/kill material within 14 days by hand pulling. If visibly flowering, the weed must be physically removed. Bag and remove off-site. Do not compost on site.
- B. Common weeds include, but is not restricted to, the following:
 - Dallies grass (*Paspalum dilatatum*)
 - Johnsongrass (*Sorghum halapense*)
 - Buffelgrass (*Cenchrus ciliaris*)
 - Bermudagrass (*Cynodon dactylon*)
 - Giant ragweed (*Ambrosia trifida*)
 - Thistles (*Cirsium* spp.)
 - Bastard cabbage (*Rapistrum rugosum*)
 - Cocklebur (*Xanthium strumariu*)
 - King Ranch bluestem (*Bothriochloa ischaemum*)
 - Old World bluestems (*Dicanthium* spp.)
 - Sandbur (*Cenchrus spinifex*)
 - Junglerice/barnyardgrass (*Echinochloa* spp.)
 - Pigweed (*Amaranthus* spp.)

Nut Sedge (Cyperus spp.)

3.7 EROSION CONTROL

- A. For soil left bare prior to sodding, refer to Section 31 11 00 – Site Clearing and Grubbing and Section 31 25 00 – Erosion Control.

3.8 WATERING

- A. Watering of Lawn Areas
 1. First Week: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least 2 inches.
 2. Second and Subsequent Weeks: The Contractor shall water the lawn as required to maintain adequate moisture, in the upper 5 inches of soil, necessary for the promotion of deep root growth.
 3. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an 8-hour period.

3.9 REPAIR OF INSTALLED LAWNS

- A. If lawn is damaged, remove damaged materials and replace with new seed or sod.
- B. If lawns exhibit unsatisfactory growth, perform soil testing for chemical properties, compaction and infiltration rates. Adhere to Engineer's recommended remediation. Remediation may include, but are not limited to, soil amendments, Liquid Biological Amendment treatments or soil decompaction.

3.10 CLEANUP, PROTECTION AND EXCESS MATERIALS

- A. Following the acceptance of lawns, the Contractor shall immediately remove from the site all materials and equipment not required for any other planting or maintenance work.
- B. Store materials and equipment remaining on site in locations which do not interfere with the Owner's maintenance of accepted lawns or other construction operations.
- C. The Contractor shall be responsible for keeping all paving and building surfaces clean during placement of topsoil and sodding operations.

- D. All excess stones, debris and soil resulting from work under this Section which have not previously been cleaned up shall be cleaned up and removed from the project site at no additional cost to the owner.
- E. Protection of Drainage System: Protect existing drainage protection system at all drain inlets to prevent silt, materials or debris caused by planting operations from entering the drainage system. If drainage protection system is not present, establish weed-free straw bales, siltation fencing or other devices as required to prevent siltation of the drainage system.

PART 4 ESTABLISHMENT AND MAINTENANCE

4.1 MOWING

- A. Certify all mowing equipment meets emissions levels set by the EPA.
- B. For required Project maintenance, see Article 1.12 of this Section.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 - GENERAL

1.01 SUMMARY

- A. This work includes native seeding as indicated on the Drawings and in areas disturbed by the Contractor's operations. Section includes:
 - 1. Seed quality and provenance.
 - 2. Scheduling.
 - 3. Seedbed preparation.
 - 4. Seed installation.
 - 5. Seed protection and maintenance.

- B. Related Sections:
 - 1. Applicable provisions of Division 1 – General Requirements shall govern work of this specification section.
 - 2. Applicable provisions of the project General Conditions, General Specifications sections, and Detailed Technical Specifications utilized for this project.
 - 3. Section 31 20 00 – Earthwork.
 - 5. Section 32 91 13 – Planting Soils.
 - 7. Section 32 92 00 – Turf and Grasses.
 - 8. Section 32 93 00 – Planting and Fine Grading.

1.02 REFERENCES

- A. Illinois Department of Transportation (IDOT):
 - 1. Standard Specifications for Road and Bridge Construction, Current edition, including Supplemental Specifications (Standard Specifications).

- B. Illinois Seed Law, Ill. Compiled Statutes, Ch. 505, Par. 110/1 et seq., Illinois Revised Statutes, Chapter 5, par. 401 et seq.

- C. Federal Seed Act: CFR, Title 7, Part 201 – Federal Seed Act Regulations

- D. Flora of the Chicago Region, A Floristic and Ecological Synthesis, Wilhelm & Rericha, 2017 edition.

1.03 DEFINITIONS

- A. Weeds: Ecologically objectionable and undesirable species of vegetation in a given area.
 - 1. Any species identified by the Northeastern Illinois Invasive Plant Partnership, also known as NIIPP (<http://www.niipp.net/natural-history-identification>) shall be considered a weed.
 - 2. The following low quality and/or aggressive native species shall be considered weeds:
 - a. *Acer negundo* – Boxelder
 - b. *Amaranthus hybridus* – Green amaranth
 - c. *Ambrosia artemisiifolia* – Common ragweed

- d. *Ambrosia trifida* – Giant ragweed
- e. *Brassica kaber* – Charlock
- f. *Convolvulus sepium* – Hedge bindweed
- g. *Cornus racemosa* – Gray dogwood
- h. *Cyperus esculentus* – Field nut sedge
- i. *Equisetum arvense* – Horsetail
- j. *Erigeron annuus* – Annual fleabane
- k. *Erigeron canadensis* – Horseweed
- l. *Lactuca canadensis* – Wild lettuce
- m. *Lepidium virginicum* – Common peppergrass
- n. *Oxalis europaea* – Tall wood sorrel
- o. *Phragmites australis* – Common reed
- p. *Plantago rugelii* – Red-stalked plantain
- q. *Potentilla norvegica* – Rough cinquefoil
- r. *Solanum americanum* – Black nightshade
- s. *Solidago altissima* – Tall goldenrod
- t. *Solidago canadensis* – Canada goldenrod
- u. *Typha angustifolia* – Narrow-leaved cattail
- v. *Verbena bracteata* – Creeping vervain

B. PLS: Pure Live Seed as described in 2.1 C. of this section.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
- B. Submit information specified in the “Quality Assurance” and “Qualifications” Articles. No work may begin prior to approval of these submittals.
- C. Resume or other qualifications and certifications for the proposed degreed ecologist
- D. Provide a list of not less than five successfully completed native seeding projects including name and current contact information of owners.
- D. Product Data: Unless otherwise indicated, submit to the Engineer the following for each seed mix provided under work of this Section:
 - 1. Product data for the following materials and components indicating compliance with specified requirements.
 - a. Seed mixes.
 - b. Inoculants.
 - c. Soil amendments.
- E. For all seed mixes, submit the following:
 - 1. Lot number for each species.
 - 2. Year of seed production.
 - 3. Tests results from a Certified Seed Lab showing the PLS for each seed lot. All tests must be completed within one (1) year of when seed is installed.
 - 4. PLS weight per acre for each species on this contract.
 - 5. Adjusted bulk seed weight for each species (lot) per acre to meet PLS weight per acre

required on this contract.

1.05 QUALITY ASSURANCE

- A. Refer to Division 1 Requirements.
- B. Ability to Deliver:
 - 1. Investigate sources of supply and confirm they can supply materials with genetic origins as specified in quantity, variety, and quality noted and specified before submitting bid.
 - 2. Failure to take this precaution will not relieve responsibility for furnishing and installing these materials in accordance with Contract documents without additional expense to the MWRD.
- C. Seed shall conform to the requirements of the Illinois Seed Law and, when applicable, the Federal Seed Act, and shall be "Certified" grade or better.
- D. Perform Work in accordance with the IDOT Standard Specifications, except as specifically modified herein.
- E. Provide the Engineer with written compliance of all listed documentation above.

1.06 QUALIFICATIONS

- A. Seed Supplier: Company specializing in producing and/or distributing seed specified in this section with minimum five (5) years of experience.
- B. Contractor Qualifications:
 - 1. Contractor shall be a company specializing in seeding installation who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 2. Contractor shall have a minimum of five (5) years of experience on comparable projects and utilizing / directing experienced crews.
 - 3. Contractor shall be familiar with the IDOT standards and specifications.
 - 4. Contractor's Field Supervision: Require Installer to maintain an experienced fulltime supervisor on the Project site during times that landscape work is in progress.
 - 5. The work described in this section requires specialized knowledge, experience, skills, and equipment to successfully complete. The Contractor shall possess the full capability to execute the work as specified, including trained, experienced and skilled personnel and possession of or access to the required equipment. The seeding Contractor (may be a subcontractor) shall provide proof of qualifications, including a work history documenting a minimum of five (5) seeding projects completed in the last five (5) years which are comparable in scope, techniques, and size. This information shall include a complete project description, lead foreman experience history, location, client name, and contact information.
 - 6. The contractor shall have a qualified and degreed ecologist, who has knowledge in streambank stabilization and restoration, on staff as part of this contract, either as a direct employee of the contractor or as a subcontractor. A resume or other

qualifications and certifications for the degreed ecologist shall be submitted for approval. The degreed ecologist must oversee the installation of all vegetation and seeding and supervise the maintenance of the native vegetation for conformance with the contract documents and specifications.

1.07 SITE CONDITIONS

A. Project Environment:

1. Seeding shall be performed only when weather and seedbed conditions are favorable for such operations.
2. No seeding applications shall be done during high winds or when the ground is frozen or in otherwise unworkable conditions.
3. Operations will be suspended or delayed whenever conditions are unfavorable for such work or as directed by the Engineer.

B. Contractor Equipment:

1. Equipment of a type, size, capacity, or condition unsuited for obtaining first class work and expedition of the job shall be replaced with proper equipment.
2. Limits of operation shall be restricted to areas approved by the Engineer.

1.08 COORDINATION

A. Section 01 13 10 – Coordination and Meetings.

- ##### B. Coordinate the Work with installation of, including but not limited to, pavements, utilities, soils, and planting specified under other sections as the Work of this Section proceeds.

1.09 PRE-INSTALLATION MEETINGS

A. Section 01 13 10 – Coordination and Meetings.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements.

- ##### B. All seeds shall be packaged and delivered to ensure the viability of the seed material. All seed shall be packed and covered in a manner as to ensure adequate protection against leakage, damage, and to maintain dormancy while in transit.

- ##### C. There shall be no seed delivered to the project site or received by the Engineer on Fridays, weekends, or holidays without prior approval.

- ##### D. Deliver materials to site in original unopened packages, each bearing name and address of manufacturer, contents, and supplier's guaranteed analysis.

- ##### E. Do not use materials which become caked or otherwise damaged.

- ##### F. Do not expose materials to weather prior to delivery on site, and after delivery until used.

- G. Protect materials and do not store in direct contact with ground.
- H. Seeds shall be protected against leakage, damage and moisture to insure viability and dormancy.

1.11 FIELD QUALITY CONTROL

A. Grading Inspection:

- 1. Finish grading in accordance with Section 32 93 00 – Planting and Fine Grading shall be inspected and approved by the Engineer prior to seeding.

B. Inspections:

- 1. No seed shall be sown until the Engineer has inspected and approved the unopened seed mix bags.
- 2. Contractor shall request a provisional inspection by the Engineer upon completion of the work.
- 3. Upon completion of the punch list, the Engineer shall make provisional acceptance in writing.
- 4. Final acceptance will be after all performance criteria have been met at the end of the specified monitoring and management period or as specified elsewhere, and after all required repairs have been made.

1.12 WARRANTY

- 1. Refer to maintenance and warranty requirements in Section 32 93 00 – Planting and Fine Grading.

1.13 FINAL ACCEPTANCE

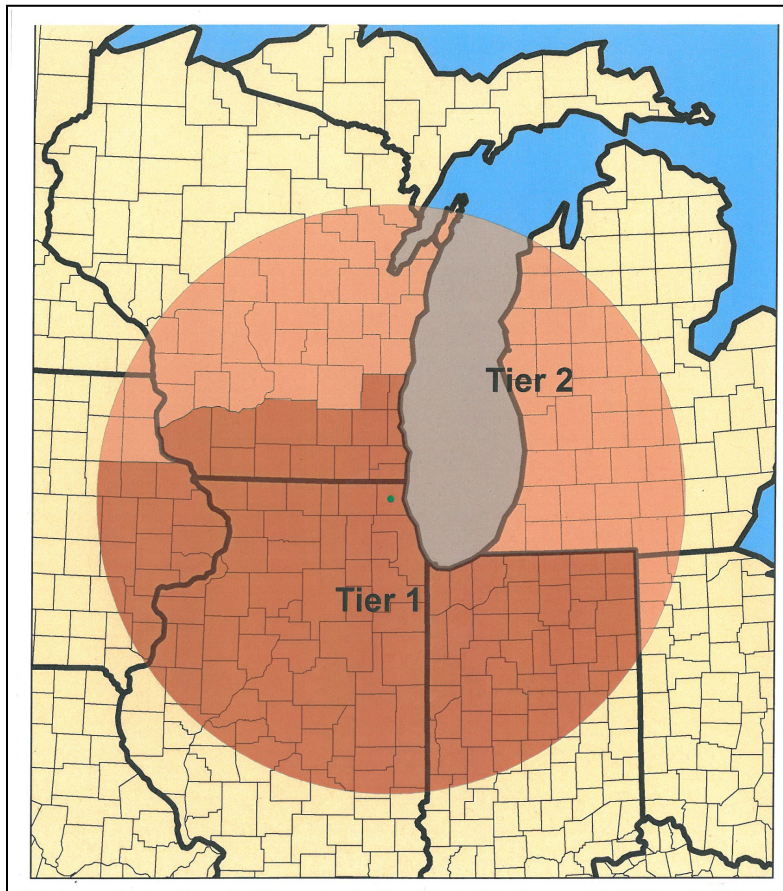
A. Native Seeding Areas:

- 1. Determination of final acceptance of the seeded areas shall be made by the Engineer upon the Contractor's request at the end of the warranty period unless seeding was performed and guaranteed outside of the recommended dates, in which case the inspection dates for establishment shall be as follows;
 - a. Seeding performed between June 15 and July 31 will be inspected after July 15 of the following year.
 - b. Seeding performed between November 2 and March 31 will be inspected after September 15 of the following year.
- 2. Provide notification at least five (5) working days before requested inspection date.
 - a. Seeded areas shall be accepted provided all requirements, including maintenance, have been complied with and native seed mix is well established and exhibits a vigorous growing condition.
 - b. Areas failing to show satisfactory establishment shall be reseeded at the Contractor's expense.

PART 2 - PRODUCTS

2.01 SEED

- A. Species mixtures shall be as designated on the Drawings.
- B. Native seed shall preferentially have origins (provenance) from locations within Tier 1 on the map below. If the Contractor can show that any species are not available with Tier 1 origins (provenance), they may be provided with origins (provenance) from Tier 2. Note Tier in submittals.



Plant Provenance Tier Map

- 1. Tier 1 provenance includes the following counties:
 - a. Illinois: Bureau, Carroll, Cass, Champaign, Coles, Cook, De Witt, DeKalb, Douglas, DuPage, Edgar, Ford, Fulton, Henderson, Jo Daviess, Kane, Kendall, Knox, La Salle, Lake, Lee, Livingston, Logan, Macon, Marshall, McDonough, McHenry, McLean, Menard, Mercer, Moultrie, Ogle, Peoria, Piatt, Putnam, Rock Island, Sangamon, Schuyler, Stark, Stephenson, Tazewell, Vermilion, Warren, Winnebago, Whiteside, Warren, and Woodford counties.
 - b. Wisconsin: Dane, Grant, Green, Iowa, Jefferson, Kenosha, Lafayette, Milwaukee, Ozaukee, Racine, Rock, Walworth, Waukesha, Waukesha, and Washington counties.
 - c. Indiana: Adams, Allen, Benton, Blackford, Boone, Carroll, Cass, Clinton, De Kalb, Delaware, Elkhart, Fountain, Fulton, Grant, Hamilton, Hendricks, Howard, Huntington, Jasper, Kosciusko, Lake, LaGrange, LaPorte, Madison, Marshall,

Miami, Montgomery, Newton, Noble, Parke, Porter, Pulaski, Putnam, St. Joseph, Starke, Steuben, Tippecanoe, Tipton, Vermillion, Wabash, Warren, Wells, White, and Whitley counties.

- d. Iowa: Buchanan, Cedar, Clinton, Delaware, Des Moines, Dubuque, Jackson, Johnson, Jones, Linn, Louisa, Muscatine, and Scott counties
- C. Seed material shall conform to the following requirements:
1. Any seed that does not meet these specifications will be rejected.
 2. The original (wild) source of seed shall be guaranteed within a 200-mile radius of Cook County, Illinois and identified by its origin tier.
 3. All species shall be provided on a PLS basis. PLS shall be defined as (purity) x (total germination). Total germination is defined as (germination + hard seeds + dormant seeds). TZ can be substituted in lieu of total germination if necessary.
 4. The bulk weight of any species that is less than 100% PLS must be increased in quantity to achieve the required PLS seed weight.
 5. All species with dispersal appendages (e.g. *Asclepias*, *Aster*, *Liatris*, *Solidago*, etc.) and marked "DF" in species lists shall be supplied on a de-fluffed basis. Contractor must indicate in their submittal if seed is not available on a de-fluffed basis. If seed is not de-fluffed, Contractor must increase quantity of that species by 25% at no additional cost to the MWRD.
 6. All "hulled" species (e.g. *Desmodium*, *Lespedeza*, *Dalea*, etc.) and marked "DH" in the species lists shall be supplied on a de-hulled basis. Contractor must indicate in their submittal if seed is not available on a de-hulled basis. If seed is not de-hulled, Contractor must increase quantity of that species by 25% at no additional cost to the MWRD.
- A. Prior to installation, the Contractor shall submit any proposed species substitutions or quantity deviations to the Engineer for review. The Engineer reserves the authority to deny substitutions and deviations from the listed quantities.
- B. All seed furnished shall be true to species name for each seed mix specified on the plans.
- C. Packaging for all seed mixes shall clearly be labeled on the outside with all species contained in the mix, and include the following information:
1. Scientific name of each species in the mix.
 2. PLS value, PLS weight, and bulk weight for each species in the mix.
 3. Adjusted bulk seed weight for each species per acre to meet PLS weight per acre required on this contract.
 4. Quantity, as both weight and acreage, for each species and overall mix.
- D. Seed tests must be submitted and approved prior to delivery of any seed to the site. Include complete information on year of seed production and date of seed tests.
1. Seed tests must be within one year of when the seed is sown.
- E. All legume species shall be supplied with the appropriate bacterium inoculants.
- F. Clearly mark seed packages that require refrigeration/freezer storage.
- G. Provide a Pick Ticket with each shipment.

- H. All seeds shall be packaged to ensure the viability of the seed material upon delivery to the project site.
- I. All seed shall be packed and covered in such a manner as to insure adequate protection against leakage, damage, and to maintain dormancy until sown.
- J. The Contractor must submit a written description of the seed materials including the following information for approval prior to delivery of any seed to the site:
 - 1. Origin of the various species of seed.
 - 2. Name and location of seed supplier, if not from Contractor's nursery.
 - 3. Certificate of compliance from appropriate regulatory agencies indicating approval of seeds.

2.02 SOIL AMENDMENTS

- A. All native seed mixes shall be combined with an appropriate mycorrhizal inoculant, such as AM 120 Mycorrhizal Inoculum or approved equal. The inoculants shall contain a diverse mixture of glomales fungal species (*Glomales* spp.) in pelletized form. Application rate shall be in conformance with the selected manufacturer's recommendations. All native seed shall be mixed with a granular form of mycorrhizal inoculants prior to installation.
 - 1. The inoculants application rate shall be a minimum of 60 pounds/acre.

2.05 WATER

- A. Water shall be free from oil, acid, alkali, salts, and other harmful substances. Water may be utilized from potable or non-potable sources. The MWRD will not be responsible for providing supplemental water. Any available water sources located on MWRD property shall not be utilized without written permission of the MWRD.

2.06 CARRIER AGENT

- A. Carrier agent for native seeding shall be perlite, ground corn cobs, vermiculite, or similar material approved by the Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 13 10 – Coordination and Meetings.
- B. Contractor shall carefully inspect all prior work and existing conditions and shall notify the Engineer immediately of all conditions that would impair proper execution of the work.
 - 1. Verify that the topsoil is ready in accordance with Section 32 93 00 and Section 32 91 13 to receive the Work of this section.
 - 2. Confirm notification with the Engineer in writing.
 - 3. Failure to notify at start of work constitutes acceptance of existing conditions.

3.02 SCHEDULE FOR SEEDING

- A. Seeding, soil amendments, and installation of erosion control blankets and turf reinforcement mat shall be performed during the following time frames:
 - 1. Native seeding shall be conducted as a dormant seeding after October 15 through December 31 excluding times when the ground is frozen or covered with snow.
 - a. No seeding shall be outside of the specified window without the Engineer's prior written approval.
 - b. Weather conditions within season shall govern actual planting periods.
 - c. Seasons may be extended upon approval by the Engineer, however, such time extensions shall not change Contractor's responsibility for establishing healthy and vigorous vegetation.
 - 2. Turf seeding shall be performed as defined in Section 32 92 00 – Turf and Grasses.

3.03 SEEDBED PREPARATION

- A. Surface Preparation:
 - 1. Gullies and washout shall be filled to conform to desired shape and final grade. Entire area to be seeded shall be reasonably smooth before actual seedbed preparation begins.
 - 2. Stones, sticks, and stumps larger than one (1) inch in any dimension, and other debris which would interfere with seeding operations, growth or maintenance of vegetative cover shall be removed.
 - 3. Any existing weeds shall be treated with a non-selective non-residual herbicide prior to seeding. Comply with directions on herbicide label including reseeding interval.
- B. Seedbed Preparation:
 - 1. Seedbed shall be prepared with suitable tillage equipment to a three (3) inch minimum depth.
 - 2. Area to be seeded shall be worked until all soil particles are reduced to a size not larger than one (1) inch in the largest dimension.
 - 3. Prepared surface shall be free from all weeds, clods, stones, roots, sticks, rills, crusting and caking.
- C. Inaccessible Areas:
 - 1. For areas inaccessible to machinery, a suitable seedbed shall be prepared to a minimum depth of one (1) inch, using hand tillage tools such as a rake or other suitable tillage tools.
- D. Restrictions: Contractor shall suspend seeding operations when soil is too wet, too dry, frozen, untillable, or at request of the Engineer.
- E. If compaction is present in graded areas (e.g. haul roads), chisel plowing the upper three (3) to six (6) inches using a construction ripper, rock rake, or similar equipment will be required in addition to seedbed preparation described above.
- F. Approval:
 - 1. Seeding shall commence immediately after seedbed preparation, or at a later time provided seedbed remains in a friable condition suitable for seeding.
 - 2. If topsoil has become compacted, crusted over, glazed, or otherwise unfavorable for seeding, Contractor shall repeat seedbed preparation at no additional cost to the MWRD.

3. No seeds shall be sown until the seedbed has been approved by the Engineer.
- G. If the long-term (i.e. permanent) seed matrix is not installed with the temporary cover crop, the permanent matrix shall be planted in the first available dormant seeding season.

3.04 SEED INSTALLATION

A. General:

1. All areas of bare soil which have been graded or otherwise disturbed by construction shall be seeded, unless below normal water level or specified on the plans otherwise. Refer to the plans for locations of the specified seed mixes. No seed shall be sown during unfavorable conditions such as high winds or very wet soil.
2. Temporary work areas, staging areas, haul roads, and all other similarly disturbed areas which require restoration shall be prepared and seeded according to the requirements of this section.
3. Contractor shall provide the Engineer 48 hours of notice of intent to perform seeding operations.
4. Seeding operation shall be performed immediately after preparation of seedbed and approval is received from the Engineer.
5. Ideally, seeding shall occur when the soil is moist to dry-damp and shall be timed such that rainfall occurs within 48 hours of seeding (particularly if seeding in early spring). No seed shall be sown when winds exceed a velocity of ten miles per hour or when the ground is not in proper condition for seeding. No seed shall be sown until purity testing has been completed and approved for the seeds to be used. Only seeds meeting noxious weed requirements shall be used.
6. The last areas to be seeded/re-seeded will be site access points.
7. Seeded areas impacted by the Contractor's vehicular traffic or other such damages shall be reseeded by the Contractor without delay and at no additional cost to the MWRD.
8. All seeded areas shall be protected from erosion and sedimentation. Erosion and sediment control measures shall be installed as detailed on the plans and in the specifications. Erosion control blankets and turf reinforcement mat shall be in accordance with the requirements of this section and in accordance with the plans.

A. Native seeding:

1. Native seeding includes the following zones and mixtures: Riparian, Mesic Prairie, and Dry Prairie seed mixtures.
2. The primary method for native seeding is broadcasting with a carrier agent via a mechanical spreader. Hydroseeding can be used for areas with erosion issues, or other hard to access areas, with prior approval of the Engineer. Other methods may be presented to Engineer for consideration. The Engineer will have final approval of the installation method.
 - a. Prior to starting work, mechanical seeders shall be calibrated and adjusted to sow seeds at the specified rate.
 - b. If a mechanical broadcast seeder (e.g. Cyclone or Seed Slinger) is used, the equipment shall be operated in a manner to ensure complete coverage of the entire area to be seeded. The seed shall be broadcast in two separate applications, with each application of seed overlapping the previous application by one-half the weight to ensure double coverage of the seeded area. For example, half the weight

of seed would be installed in a north-south direction and the remaining half would be installed in an east-west direction.

- c. Where soil conditions are too wet or slopes are too steep for mechanical broadcasting, hand broadcasting or hydraulic application of the seed is acceptable on exposed soils only. Seed to be hand shall be mixed with an equal volume of carrier agent to ensure even distribution.
3. The seed shall be mixed and planted with a granular form of endomycorrhizal inoculants at a rate of 60 pounds/acre.
4. Roll seeded areas perpendicular to the slope within 12 hours of seeding with a cultipacker or other approved equipment.
5. The use of rangeland-type seed drills will not be permitted without the written permission of the Engineer.

3.05 EROSION CONTROL

- A. Refer to Section 31 25 00 – Erosion Control.

3.06 SEED PROTECTION AND MAINTENANCE

- A. Maintain seeded areas to ensure that intended vegetation becomes well established and exhibits a vigorous growing condition.
- B. Protection: Contractor shall take measures to prevent damage to areas of work as follows.
 1. Damage resulting from erosion, traffic, or any other causes shall be repaired by filling with topsoil, tamping, and seeding with the originally specified seed mixture by the Contractor.
- C. Weeding:
 1. Contractor shall remove weeds, as defined in Article “Definitions” and other unintentional vegetation by least disruptive means possible. All removed weeds shall be bagged and removed from the project site. No composting of weed materials is allowed on the project site.
 2. Contractor shall provide written options for methods of removal for approval by the Engineer prior to weeding.
- D. Watering of seeded areas:
 1. Furnish sufficient water to apply complete coverage once each week to the seeded areas in an eight (8) hour period penetrating the soil to a minimum depth of four (4) inches until germination.
 2. Weather conditions shall dictate the need for additional watering.
 3. At no time shall a water tank truck be allowed on the seeded areas.
- E. After any rainfall event, the Contractor is responsible for maintaining seeded slopes to prevent or repair erosion.

3.07 SUPPLEMENTAL WATERING AND MAINTENANCE

- A. Maintenance of the native vegetation is vital to the success of the project. The items outlined in this specification are requirements for achieving a successful establishment and management of the native vegetation. Twice annual monitoring of all native plant communities shall be conducted for three full growing seasons following initial implementation.
- B. The site visits each year shall be conducted between June 1 and September 30. Each visit shall be conducted by a qualified professional with adequate plant identification skills and who is also able to make recommendations regarding management of native plant communities and stream structure maintenance. The site inspector shall collaborate over the needed maintenance requirements for a given year with the Village of Robbins and the Engineer. The preferred management schedule and & performance standards for all native plant communities following initial installation is as follows:
1. Herbicide application: Contractor shall eradicate herbaceous noxious weed species. It is the responsibility of the contractor to protect native species and areas outside of the project area during execution of the work described in this section. The contractor shall restore all areas affected or disturbed by the work according to the approved plans and specifications at no additional cost to the MWRD. The contractor shall maintain copies at the project site of all current pesticide applicator's licenses, herbicide labels, and MSDS's (material safety data sheets) for all chemicals utilized during completion of the work. Herbicide shall be mixed and placed in containers away from any natural area, trees, shrubs, herbaceous or woody growth, or body of water. Herbicides shall not be transported to the work area in any container other than that used for application. Several back-to-back treatments with appropriate herbicides may be necessary to be effective in eliminating these noxious weeds.
 2. Mowing: The contractor shall mow native plant communities to a height of 6"-10" after vegetation in said areas reaches a height of 24" and before non-native species go to seed no less than two times during first growing season. The contractor shall also mow to a height of 12" up to two times during the second growing season (approximately mid-June and mid-August) and possibly one time during the third growing season (approximately mid-June) unless the Engineer determines that mowing is not needed. Mowing should be done with a rotary bush hog style mower to ensure clippings are dispersed rather than deposited in dense mats, which smother vegetation, or the clippings/branches should be removed from the mowed area. In the instance of dense patches of non-native or invasive species greater than 100 square feet, Contractor shall collect, bag, and dispose of clippings off site in a legal manner and in accordance with the Division 1 specifications.
 3. Prescribed Burning: Prescribed burning shall be the primary method for long-term ecological management and weed control on the site. Burning shall begin following the third growing season and be conducted in the fall of that year (November-December). Burning should be conducted by a licensed contractor

experienced in burn planning and permit application as well as prescribed burn management. Prior to the commencement of prescribed burning, the contractor shall compile a burn plan that outlines a plan of action, identifies contingencies, and lists the names and phone numbers of emergency agencies (fire department, police department, etc.). Proper notice of intent to burn shall be given. The Contractor shall apply for and receive all required permits prior to the commencement of prescribed burning.

3.08 CLEANING

- A. Perform cleaning of the work area during installation of the work and upon completion of the work.
- B. Remove from the site excess materials, packaging, debris, and equipment associated with work of this Section upon completion of the work.
- C. Contractor shall repair damage resulting from seeding operations to the satisfaction of the Engineer.

3.09 GUARANTY

- A. Upon completion of seeding operations, the Contractor shall become responsible for protecting the seeded areas from any damage resulting from foot or vehicle traffic, vandalism, or weather. When possible, isolate and contain the completed areas with temporary fencing or other such means. Erosion or soil subsidence caused by rain shall be repaired to the original grade, prepared for seed, reseeded, and the specified erosion control blanket or turf reinforcement mat reapplied. Any damage which occurs before achieving the performance and guaranty criteria shall be repaired to original specifications by the Contractor at no expense to the MWRD.
- B. Seeded areas shall have a minimum of 90% ground coverage with active growth of installed species and no bare ground greater than two square feet before initial acceptance. The minimum ground coverage shall be achieved within 90 days of the original seeding, excluding the winter months of November through March. The Contractor shall promptly remove any erosion control blankets or turf reinforcement mat and reseed the bare areas according to the specifications as necessary until the minimum coverage is achieved. When weed species interfere with proper establishment, the Contractor shall apply and appropriate herbicide to reduce competition. After each reseeded, the Contractor shall install new erosion control blankets or turf reinforcement mat as originally indicated on the plans.
- C. Any erosion control blankets or turf reinforcement mat which becomes displaced for any reason shall be reinstalled to its original condition and position with additional staples. Any erosion control blankets or turf reinforcement mat which becomes damaged or otherwise ineffective shall be replaced with new product. All rills and gullies shall be repaired, and the area shall be reseeded prior to reinstallation of erosion control blankets.

END OF SECTION

SECTION 32 93 00

PLANTING AND FINE GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK:

- A. The work of this Section includes, but is not limited to, the following:
 - 1. Trees and shrubs.
 - 2. Groundcover, Perennial and Herbaceous plants.
 - 3. Mulch, fertilizer, and other soil amendment applications to suit plant type during and after planting.
 - 4. Plant anchoring system.
 - 5. Temporary erosion control.
 - 6. Protecting and Maintaining the Completed Work.
 - 7. Coordination with other Trades.
 - 8. Clean up.
 - 9. Post installation Maintenance.
 - 10. Warranty.
- B. Extent of Landscaping Work: In addition to the work indicated, Landscape work includes restoring all areas within the limit of work disturbed by work of the Contract and coordination of work with other subcontractors.

1.03 RELATED SECTIONS:

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 01 56 39 – Temporary Tree and Plant Protection.
 - 2. Section 31 05 13 – Soils for Earthwork.

3. Section 31 05 16 – Aggregates for Earthwork.
4. Section 31 20 00 – Earthwork.
5. Section 31 25 00 – Erosion Control.
6. Section 32 91 13 – Planting Soils.
7. Section 32 92 00 – Turf and Grasses.
8. Section 32 92 19 – Seeding.
9. Section 32 96 00 – Transplanting.

1.04 REFERENCES:

- A. ANLA: American Nursery & Landscape Association.
- B. ANSI: American National Standards Institute.
- C. AOAC: Association of Official Agricultural Chemists.
- D. ASTM: American Society for Testing Materials.

1.05 STANDARDS:

- A. The references listed herein shall be the standards used for performance of the Work: All standards shall include the latest and current additions and amendments.
 1. American National Standards for Tree Care Operations, ANSI A300. American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.
 2. American Standard for Nursery Stock, ANSI Z60.1. American Nursery and Landscape Association, 1250 Eye Street. NW, Suite 500, Washington, D.C. 20005.
 3. Horticultural Standards, American Nursery & Landscape Association.
 4. Hortus Third, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.
 5. Standardized Plant Names, American Joint Committee on Horticultural Nomenclature, 1942 edition.
 6. American Society for Testing Material (ASTM).
 7. International Society of Arboriculture.
 8. Flora of the Chicago Region, A Floristic and Ecological Synthesis, Wilhelm & Rericha, 2017 edition.

1.06 DEFINITIONS:

- A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
- B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- C. Bare Root Stock: Healthy, vigorous, plants grown without artificial root restriction devices, such as containers or fabric bags and have a well-established and branched root system. All bare root plant material shall be installed no later than the first week in May of each year. Conform to ANSI Z60.1 for storage, kind, type, and size of exterior plant required.
- D. Finish Grade: Elevation of finished surface of planting soil.
- E. Planting Soil for Soil Profiles: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil. See Section 32 91 13 – Planting Soils.
- F. Topsoil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments. See Section 32 91 13 – Planting Soils.
- G. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing topsoil / planting soil. See Section 32 91 13 – Planting Soils.
- H. Final Acceptance: Date at which all Work, including work identified in the “Punch List”, is completed and accepted by the Engineer. After all Punch List work has been completed and accepted, the Contractor shall request in writing for the Engineer to perform a final inspection for the purpose of Final Acceptance of the work. The Engineer shall not give Final Acceptance until all Punch List work has been accepted. The maintenance and warranty periods shall not commence until Final Acceptance is granted by the Engineer.

1.07 SUBMITTALS:

- A. Submittals shall conform to Division 01 requirements.
- B. Product Data: Provide manufacturer’s data for each type of product indicated showing installation and limitations in use.
- C. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following. Submit inspection certificates

- required by authorities having jurisdiction. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.
1. Manufacturer's certified analysis for standard products including, but not limited to:
 - a. Soil amendments.
 - b. Mulch, maturity certification. Tests must be completed within three (3) months of when mulch is installed.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- D. Material Test Reports: Submit certified reports for tests required, including:
1. Mechanical and chemical analysis of existing surface soil and topsoil / planting soils. See Section 32 91 13 – Planting Soils.
 2. Miscellaneous tests listed herein. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Qualification Data: For landscape Installer's, Project Manager, Site Superintendent/Foreman, showing years of experience, certifications and licenses, education, projects worked on of a similar size, scale and complexity. For each project list client, type of project, cost of project, duration and role of personnel.
1. Provide a minimum of three project references (name, title, company, phone number and email address) for the Project Manager and Site Superintendent/Foreman. For every project provide at least one Landscape Architectural reference.
- F. Samples and Submittals for Verification: Prior to ordering the below listed materials, submit representative samples and submittals to Engineer for selection and approval as follows. Do not order materials until Engineer's approval has been obtained. Delivered materials shall closely match the approved samples. Submit duplicate samples of each type listed below showing full range of color variation, finish and texture that can be expected in the permanent work:
1. Mulch: At least two pint-bag of partially decomposed leaf waste mulch of the type to be used on this project.
 2. Staking materials, Wood Stakes and Duck-Bill System.
 3. Nursery Source Plant List.
 4. Hydromulch Mix (30% paper, 70% wood).
 5. Root Dip Mycorrhiza Gel
- G. Delivery and Storage: Prior to construction the Contractor shall submit for the Engineer's review and approval a plan showing proposed routing for deliveries and access to the site as well as on site storage of any bare root plant material.

- H. Plant Source: The Contractor shall submit for the Engineer's review and approval a list indicating the plant botanical and common name, size, quantity, form, rootball, limb height (if applicable), identification of fall dig hazards, nursery, and source for the plants, including contact information, and Landscape Architect's seal number. Plant list shall clearly indicate deviations from the specified plant list and any proposed substitutions.
1. Submit a complete list of all plant material for Project with nursery source identification for each plant.
 - a. Include in plant list the botanical and common names, size, quantity, form, root ball, limb height (if applicable), other requested data, and source locations for all plant materials.
 - b. Include names, addresses, and phone numbers of each nursery source associated with each plant item.
 - c. Plant lists shall clearly identify deviations from the specified plants and any approved substitutions. Submit substitution requests, if any, as specified in Division 01 Section 01 60 00 Product Requirements. Where deviations or other changes occur in plant list, identify both the original specified plant item and the new plant item.
 - d. Plants listed with submittal shall be available at the nursery for inspection and selection as specified herein. Contractor shall evaluate and verify at proposed nursery source that plant material conforms to the requirements of the Contract Documents prior to scheduling Engineer's inspection and selection/tagging trip. Contractor shall confirm nursery source prior to scheduling tagging trip.
 2. Maintain and re-submit updated Plant List and Source Identification as deviations or other changes occur until Substantial Completion. Submit as a Record Document at completion of Contract work.
 3. As the project progresses and plants are located and sealed, revise and resubmit the plant source list submittal. The Contractor shall maintain an up-to-date plant species and source list indicating the plant botanical and common name, size, quantity, form, root ball, identification of fall dig hazards, limb height (if applicable), nursery source, including contact information, and seal number.
- I. Temporary irrigation plan, including all related equipment to be utilized, a preliminary schedule for installation and operation, and water source access approach for each type provided.
- J. Plant Photographs: Provide photographs of plants taken at the Nursery Source prior to scheduling tagging trips and as the basis for the Engineer to select plants.
1. Contractor shall label each photograph with the plant species botanical name, nursery name, and date of photograph.
 2. Photographs shall include images showing the full range of characteristics of each plant including detailed photographs of the bark, the base of the tree (rootball crown), leaves if present, branching structure, form, and habit.
 3. Images shall include a scale figure or measuring device to indicate true size.

4. Photographs may be transmitted electronically but the title of the electronic files must bear the plant name, nursery, and date.
 5. For container plants. Also provide close up photographs of the rootball with the container removed.
 - a. Quantity: 10% of the total number specified.
- K. Planting Schedule: Indicating anticipated planting dates for performing all Work within this Section, coordinated with the Project.
1. Planting Schedule Updates: As the project progresses, resubmit approved planting schedule updated to indicate anticipated planting dates for performing all Work within this Section, coordinated with the Project.

1.08 QUALITY ASSURANCE:

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in the successful establishment of exterior plants.
1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.
- B. Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
1. Employ at Contractor's expense a qualified independent testing and inspection laboratory acceptable to the Engineer and Owner to perform tests and certifications indicated. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists.
- C. Plant Materials: Provide quality, size, genus, species, and variety of exterior plants indicated. Provide only healthy, vigorous stock, grown in a recognized nursery acceptable to the Engineer and free from disease, insects, eggs, larvae, and other defects. Provide plants in strict compliance with the recommendations of the following:
1. ANSI Z60.1, American Standard for Nursery Stock, latest edition.
 2. American Association of Nurserymen, Horticultural Standards.
 3. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names, 1942 edition.
 4. International Society of Arboriculture.
- D. Labeling: Label at least one specimen of each variety and size with a securely attached, waterproof tag bearing legible designation of botanical and common name in compliance with the recommendations of the American Nursery & Landscape Association.
- E. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Measure

main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

- F. Pruning: Pruning of plants before, during or after installation is prohibited except to remove dead or broken branches and limbs. Confer with Engineer and Owner before any pruning. Plants pruned without permission from the Engineer and Owner is subject to rejection and replacement.
1. Pruning plants after the Engineer's selection and prior to delivery to the site shall be cause for rejection.
- G. Inspection: Engineer will inspect plant materials at place of growth before planting for compliance with requirements for genus, species, variety, size, and quality. Engineer and Owner retain the right to inspect plant materials further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work even if previously inspected and approved. Remove and replace rejected plants immediately from Project site at no change in Contract Amount.
1. Selection: All plants shall be tagged in the nursery by the Engineer prior to digging of plants. The Engineer and Owner shall place seals on selected plants at the nursery. Seals shall remain on plants until the acceptance of the work. At least three weeks prior to expected planting date, request, in writing, the Engineer's inspection of plant material at the nursery. The Engineer shall make their own travel arrangements.
 2. Photographs: At the Engineer's option and/ or request, the Contractor shall supply the Engineer with photographs of plants for the project.
 - a. The photographs shall be taken at the nursery source. Photographs shall include images showing the full range of characteristics of each plant including detailed photographs of the bark, the base of the tree (rootball crown), leaves, branching structure, form, and habit. Images shall include a scale figure or measuring device to indicate true size.
 - b. Contractor shall label each photograph with the plant species botanical name, nursery name, and date of photograph.
 3. Nursery Source: The Engineer shall have the right to reject any nursery source if he/ she determine before, during or after inspecting or receipt of plants, any of the following:
 - a. The nursery stock does not meet quality standards set forth herein.
 - b. The nursery stock does not meet the intended visual characteristics of the plants as determined by the Engineer.
 - c. The nursery cannot supply the specified plant(s) or an acceptable substitute cultivar or species.
 - d. The nursery's cultural practices or maintenance procedures do not meet specified standards.
 - e. The nursery or plants are infested with pests or disease.

- H. Pre-installation Conference: Conduct conference at Project site with the Engineer to comply with requirements in Division 01.
- I. Plant Sources: The Contractor shall submit to the Engineer any questions regarding the source of any plant. Plugs must comply with the genotypic origin as delineated in Section 32 92 19 – Seeding. The Engineer has endeavored to locate plants at the nursery sourced below. Additional sources may be used for plants not available at the nurseries listed below provided the Engineer has approved the source:
 - 1. Trees have been located at the following sources, however Owner makes no claim or in no way guarantees that the plants will be available at the time of installation:
 - a. Kaneville Tree Farms, Inc. (tel: 630.557.2793)
 - b. Hinsdale Nurseries (tel: 630.323.1411)
 - c. Kankakee Nursery (tel: 815.937.9358)
 - d. Gerdes Wholesale Nursery Inc. (tel: 815.943.0305)
 - 2. Other Plants including Shrubs, Plugs, Perennials and Groundcover. Other sources include, but are not limited to, those listed below:
 - a. Cardno Native Plant Nursery (tel: 574.586.2412)
 - b. Pizzo Native Plant Nursery (tel: 815.981.8000)
 - c. Natural Communities Native Plant Nursery (tel: 331.248.1016)

1.09 DELIVERY, STORAGE, AND HANDLING:

- A. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Plants shall be closely monitored for sufficient root moisture. Protect all materials from damage, injury and theft.
- B. Sequence deliveries to avoid delays but minimize on-site storage.
 - 1. On-site storage space is extremely limited and is restricted to a 24-hour period for any one material, plant or group of plants. On site storage is permissible only with written notice from the Engineer.
 - 2. Deliver materials and plants only after preparations for planting have been completed and accepted, including but not limited to: subdrainage system, irrigation, rough grading, utilities, decompaction or remediation of soils. The Engineer shall determine if the site is acceptable for planting.
- C. Refer to Section 32 91 13 – Planting Soils for delivery and storage of topsoil / planting soils.
- D. Prohibit vehicular and pedestrian traffic on or around stockpiled topsoil / planting soils.
- E. Deliver plants freshly dug.
- F. Do not prune trees and shrubs before delivery, except as approved by Engineer. Protect bark, branches, and root systems from sun scalding, drying, sweating, whipping, and

other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

- G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery or if plants are to be stored off site set exterior plants in shade, protect from weather and mechanical damage, and keep roots moist.
1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, wood chips, straw mulch, or other acceptable material.
 2. Do not remove container-grown stock from containers before time of planting.
 3. During the growing season, stored plant material shall be watered and the rootball kept moist with an automatic drip irrigation system to prevent drying out. Do not move trees if rootballs are saturated. Mist plants several times a day if necessary to reduce transpiration in sunny or windy locations.
 4. During the dormant season, rootballs shall be insulated against freezing and cold weather damage. Plants shall be protected from cold, wind and ice damage.
 5. During the storage period, inspect all plants for pests and diseases and have them evaluated by a certified arborist.
 - a. Before proceeding, report issues and recommend treatment to the Engineer for review and approval.
 - b. Whenever possible, select and use organic treatments.
 - c. Isolate trees with diseases or pests. Remove any plants from the site and replace if the Engineer determines that they are unusable.
 6. For plants stored on-site more than 12 hours, the Contractor must keep a maintenance log. The log shall include information on the watering, misting, and protection of plants. The date, time, type of maintenance, and name of maintenance personnel shall be included in the log.
 7. The Contractor shall fully inspect and maintain plants for the entire duration of the storage period.
 8. All stored plants shall remain the property of the Contractor and shall be replaced in kind to meet the standards defined herein for healthy plants and the character and habit defined by the Engineer. The Engineer shall be the sole evaluator whether replacement plants match the originally stored plants.
 9. No plant shall be stored more than four weeks at any location without written acceptance by the Engineer.

1.10 PROJECT CONDITIONS AND COORDINATION:

- A. Utilities: Determine and stake the location of underground utilities before project staking. Hand excavate as necessary to avoid damage.

- B. Concealed Conditions: Notify Engineer before planting when below grade conditions are detrimental to proper plant growth are encountered. Do not proceed with planting without specific written instructions from the Engineer.
- C. Sequence of Planting: Plant trees and shrubs after finish grades are established and before planting lawns, groundcovers and other herbaceous material, unless otherwise approved by the Engineer. Complete landscaping work as quickly as possible on portions of the site as they become available for landscaping.
1. When planting trees and shrubs after lawns, prairies or meadows are installed, protect lawn areas and promptly repair damage caused by planting operations.
 2. The Contractor shall coordinate the installation of all native seed mixture and plugs with the installation of erosion control fabric. All native seeding shall be installed prior to the installation of erosion control fabric. If erosion control fabric has been installed in areas to receive seed, Contractor shall be responsible for removing and reinstalling all erosion control measures required to perform the associated work.
- D. Planting Seasons: Work only within seasonal limitations for proper planting noted below. The Contractor shall, however, take into consideration seasonal weather conditions that would affect the planting period and shall not proceed if planting in these conditions would affect the short and/or long term health of the plants:
- | Item | Spring Season | Fall Season |
|----------------------------------|--------------------|-----------------------------------|
| Deciduous (container) | Mar. 15 to Jun. 1 | Sept. 1 to Nov. 15 |
| Deciduous (balled and burlapped) | Mar. 15 to Jun. 1 | Sept. 1 to Nov. 30 |
| Evergreens | Mar. 30 to Jun. 15 | Sept. 1 to Nov. 15 |
| Groundcover | Apr. 15 to Jun. 15 | Sept. 1 to Oct. 15 |
| Perennials | May 15 to Jun. 15 | Sept. 1 to Oct. 15 or first frost |
| Bulbs | N/A | Nov. 1 to Dec. 1 |
- E. Regardless of the specified planting season dates, suspend work when the temperature is below 25 degrees F, the wind velocity is over 25 mph, the ground or planting soil is frozen or wet, or the continuation of prevailing weather will damage plant materials, including sustained periods of above-normal high temperatures. Complete planting operations as early in the specified season as possible.
- F. Fall Dig Hazard: Many species of trees or shrubs are considered “Fall Transplanting Hazards” by the nursery trade. The Contractor shall identify Fall Transplanting Hazards from the plant schedule and factor the proper handling of these trees into the overall sequencing of construction and Project schedule. The Contractor shall notify the Engineer of any conflicts arising from this analysis of the plant list and schedule.
- G. Water: The Contractor shall bear the cost of supplying all water and shall reimburse applicable governing authorities for all water used for the project.
1. Water shall be tested for presence of chloramine. If levels are determined to exceed acceptable levels, provide an alternate source for water.

2. Water connections are available on site. Contractor shall install temporary water meter to measure water consumption. The Contractor shall immediately notify the Owner in writing if water is insufficient for work and maintenance operations.
3. Provide as needed water from sources free from impurities injurious to vegetation.
4. Provide all hoses and equipment as needed to distribute water to area of landscape work and areas needing watering. Provide water tank trucks as needed, at no additional cost, if water service is interrupted. Also refer to Division 1.
5. The Contractor shall employ conservative practices for all water use and shall instruct all of his/her installers to abide by this requirement.

H. Painting: Do not paint vegetation for any reason.

1.11 LINES AND GRADES:

- A. The Contractor shall provide his own lines and grades for the work required.
 1. The Contractor shall determine where the site benchmark is located and set all grade stakes in reference to this point.
- B. Grades: If present, protect and maintain grade stakes and location stakes until removal is acceptable to Engineer and all parties involved in this project. If grade stakes are not present, establish grade stakes to ensure that grades shown on the Drawings are being met.

1.12 ACCEPTANCE AND MAINTENANCE:

- A. Request for Acceptance: In writing, request Engineer's inspection for acceptance at least 10 days in advance of preferred inspection date. Do not request inspection for acceptance until work is 100% complete (not including maintenance) and in compliance with the Contract requirements.
 1. Final Acceptance is defined as the time at which 100% of the work has been performed and accepted by the Engineer (excluding post project maintenance) including any work noted on the "Punch List".
 2. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted, at the Owner's option, if the area to be inspected for acceptance is large, well defined, and easily described. The Owner and Engineer are not obligated to provide partial acceptance of the work.
- B. Lawn Maintenance: Provide complete maintenance and service as required to promote and maintain healthy growth including, without limitation, watering, fertilizing, weeding, mowing, trimming, rolling, regrading, fallen leaf removal, treating for insects and disease, and other operations and work. Mow lawn as required.

- C. Lawn Replacement: Replace defective lawn with new lawn of same species, character, and quality of originally accepted work. If a replacement is unacceptable during its one year warranty, the Contractor shall provide another replacement or, when approved by the Engineer, equivalent cash payment.
1. Replacement Planting Seasons: Planting for replacement and warranty work for lawns shall comply with the Planting Seasons specified herein.
- D. Vegetation and Landscape Maintenance: Begin maintenance immediately after planting. Provide complete maintenance and service as required to promote and maintain healthy growth including, without limitation, watering, and per the Owner's specifications, weeding, fallen leaf removal, treating for insects and disease, resetting plants to proper grade and upright position, and other operations and maintenance work. Throughout the maintenance period, restore planting saucers and mulch, and keep mulch beds weed free. Tighten and adjust guy wires, stakes, and deadmen to keep trees in vertical position. Restore and replace damaged trunk wrappings.
1. Maintenance Period: Completely maintain lawn, native vegetation areas, plants and trees for three (3) years from the date of Final Acceptance or project completion, whichever is later in time.
 2. Watering: Flood all plants during the construction and maintenance periods at least twice each week. If present and operational, coordinate programming of irrigation system to meet watering needs. If irrigation system is not operational, provide hand watering as needed to maintain healthy growth. At each watering, thoroughly saturate the soil around each tree and shrub. If sufficient moisture is retained in the soil as determined by the Owner, the required watering may be reduced. Trees will require a minimum of twenty gallons of water for each watering. Shrubs will require a minimum of ten gallons of water for each watering.
 - a. Winter Watering: Lack of adequate soil moisture is often a major cause of winter damage. All plants, but especially narrowleaf and broadleaf evergreens, use water during winter. Moisture must be available below the frost line or frozen soil.
 - 1) Plants should be watered thoroughly in the fall to prepare them for the winter months.
 - 2) During dry winters, broadleaf evergreens should be watered about once each month, ideally on a day with a high temperature above 35 degrees F.
 3. Application of insecticides and herbicides is expressly prohibited. Confer with Owner for methods of controlling insect infestation or disease.
 4. Contractor shall provide all maintenance and monitoring as defined by "minimum performance standards and maintenance activities" as included in "Application for Section 404 Nationwide Permit 27 Authorization – Flood Control Project on Midlothian Creek, Robbins, Cook County, Illinois." Contractor shall refer to Volume 3 Supplemental Information.
 5. Training of Village of Robbins Representative: Contractor shall arrange to provide training for selected Village of Robbins Representative. Training shall

include methods of installation as well as long-term maintenance requirements across a full growing season and shall be performed to the satisfaction of MWRDGC and the Village of Robbins. Upon completion of the training period, Contractor shall prepare a maintenance manual for the review and approval of the Engineer. Manual to include:

- a. Site plans denoting all seeding areas.
- b. Maintenance schedule denoting all regular maintenance activities performed by the Contractor during required Maintenance Period.
- c. Product / Supplier cutsheets and contact information for all necessary materials and supplies that will become the responsibility of the Village of Robbins.
- d. Detailed specifications denoting the number, timing, and frequency of the required maintenance activities for the project.

1.13 WARRANTY:

- A. Warranty: Provide written warranty agreeing to remove and replace work that exhibits defects in materials or workmanship for the specified periods. "Defects" is defined to include, but is not limited to, death, unsatisfactory growth, disease, insect infestation, abnormal foliage density, abnormal size, abnormal color, failure to thrive, and other unsatisfactory characteristics.
 1. Warranty Period for Plants: One (1) year from end of the last date of the maintenance period.
 2. Replacement: Replace defective work with new material of same species, size, character, and quality of originally accepted work. With each replacement material, provide a new one-year warranty for the replacement work. If a replacement is unacceptable during its one-year warranty, the Contractor shall provide another replacement or, when approved by Owner, equivalent cash payment.
 3. Replacement Planting Seasons: Replacement for plant warranty work shall comply with the Planting Seasons specified herein.
 4. Owner's Responsibilities and Warranty Exclusions: After completion of the Contractor's maintenance responsibilities, the Owner is responsible for maintaining the work in reasonable compliance with the Contractor's maintenance instructions. The Contractor's warranty shall exclude problems due to improper or inadequate maintenance or vandalism.
 - a. During the warranty period, the contractor shall visit the site at one-month intervals to review the conditions of the accepted work. The Contractor shall submit in writing to the Engineer and Owner his/ her concerns regarding the Owner's maintenance practices and/ or any vandalism. The content of this notice shall include a list of specific plants involved, the presumed problem, and a method of remedy for the problem(s) cited. The Owner shall make reasonable efforts to correct the problems cited by the Contractor, but the Owner shall not be held

- responsible for the Contractor's defects in materials or workmanship that result in decline or death to plants.
- b. Failure of the Contractor to make the required monthly review of the site during the warranty period and to submit written notice to the Owner and Engineer of maintenance defects shall negate the Contractor's ability to make a claim against the Owner for negligence of maintenance.

PART 2 - PRODUCTS

2.01 PLANTING SOIL MIXTURE AND AMENDMENTS

- A. See Section 32 91 13 – Planting Soils for topsoil / planting soil requirements. The Contractor shall strictly adhere to the soil specification composition for each section of the Work.
- B. Coordinate installation of soil and plants to meet the requirements of this Section and Section 32 91 13 – Planting Soils.

2.02 PLANT SOURCES

- A. The Contractor shall submit to the Engineer any questions regarding the source of any plant.
- B. Contract growing of some plants may be required. The Contractor shall identify plant species in need of contract growing within four weeks of beginning work.

2.03 DIGGING SEASON

- A. Plants shall be delivered freshly dug. Plants that have been pre-dug the previous season shall not be accepted. Pre-dug, above-ground / staged nursery materials are prohibited for this project without the written authorization of the Engineer.
 - 1. Spring Dig: Plants shall be dug as early as possible and as determined by the nursery owner, and no later than bud break.
 - a. Do not transport plants within 14 days after bud break.
 - 2. Fall Dig: Plants shall be dug following leaf senescence.
 - a. Fall Dig Hazard: Many species of trees or shrubs are considered "Fall Transplanting Hazards" by the nursery trade. Fall Transplanting Hazards are to be transplanted only during the spring digging season. The Contractor shall identify Fall Transplanting Hazards from the plant schedule and factor the proper handling of these trees into the overall sequencing of construction. The Contractor shall notify the Engineer of any conflicts arising from this analysis of the plant list. Fall Dig Hazards are listed on the Drawings.

2.04 SELECTION AND INSPECTION OF PLANTS

- A. The Engineer will review plant materials at the nursery source and/or at the Engineer's discretion, through photographs provided by the Contractor prior to selection. All plants brought to the site will have been reviewed in this manner. Plants that do not have the Engineer's approval shall be removed from the site.
1. Tagging: At least three weeks prior to the expected planting date, request, in writing, the Engineer's inspection of plant material at the nursery. Provide photographs beforehand if requested by the Engineer.
 - a. The Engineer will make his/her own travel arrangements to the nursery.
 - b. Seals placed on the selected plants at the nursery shall remain on the plants until Final Acceptance of the work.
 2. The Engineer's basis of plant selection will include:
 - a. Conformance with specified genus, species, variety, size, form, rootball and quality.
 - b. The visual characteristics of the plants.
 - c. Plant health.
 - d. Adherence of the nursery to cultural practices and maintenance procedures that are at or above industry standard.
 3. On-Site Inspection:
 - a. The Contractor shall permit the Engineer to inspect plants upon their arrival to the project site and at any time prior to planting. The Engineer will inspect the plant materials for size and condition of rootballs and/or root systems, insects, injuries, defoliation, wind burn and latent defects. The Contractor shall remove plant material that is unsatisfactory or defective and replace the plants at no additional cost to the Owner.
 - b. The Engineer may reject a specific nursery source and associated plants if he/she determines before, during or after receipt of plants, any of the following:
 - 1) The nursery stock does not meet health standards set forth herein, including disease and infestation.
 - 2) The nursery stock does not meet the requirements of the Engineer's basis of selection as stated herein.
 - 3) The nursery cannot supply the specified plant(s) or an acceptable substitute cultivar or species.
 - 4) Basal flares of tree not within specified location in rootball.
 - 5) The nursery stock does not meet the intended visual characteristics of the plants as determined by the Engineer.
 - 6) The nursery's cultural practices or maintenance procedures do not meet specified standards.
- B. Substitutions
1. In the event that the Contractor is unable to obtain the plant material specified, either because of unavailability or the failure of the plant material to meet the quality control requirements of this Section, the Contractor shall submit request

for substitution to the Engineer to provide substitute plants of equal size, quality, character, overall form, branching habit, color, time of bloom and value to the plant originally specified. The substitute plants shall conform to all requirements of this Section and must be approved by the Engineer. Contractor shall be required to make all efforts to include species as designated in the drawings and shall not assume that material can be substituted without cause.

2.05 PLANT MATERIALS:

- A. General: Furnish specimen nursery-grown plants of genus, species, and cultivar specified complying with ANSI Z60.1, with healthy root systems well provided with fibrous roots developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. All parts of the plant shall be moist and show active green cambium when cut. Plants will be densely foliated when in leaf.
- B. Grade: Provide plants of specified height, caliper, sizes and grades complying with ANSI Z60.1 for type of plants required.
 - 1. Larger Stock: Plants larger than required may be used if approved by Engineer, if root ball is proportionately larger, and if there is no change in Contract Price.
 - 2. Undersize Stock: If approved by the Engineer, plants may be undersized as long as not more than 10% of plants smaller than required are used. If more than 10% undersized plants are used, then an additional 25% of the undersized plants shall be provided at no additional expense to the Owner.
- C. Hardiness: Provide plant stock certified to have been grown within hardiness Zones 2 through 6 as established by the Arnold Arboretum, Jamaica Plain, Massachusetts. Plants without this certification will be rejected.
- D. Plant Character: All plants, except custom grown plants as shown on the Drawings, shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Form and size shall comply with ANSI Z60.1.
 - 1. Deciduous Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated.
 - a. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1.
 - 2. Deciduous Shrubs: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
 - 3. Evergreen Trees and Shrubs: Well-balanced evergreen plants, of type, height, spread, and shape required, complying with ANSI Z60.1.

4. Broadleaf Evergreens: Well-balanced broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
 5. Groundcover and Vines: Provide groundcover and vines of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.
 6. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.
 7. Bulbs: Bulbs shall be Top Size for species specified as defined by ANSI Z60.1, firm of flesh, free from decay and disease. Bulbs shall be certified as being grown for the season in which they will be installed.
- E. Trunk: The height of the trees (measured from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated. The trunk of each tree shall be a single trunk growing from a single un-mutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire or other causes. No pruning wounds shall be present having a diameter exceeding one inch and such wounds must show vigorous bark on all edges. Plants shall not be pruned prior to delivery. No trees with double-leaders or twin-heads shall be acceptable. The Contractor shall reject such plants at time of delivery by the nursery/supplier unless such plants were selected by the Engineer as indicated by tags and seals.
- F. Rootballs:
1. General:
 - a. The diameter and depth of rootballs shall be sufficient to encompass the fibrous and root feeding system necessary for the healthy development of the plant in accordance with ANSI Z60.1., or the minimum rootball diameter shown, whichever is larger.
 - 1) If the root flare is buried 2" or more, provide a larger diameter or greater depth rootball to compensate for the buried root flare, as the soil overburden shall be removed prior to planting, which effectively reduces the size of the rootball.
 - b. No plant will be accepted when the ball of earth surrounding its roots has been cracked or broken prior to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The rootballs shall remain intact during all operations.
 - c. Girdled Roots: Inspect root crown for girdling roots. Inspection for girdled roots shall be done at the nursery to the extent possible. If girdled roots are not visible at the nursery and are revealed before acceptance, any plant with a girdled root over 1/2" shall be rejected.
- G. Balled and Burlapped: All plants to be moved balled and burlapped shall be moved with the root systems as solid units with balls of earth firmly wrapped with burlap, firmly

held in place by a stout cord and drum lacing, or wire basket. Burlap for containing rootballs shall be untreated, made from biodegradable natural fibers.

- H. Container Stock: Container stock shall have a full container of well-developed root system. Plants loose in the container are not acceptable. The surface of the root zone shall be free of circling or kinked roots. Staked plants must be self-supporting when unfastened from the stake. When removed from the container, the root ball shall be free from numerous circling roots. Large, matted roots at the sides or bottom of the container will not be accepted. Container grown plants may be accepted for balled and burlapped material if approved by Engineer.
- I. Handling of Plants: Plants delivered by truck and plants requiring storage on site shall be properly wrapped and covered to prevent wind-drying and desiccation of branches, leaves and buds; plant balls should be firmly bound, unbroken, reasonably moist to indicate watering prior to delivery and during storage, tree trunks shall be free from fresh scars and damage in handling and all bare root material shall be heeled in if not planted within 10 hours of delivery to site. All seed mixes shall be stored in a cool, dry location.

2.06 MULCHES:

- A. Well-Rotted Leaf Mulch: Provide partially decomposed minimum six month aged finely shredded leaf mulch with dark brown color and free of weeds, excessive fine particles, stringy material, and chunks of wood thicker than 1/4". Provide leaf mulch as approved by Engineer.

2.07 STAKING AND GUYING MATERIALS

- A. Stakes: Provide 2" diameter un-peeled cedar stakes for all balled and burlapped trees, 3 per tree. Tie shall be "ArborTie."
 - 1. ArborTie Manufacturers:
 - a. DeepRoot Green Infrastructure, 5030 Washington Street, San Fransisco, CA, Tel: 800.458.7668, www.deeproot.com
 - b. Forestry Suppliers Inc., www.forestry-suppliers.com
 - c. Gempler's, www.gemplers.com
 - d. Or approved equal.
 - 2. Tree Protective Collar: Nylon of color indicated and approved by Engineer.

2.08 PLANT ANCHORING SYSTEM:

- A. Rootball anchoring system shall be as manufactured by Platipus Anchors, Inc., 2008 Garner Station Boulevard, Raleigh, NC 27603, Tel: 866.752.8478, or approved equal. System shall be Platipus rootball fixing system, including Plati-Mat, Model # RF2RP.

1. Work with manufacturer to confirm the correct size of anchoring system for specified trees.

2.09 TEMPORARY EROSION CONTROL MATERIALS

- A. Refer to Section 31 25 00 – Erosion Control.

2.10 ANTI-DESSICCANT:

- A. Provide emulsion type, film forming agent designed to permit vapor transmission but retard excessive moisture loss. Provide “Vapor Guard” or Engineer’s approved equivalent.
 1. Use anti-desiccant only with the approval of the Engineer.

2.11 MISCELLANEOUS MATERIALS:

- A. Plywood: Provide 3/4” Grade C or better plywood for use as planking when driving vehicles or equipment over lawns or areas to be planted. The driving of vehicles over planted areas is expressly prohibited.
- B. GEOCOIR /DeKoWe 400 and 700: Provide coir blankets for erosion control on all slopes 3:1 or greater except where closely planted shrubs prohibit use.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

3.02 PREPARATION:

- A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and notify Engineer in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil mixtures until all work in adjacent areas is complete and accepted by the Engineer.

- B. Concealed Conditions: Notify Engineer before planting when below grade or on-structure conditions detrimental to proper plant growth are encountered. Do not proceed with planting without specific written instructions from the Engineer. At the Engineer's direction and at no additional expense to the Owner, plants shall be relocated to avoid the obstruction.
- C. Deliver materials and plants only after preparations for planting have been completed and accepted, including but not limited to: planting soil system, irrigation (minimum: Mainline), rough grading, utilities, decompaction or remediation of soils. The Engineer will determine when the site is acceptable for planting.
- D. Layout and Approval: Layout and stake individual trees and obtain Engineer's approval before starting installation. After staking is accepted, set plants in place for final review and acceptance by the Engineer. Contractor shall not stake plant locations for Engineers approval until proper subgrade, drainage, and subsoil layers are installed as described in Sections 32 91 13. Make revisions and adjustments as directed by Engineer.
- E. Planting Soil Preparation: Refer to Section 32 91 13 – Planting Soils.

3.03 PLACEMENT OF PLANTING SOIL MIXTURE:

- A. Placement of Planting Soil: Refer to Section 32 91 13 – Planting Soils.

3.04 HANDLING OF PLANTS

- A. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape.
- B. Provide a double tarp protective covering over exterior plants during transport.
- C. Do not drop exterior plants during delivery.
- D. Do not loosen drum-lacing nor remove container-grown stock from containers before time of planting.
- E. Do not move trees if rootballs are saturated.
- F. Handle planting stock by supporting the rootball or container.
- G. Smooth planting areas after planting to provide even finish grade. If plant is to reside below normal water level, secure the plant to the benthic mesh and surrounding soil with two angled 6-inch staples per details. Dress all other plantings with Contractor provided mulch per the planting details.

3.05 TEMPORARY STORAGE OF PLANTS

A. Storage – General

1. For plants stored on or off-site for more than 24 hours, the Contractor shall keep a log that records dates of watering.
2. The Contractor shall fully inspect and maintain plants for the entire duration of the storage period.
3. All stored plants shall remain the property of the Contractor and shall be replaced in kind to meet the standards defined herein for healthy plants and the character and habit defined herein. The Engineer shall be the sole evaluator of whether replacement plants match the originally stored plants.
4. No plant shall be stored more than four weeks without written acceptance by the Engineer.

B. Storage of plants less than one week:

1. If planting is delayed more than six hours after delivery of plants to the site, the Contractor shall adhere to the following practices:
 - a. Set plants in shade, protect from weather and mechanical damage, and keep roots moist.
 - b. Store plants upright with room between rootballs.
 - c. Closely monitor plants for sufficient root moisture.
 - d. Store all plant materials in a secure and clean location, free from conditions that would be harmful and/or deleterious to the immediate or long-term health of the trees.

C. Storage of plants more than one week:

1. The Contractor shall store plants at a location mutually agreed upon by the Contractor and Engineer.
2. Space plants sufficiently apart to prevent damage or death to branches and leaves. During all seasons, set balled stock upright and plumb on firm ground and cover the ball with fully aged and decomposed wood mulch or other material acceptable to the Engineer
3. During the growing season, stored plant material shall be watered and the rootballs kept moist with an automatic drip irrigation system to prevent drying out. Mist plants several times a day as necessary to reduce transpiration in sunny or windy locations.
4. During the dormant season, rootballs shall be insulated against freezing and cold weather damage. Plants shall be protected from wind and ice damage.
5. During the storage period, inspect all plants for pests and diseases and, if found, have them evaluated by an arborist certified in the state where the project is located.
 - a. Before proceeding, report on the presence of any diseases or pests.
 - b. Before proceeding, report on issues and recommended treatment to the Engineer for review and approval.

- c. Whenever possible, select and use organic treatments.
- d. Isolate trees with diseases or pests and remove and replace if the Engineer determines that the plants are unusable.

3.06 PLANT LAYOUT

- A. Horizontal Layout: The plant locations shown on the Drawings are approximate. The Contractor shall layout the final location of individual plants by stake or flag and obtain the Engineer's approval of locations before starting installation. After staking is accepted, set plants in place for final review and acceptance by the Engineer. The Contractor shall make revisions and adjustments as directed by the Engineer.
 1. Contractor shall not stake plant locations until proper subgrade, drainage, and subsoil layers are installed.
 2. Indicate the species and size of plant on the stake or flag.
 3. Contractor shall verify the locations of all underground utilities before staking plant locations.
 4. Contractor shall make adjustments as determined by the Engineer without additional cost to the Owner.
- B. Vertical Layout: Set the elevation of trees through the use of string lines or by instrumentation. Demonstrate to the Engineer through the use of stakes and string that trees have been set at the correct elevation prior to completing planting and installing topsoil, if requested.

3.07 PLANTING WOODY PLANTS

- A. General
 1. Sequence of Planting: Plant trees and shrubs after the subgrade has been accepted and concurrently with the horticultural subsoil planting soil layer unless otherwise approved by the Engineer. Complete landscaping work as quickly as possible on portions of the site as they become available for landscaping.
 2. If plants are installed in planting pits, scarify sides of pits before placing trees.
 3. Grade stakes: If present, protect and maintain grade stakes and location stakes until removal is acceptable to the Engineer and all parties involved in this project. If grade stakes are not present, establish grade stakes to ensure that grades shown on the Drawings are being met.
 4. Painting: Do not paint vegetation for any reason.
- B. Rootball and Rootflare
 1. Rootball Pedestals: Provide a rootball pedestal composed of subgrade fill immediately beneath the ball or root mass. Pedestal shall provide the relationship to finish grade described below and prevent settlement of the plant. Compact pedestal to 95% Standard Proctor. See also Section 32 91 13.

2. Identifying and Exposing the Root Flare: Prior to setting the height of the rootball pedestal, the Contractor shall remove burlap and twine from the top of the rootball and inspect each plant to determine if the trunk flare is buried within the rootball. If buried, the Contractor shall expose the trunk flare by removing excess fill on top of rootball, taking care not to damage the bark or roots while removing the soil overburden. Adventitious roots and girdling roots shall be removed with sharp pruners. Adjust the rootball pedestal to position the trunk flare 2"-3" higher than the proposed finished grade.
 3. Wire Baskets: Once set, completely remove wire basket. Cleanly cut each tier of horizontal wires making one cut centered between each set of vertical wires.
 - a. Burlap: Completely remove top one-third of burlap.
 - b. Drum lacing and Burlap: Once set, remove top one-third of lacing and burlap.
 4. Containerized plants: Completely remove container. Cut out container with a sharp blade if container does not readily separate from the rootball.
 5. Scarification of Balled and Burlapped Plants: The Engineer will examine the exposed rootball and determine if the Contractor shall scarify the sides of the rootball. Scarification shall result in no additional expense to the Owner.
 6. Scarification of Containerized Plants: The Contractor shall scarify the rootballs of container plants with a sharp blade 2" in length. Rest the plant on its side and scarify an 'X' on the bottom of the root mass. Then make vertical cuts that are the full height of the rootball every 3" o.c of the full circumference.
 7. Rootballs shall be kept in a moist, but not wet, condition. Protect rootballs from damage due to sun and wind. Contractor shall strictly limit the time between exposing the rootball and backfilling. Protect exposed rootballs with burlap or other shading device until backfilled.
- C. Placement of Topsoil / Planting Soil at Woody Plants: Place topsoil / planting soil to levels shown on Drawings and described in Section 32 91 13 – Planting Soils.
1. Maintain at all times during the planting operations at least one stockpile of each approved type of soil.
 2. Planting soil shall be in full contact with the rootball, with no voids or air pockets. Where burlap is present, burlap shall be tightly pressed between backfill and rootball. Folded or bunched burlap will create an obstruction to backfill and rootball contact and shall be removed.
 3. Backfilling of Tree Pits: Backfill with topsoil / planting soil in 6" layers. Handtamp each layer to eliminate voids and air pockets before placing subsequent layers. Continue until backfill has reached finish grade shown on the Drawings.
 4. Watering Dish and Mulch: Construct a watering dish as shown to promote water infiltration into the root zone. Hand tamp edges of watering dish to be firm and withstand hose pressure. Cover watering dish with mulch, leaving a 4" gap between mulch and the trunk.

D. Watering:

1. Flood all plants with water twice within the first 24 hours after planting. Take care to avoid saturating adjacent soils where planting operations are ongoing. Monitor water pressure. Displacement of soil materials including watering dish by watering shall not be acceptable.
2. Flood all plants during the construction and maintenance periods at least twice each week. If present and operational, coordinate programming of irrigation system to meet watering needs. If irrigation system is not operational, provide hand watering as needed to maintain healthy growth. At each watering, thoroughly saturate the soil around each tree and shrub. If sufficient moisture is retained in the soil as determined by the Engineer, the required watering may be reduced. Trees will require a minimum of twenty gallons of water for each watering. Shrubs will require a minimum of ten gallons of water for each watering.
 - a. Winter Watering: Lack of adequate soil moisture is often a major cause of winter damage. All plants, but especially narrowleaf and broadleaf evergreens, use water during winter. Moisture must be available below the frost line or frozen soil.
 - b. Plants should be watered thoroughly in the fall to prepare them for the winter months.
 - c. During dry winters, broadleaf evergreens should be watered about once each month. Watering shall occur on days with a high temperature above 35 degrees F.
3. All planted zones shall be kept inundated one foot below normal water level during the first year of establishment.

E. Plant Anchoring System: Install tree stakes immediately after planting to maintain trunk plumb.

3.08 PLANTING POTTED HERBACEOUS PLANTS

- A. The Contractor shall scarify the rootballs of container plants. Using a sharp knife, make vertical cuts the full height of the rootball at a depth of 2" and every 3" o.c.

3.09 PLANTING HERBACEOUS PLUGS

A. Individual Plant Pit Excavation

1. Plant holes located in areas covered with benthic mesh shall first cleanly remove a 6-inch diameter area of benthic mesh with a 6-inch hole saw attached to a drill and operated in a counter-clockwise (reverse) direction.
2. Methods to dig plant holes located in areas with erosion blanket should be reviewed with the Engineer prior to work to ensure digging methods as will not damage the surrounding blanket. It is recommended that the holes are dug first.

3. The Contractor must remove all cut outs from the work area prior to digging.
 4. Plant holes shall be dug only by methods pre-approved by the Engineer. For herbaceous plant plug planting, an auger drill, dibble bars, or shovels shall be used. Only prepare plant pits for materials to be installed before the end of each workday.
 5. If obstructions are encountered that are not indicated, do not proceed with planting operations until alternative plant locations have been selected and approved in writing by the Engineer. Excavate holes at least twice as large in diameter as the size of ball or container. Depth of planting pits should be slightly less than the root ball depth so that herbaceous crowns at grade. Do not over excavate the planting pits. If over digging happens as an exception, add and compact planting soil in the bottom of the hole to depth necessary to set the plant such that it will not settle.
 6. Excavated material that is not suitable planting soil will not be used for backfill in any planting hole and shall be removed.
- B. Install the plug so the stem base is at or slightly above finish grade. Plant plugs fully into planting soil, not mulch.
 - C. Install plugs to their full depth. A “J-Root” plug installation shall not be acceptable.
 - D. Tamp each plug into place so that it is firmly seated in the soil, with no air pockets.
 - E. Place crossing sod staples as indicated in the Drawings.

3.10 SOIL DIAGNOSTICS DURING THE MAINTENANCE PERIOD

- A. If plants exhibit unsatisfactory growth during the maintenance period, perform soil testing for chemical properties, compaction and infiltration rates. See Section 32 91 13 – Planting Soils for testing definitions. Adhere to Engineer’s recommend remediation. Remediation may include, but are not limited to, soil amendments, Liquid Biological Amendment treatments, or soil decompaction.

3.11 PLACEMENT OF MISCELLANEOUS MATERIALS:

- A. Fertilizer: Apply organic fertilizer as required by soil analysis and approved by Engineer. Refer to Section 32 91 13 – Planting Soils.

3.12 FINE GRADING:

- A. Prior to fine grading, Contractor shall verify that the rough grading, under drainage system, planting soil mixes and irrigation system have been accepted.

- B. Fine Grading: Set sufficient grade stakes for checking the finished grades. Stakes must be set at the bottom and top of slopes and the centers of plant beds. Grades shall be established which are accurate to 1/10th of a foot either way. Connect contours and spot elevations with an even slope. All grading will insure drainage away from structures.
1. After topsoil mix has been spread, it shall be carefully prepared by scarifying and hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter, and stones over one inch in diameter shall be removed from the topsoil. Topsoil shall also be free of smaller stones in excessive quantities as determined by the Engineer. See also Section 32 91 13 – Planting Soils.
 2. Fine grade planted areas to smooth, free draining, even surfaces with fine texture. Roll, rake and drag areas to flatten ridges and fill depressions, except as select areas shown on drawings. Control moisture content to maintain optimum conditions, but do not create a muddy condition.
 3. Lawn Rolling - Typical: Roll the entire lawn area with a hand roller weighing not more than 100 pounds per foot of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional topsoil and the surface shall be regraded and rolled until presenting a smooth and even finish to the required grade or to the shapes and configurations as shown on the details.
 4. Maintenance and Restoration: Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to lawn planting.

3.13 TRAFFIC ACCESS:

- A. The Contractor is strictly prohibited from tracking or driving over newly planted areas.
- B. Restore areas disturbed by planting to achieve full healthy growth as approved by Engineer. Vehicular traffic routes must conform to pre-approved routing of construction operations.

3.14 TEMPORARY EROSION CONTROL

- A. Refer to Section 31 25 00 – Erosion Control.
- B. The construction of the site will initiate with the installation of measures sufficient to control sediment deposits and erosion. All sediment control measures will be maintained until all upstream ground within the construction area has been completely stabilized with permanent vegetation and all walks have been paved.
- C. The Contractor shall remove accumulated sediments when they reach half the capacity of the erosion control devices. Sediment/erosion control devices must be checked after each storm event.

- D. The Contractor is responsible for cleaning any and all sediment leaving the site. The Contractor shall be responsible for repairing all damages caused by the accumulation of sediment.
- E. Failure to install, operate, or maintain all erosion control measures will result in the cessation of all construction until such measures are corrected to the local jurisdiction or city standards.

3.15 CLEANING, PROTECTION AND EXCESS MATERIALS:

- A. Clean pavements and keep work areas clean and neat during landscape work. Remove all debris from site.
- B. Provide temporary protection, as specified and as needed to protect drainage system, restrict traffic, to permit growth to develop, to protect completed work, and to ensure work is without damage or deterioration at time of final acceptance. Remove and replace damaged landscape work prior to acceptance.
 - 1. Protection of Drainage System: Protect existing drainage protection system at all drain inlets to prevent silt, materials or debris caused by planting operations from entering the drainage system. If drainage protection system is not present, establish strawbales, siltation fencing or other devices as required by other Sections.
 - 2. Excess Topsoil / Planting Soil and Materials: remove the excess topsoil / planting soil and materials from the site at no additional cost to the Owner. Coordinate with work in Section 32 91 13 – Planting Soils.
- C. Tags: Remove all identification labels, seals, and tags at final acceptance of the project.

END OF SECTION

SECTION 32 96 00

TRANSPLANTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.
- B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
 - 1. Transplanting non-nursery-grown trees by hand-digging, tree spade, or digging and boxing.
 - 2. Backfill of tree pits for transplanted trees.
 - 3. Maintenance and after-care for transplanted trees and stored trees.

1.3 RELATED SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 01 56 39 – Temporary Tree Protection
 - 2. Section 02 41 13 – Site Demolition
 - 3. Section 31 20 00 – Earthwork
 - 4. Section 31 25 00 – Erosion Control
 - 5. Section 32 91 13 – Planting Soils
 - 6. Section 32 92 00 – Turf and Grasses
 - 7. Section 32 92 00 – Seeding
 - 8. Section 32 93 00 – Planting and Fine Grading

1.4 REFERENCES:

- A. The following related items are included herein and shall mean:
 - 1. ANLA: American Nursery & Landscape Association.
 - 2. ANSI: American National Standards Institute.
 - 3. AOAC: Association of Official Agricultural Chemists.

4. ASTM: American Society of Testing Materials.

1.5 STANDARDS

- A. The references listed herein shall be the standards used for performance of the Work: All standards shall include the latest and current additions and amendments.
 1. American National Standards for Tree Care Operations, ANSI A300. American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.
 2. American Standard for Nursery Stock, ANSI Z60.1. American Nursery and Landscape Association, 1250 Eye Street. NW, Suite 500, Washington, D.C. 20005.
 3. Horticultural Standards, American Nursery & Landscape Association.
 4. Hortus Third, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.
 5. Standardized Plant Names, American Joint Committee on Horticultural Nomenclature, 1942 edition.
 6. American Society for Testing Material (ASTM).
 7. International Society of Arboriculture.
 8. Flora of the Chicago Region, A Floristic and Ecological Synthesis, Wilhelm & Rericha, 2017 edition.

1.6 DEFINITIONS

- A. The following related items are included herein and shall mean:
 1. AAN: American Association of Nurserymen.
 2. ASTM: American Society of Testing Materials.
- B. Caliper: The caliper of existing trees shall be measured before transplant and/or removal at a height of 6 inches above the ground line if the resulting measurement is no more than 4 inches. If the resulting measurement is more than 4 inches, the measurement is made at a point 12 inches above the ground line of the planter bed and/or landscaped area where the tree is located.
- C. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping to be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

- A. Bare Root Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Planting Soil for Soil Profiles: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil. See Section 32 91 13 – Planting Soils.
- G. Topsoil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments. See Section 32 91 13 – Planting Soils.
- H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing topsoil / planting soil. See Section 32 91 13 – Planting Soils.
- I. Final Acceptance: Date at which all Work, including work identified in the “Punch List”, is completed and accepted by the Engineer. After all Punch List work has been completed and accepted, the Contractor shall request in writing for the Engineer to perform a final inspection for the purpose of Final Acceptance of the work. The Engineer shall not give Final Acceptance until all Punch List work has been accepted. The maintenance and warranty periods shall not commence until Final Acceptance is granted by the Engineer.

1.7 SUBMITTALS

- A. Submittals shall conform to Division 01 requirements.
- B. Product Data: Provide manufacturer's data for each type of product indicated showing installation and limitations in use.
- B. Product Certificates: For each type of product, signed by product manufacturer, and complying with the following. Submit inspection certificates required by authorities having jurisdiction. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.
- C. Qualification Data: For Tree Service Firm, Landscape Installers, Project Manager, Site Superintendent/Foreman, a certified Arborist, showing years of experience, certifications and licenses, education, projects worked on of a similar size, scale and complexity. For each project list client, type of project, cost of project, duration and role of personnel.

1. Provide a minimum of three project references (name, title, company, phone number and email address) for the Project Manager and Site Superintendent/Foreman. For every project provide at least one Landscape Architectural reference.
- D. Certification: From a certified arborist, certifying that transplanted trees have been protected during construction and that trees were promptly and properly treated and repaired when damaged.
- E. Maintenance Recommendations: From a certified arborist, recommended procedures to be established by the MWRD for care and protection of trees after completing the Work.
1. Submit before completing the Work.
- F. Existing Conditions: Documentation of existing trees indicated to be transplanted, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
1. Use sufficiently detailed color photographs or video recordings. Color shall accurately depict the existing condition of foliage and bark.
 2. Include drawings and notations as necessary to indicate specific wounds and damage conditions of each tree designated to be transplanted.
- G. Tree-Transplanting Program or Schedule: Submit before work begins.
- H. Sample Warranties: For special warranties.
- I. Tree-maintenance and storage reports (if applicable).
- J. Samples and Submittals for Verification:
1. Weed-control barriers.
 2. Proprietary Root-Ball-Stabilization Device: One unit.
 3. Slow-Release Watering Device: One unit of each size required.
- K. Pruning Schedule: Written schedule prepared by a certified arborist detailing scope and extent of pruning each tree in preparation for and subsequent to transplanting.
1. Species and size of plant.
 2. Location on site plan. Include identifier for each.
 3. Reason for pruning.
 4. Seasonal limitations on pruning.
 5. Preparatory Pruning: Time schedule and description of preparatory pruning to be performed.
 - (a) Indicate time in months preceding the extraction of the tree.

- (b) Indicate diameter of root ball and depth of root pruning for each tree.
- 6. Description of root and crown pruning during and subsequent to transplanting.
- 7. Description of maintenance following pruning.
- L. Delivery and Storage: Prior to construction the Contractor shall submit for the Engineer's review and approval a plan showing proposed schedule for transplanting activities in coordination with the requirements for similar landscape planting activities contained elsewhere in the contract documents. Refer to Section 32 93 00 - Planting Fine Grading.

1.8 QUALITY ASSURANCE

- A. Tree Transplanter Qualifications: Engage an experienced Installer who has completed transplanting work similar in material, design, and extent to that indicated for this Project and with a minimum of ten (10) years experience and demonstrated record of successful transplanting of mature trees and landscape establishment.
 - 1. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on the Project site during times that tree transplanting operations are in progress.
- B. Tree-Service Firm Qualifications: An experienced Landscaping Contractor or tree-moving firm that has successfully completed transplanting work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
 - 1. Arborist Qualifications: A certified arborist with a minimum of five (5) years experience.
 - 2. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs and Other Woody Plant Materials – Standard Practices," and the "Standards of Shade Trees", current edition, as published by National Arborist Association, The Meeting Place Mall, Route 101, P.O. Box 1494, Amherst, NH 03031-1094.
- C. Tree-Transplanting Program: Prepare a written plan under the review and direction of a certified arborist for transplanting trees for the whole Project, including each phase or process, tree maintenance, and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of the transplanting work.
 - 1. Include transplanting times appropriate for each species at the Project location unless otherwise indicated on Drawings or directed by arborist.
 - 2. Include a transplanting schedule for each species to be transplanted, coordinated with the Project schedule.

3. Include site plans clearly marked to show tree-moving routes from extraction to planting locations. Indicate proposed equipment, weight and turning radii.
4. Show details of temporary protective barriers where needed.
5. Include diagrams showing clearances to utility lines and other encumbrances along route.
6. Include care and maintenance provisions and eventual removal of tree stabilization.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle packaged materials in strict compliance with manufacturer’s instructions and recommendations. Plants shall be closely monitored for sufficient root moisture. Protect all materials from damage, injury, and theft.
- B. Protect bark, branches and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees in such a manner as to destroy their natural shape.
- C. Completely cover foliate when transporting trees while they are in foliage.
- D. Handle trees by root ball. Do not drop trees.
- E. Move trees after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after moving, set trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist. Any stockpiling or temporary storage arrangements are to be coordinated with the requirements included elsewhere in the contract documents. Refer to Section 32 93 00.

1.10 FIELD CONDITIONS

- A. Field Measurements:
Seasonal Restrictions: work only within seasonal limitations for proper planting noted below. The Contractor shall, however, take into consideration seasonal weather conditions that would affect the planting period and shall not proceed if planting in these conditions would affect the short and/or long-term health of the plants:

Item	Spring Season	Fall Season
Deciduous (balled and burlapped)	Mar. 15 to Jun. 1	Sept. 1 to Nov. 30
Evergreens	Mar. 30 to Jun. 15	Sept. 1 to Nov. 15

- B. Weather Limitations: Proceed with transplanting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Do not transplant during excessively wet or

frozen conditions. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

- C. Coordination with Turf Areas (Lawns): Perform transplanting before planting turf areas unless otherwise indicated.
 - 1. When transplanting after planting turf areas, protect turf areas, and promptly repair damage caused by transplanting operations.
- D. Coordination with Planting Beds: Perform transplanting before planting bedded areas unless otherwise indicated.
 - 1. When transplanting after planting bedded areas, protect bedding plants, and promptly repair damage caused by transplanting operations.

1.11 WARRANTY

- A. Installer's Special Warranty: Tree-service firm agrees to repair or replace trees and related materials that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - (a) Death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, or incidents that are beyond Contractor's control.
 - (b) Structural failures including trees falling or blowing over.
 - (c) Faulty performance of materials and devices related to tree plantings including tree stabilization and watering devices.
 - 2. Warranty Periods for Transplanted Trees: One (1) year from end of the last date of the maintenance period. All warranty obligations are to be coordinated with the warranty requirements contained in Section 32 93 00.
 - 3. Include the following remedial actions as a minimum:
 - (a) Remove dead trees with unsatisfactory growth at end of warranty period; replace when directed.
 - (b) A limit of one replacement of each tree will be required except for losses or replacements due to failure to comply with requirements.
 - (c) Replace materials and devices related to tree plantings.
 - (d) Provide a new warranty for all replacement materials of a period equal to original warranty period that is to commence upon completion of the tree replacement activities.

1.12 ACCEPTANCE AND MAINTENANCE

- A. Refer to Section 32 93 00 – Planting Fine Grading.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Transplanted trees shall be healthy and resume vigorous growth within one year of transplanting without dieback due to defective extracting, handling, planting, maintenance, or other defects in the Work.

2.2 PLANTING MATERIALS

- A. Backfill Soil: Excavated soil mixed with planting soil of suitable moisture content and granular texture for placing and compacting in planting pit around tree, and free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
 - 1. Mixture: Well-blended mix of two parts excavated soil to one part planting soil.
 - 2. Planting Soil: Planting soil as specified in Section 32 91 13 - Planting Soils.

2.3 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:
 - 1. Tree Stakes and Guys:
 - (a) Provide tree staking components, connections, and adjustable tie systems to secure each new planting by tree trunk; sized as indicated and according to manufacturer's written instructions.
 - 2. Flexible Ties: Wide rubber or elastic bands or straps.
 - 3. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two strand, twisted, 0.106 inch in diameter.
 - 4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
 - 5. Guy Cable: Five-strand, 3/16-inch-diameter, galvanized-steel cable, fitted with zinc-coated 3/8-inch galvanized eyebolts at ends.
 - 6. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
 - 7. Plywood: Provide 3/4" Grade C or better plywood for use as planking when moving equipment over areas to be planted or existing lawns. The driving of vehicles over existing or proposed planted areas is expressly prohibited.

2.4 WATERING DEVICES

- A. Watering Pipe: PVC pipe 4 inches in diameter, site-cut to length as required, and with snug-fitting removable cap.

- B. Slow-Release Watering Device: Standard product for drip-irrigation of plants and emptying its water contents over a period of 2 to 9 hours; manufactured from UV-light stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

2.5 MISCELLANEOUS PRODUCTS

- A. Well-Rotted Leaf Mulch: Refer to Section 32 93 00 – Planting Fine Grading.
- B. Pruning Alcohol: A commercial ethyl alcohol or “Ethanol” 70-95%.
- C. Anti-desiccant:
 - 1. “Wilt-Pruf NCF” anti-desiccant as manufactured by Wilt-Pruf Products, Inc., P.O. Box 4280, Greenwich, CT 06830-0280;
 - 2. “Cloud Cover” as manufactured by Easy Gardener, P.O. Box 21025, Waco, TX 76702-1025;
 - 3. “Transfilm” as manufactured by PBI/ Gordon Corporation. 1217 West 12th Street, Kansas City, MO 6410
 - 4. Or approved equal conforming to the following:
 - (a) 100% organic and biodegradable, and not damaged by freezing.
 - (b) Use anti-desiccant only with the approval of the Engineer.
- D. Burlap: Refer to Section 32 93 00 – Planting Fine Grading.
- E. Weed-Control Barriers: Refer to Section 32 93 00 – Planting Fine Grading.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The installer shall examine existing conditions prior to bid, previous work completed by other trades prior to commencement of related work activities denoted herein, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.
- B. Verify locations of all underground utilities in the areas of intended transplanting and storage, as specified in this Section.
- C. Erosion and Sedimentation Control: Examine the site to verify what temporary erosion and sedimentation control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter across transplanting areas.

- D. For the record, prepare written report, endorsed by a certified arborist, listing conditions detrimental to transplanting work and tree protection and health.
- E. Proceed with transplanting only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, other facilities, turf areas, and other plants and planting areas from damage by transplanting operations.
- B. Locate and clearly identify trees for transplanting. Tie a 1-inch blue-vinyl tape around each tree at 54 inches above the ground and obtain Engineer's written confirmation of trees that are to be transplanted.
- C. Lay out individual transplant locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Engineer's acceptance of layout before transplanting. Make minor adjustments as required.
- D. Apply anti-desiccant to trees uniformly, using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during extracting, handling, and transportation.
 - 1. If deciduous trees are moved in full leaf, spray antidesiccant before extracting and again two weeks after transplanting.
- E. Trees shall be thoroughly watered within 24-48 hours prior to transplanting.
- F. Wrap trees with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during extracting, handling, and transporting.

3.3 PREPARATORY PRUNING

- A. Root Pruning: perform preparatory root pruning under the direction of arborist as far in advance of extracting each tree as the Project Schedule allows.
 - 1. Dig exploratory pits or trench with air spade around perimeter of tree at indicated root-ball width to determine locations of main lateral roots.
 - 2. Dig trench with tree spade around perimeter of tree at indicated root-ball width to the depth of the root system. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 3. Root-Ball Width: Minimum 9 inches of root-ball diameter, or at least dimension for non-round root balls, for each inch of tree caliper being transplanted.
 - 4. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking.

5. Use narrow-tine spading forks to comb soil to expose roots with minimal damage to root system.
 6. Cut exposed roots manually with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 7. Do not paint or apply sealants on cut root ends.
 8. Backfill trench with excavated soil.
- B. Crown Pruning (Tip Pruning):
1. Do not perform preparatory crown pruning (tip pruning).
 2. Perform preparatory crown pruning under direction of arborist. Follow procedures as specified in "Crown Pruning" Article of this Section.

3.4 EXCAVATION AND PLANTING EQUIPMENT

- A. Tree Spade: Track-mounted mechanized tree mover; sized according to manufacturer's size recommendations for each tree being transplanted.

3.5 EXCAVATING PLANTING PITS

- A. General: Excavate under supervision of the arborist.
1. Excavate planting pits or trenches with sides sloping. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil. Scarify sides of planting pit smeared or smoothed during excavation.
 2. Excavated approximately two times as wide as root ball.
 3. Keep excavations covered or otherwise protected until replanting trees.
- B. Subsoil and topsoil removed from excavations may not be used as planting soil except as denoted herein.
- C. Obstructions: Notify Engineer if unexpected rock or obstructions detrimental to trees are encountered in excavations.
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Seepage: Notify Engineer if subsoil conditions evidence unexpected water seepage into tree planting pits.
- E. Drainage: Fill planting pit or trench with 6 inches of water and time the infiltration rate of the soil, If the drainage is less than 0.25 inches per hour, notify the Engineer to determine need for subsurface drainage.

- F. Saline or Sodic Soils: Completely fill excavations with water and allow to percolate away before positioning trees.

3.6 EXTRACTING TREES

- A. General: Extract trees under supervision of the arborist.
- B. Orientation Marking: Mark the north side of each tree with non-permanent paint before extracting.
- C. Root-Ball Width: Minimum 10 inches of root-ball diameter, or least dimension for non-round root balls, for each inch of tree caliper being transplanted.
- D. Root-Ball Depth: As determined by the arborist for each species and size of tree and for site conditions at original and planting locations.
- E. Digging:
 - 1. Dig and clear a pit with a tree spade to the depth of the root system. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Use narrow-tine spading forks to comb soil to expose roots with minimal damage to root system.
 - 3. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking.
 - 4. Cut exposed roots manually with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not paint or apply sealants on cut root ends.
 - 5. Brace and support excavation pit and rootball according to the transplanting equipment that is to be used and take steps to prevent breaking of root ball.
 - 6. Temporarily support and protect exposed roots from damage until they are permanently redirected and covered with soil. Cover roots with burlap and keep them moist until planted.
- F. Extracting with Tree Spade: Use the same tree spade to extract the tree as will be used to transport and plant the tree.
 - 1. Do not use tree spade to move trees larger than the manufacturer's maximum size recommendation for the tree spade being used.
 - 2. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

3.7 BALLING AND BURLAPPING OPERATIONS

- A. All digging, balling and burlapping shall be performed by hand. Light machinery may be use to pull any excess soil away from the outside of the final root ball,

however, all equipment must be kept out of the designated rootball perimeter as identified by the Engineer.

- B. Dig trees immediately before moving.
- C. Use digging methods that retain as many fibrous roots as possible.
- D. Hand shape final rootball, prior to burlapping, to a diameter and depth suitable for the species, in accordance with ANSI, and as accepted by the Engineer. NOTE: Contractor shall exercise care and utilize methods in an effort to maintain an intact soil root ball at the base of the tree.
- E. Prune with a clean cut, all projecting roots or root tips shredded by digging operations.
- F. Cover the entire rootball, top and bottom inclusive, with burlap. Securely pin burlap to the rootball with eight-penny nails, or an approved equivalent.
- G. Prior to lacing, fold the slack burlap on the sides of the rootball neatly into pleats on the lower tapered part of the rootball and pin smoothly with eight-penny nails.
- H. Drum-lace the rootball using ½ inch diameter manila rope for the top and bottom and ¼ inch diameter manila rope for the vertical lacing.

3.8 TRANSPORTING TREE TO NEW LOCATION

- A. Take all necessary precautions so as not to damage the tree trunk, break branches or loosen the rootball mass during transport of the tree.
- B. Employ a crane and approved tree lifting equipment in accordance with acceptable horticultural practices.
- C. Prevent the rootball from rolling.
- D. Place a minimum 3 inch thick layer of burlap on the tree trunk at points of contact where rope or straps touch trunk. No cable shall be used on the tree during transplanting or transporting.
- E. Transport the trees to the designated new location as approved by the Engineer. Set crown of rootball 3 inches higher than finished grade. Obtain final acceptance for transplanting location and grade prior to transplanting operations.
- F. Staking and Layout: Refer to Section 32 93 00 – Planting Fine Grading.
- G. Protect new and existing site improvements from damage due to transplanting operations. Repair all damage and restore items to their original condition as approved by Engineer at no charge in Contract Amount.
- H. Placement of Planting Soil Mixture: Refer to Section 32 91 13 – Planting Soils.

3.9 PLANTING

- A. Refer to Section 32 93 00 – Planting Fine Grading.

3.10 MULCHING

- A. Refer to Section 32 93 00 – Planting Fine Grading.

3.11 INSTALLING SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree.
- B. Place device on top of the mulch at base of tree and fill with water according to manufacturer's written instructions.

3.12 TREE MAINTENANCE

- A. Refer to Section 32 93 00 – Planting Fine Grading.

3.13 REPAIR AND REPLACEMENT

- A. General: Repair or replace transplanted trees and other plants indicated to remain or be relocated that are damaged by construction operations, in a manner recommended by the arborist and approved by Engineer.
 - 1. Submit details of proposed pruning repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Engineer.
- B. Remove and replace trees as directed by the Engineer.

3.14 CLEANUP AND PROTECTION

- A. During transplanting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect Trees from damage due to transplanting operations and operations of other contractors and trades. Maintain protection during transplanting and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After planting and before Substantial Completion, remove tags, markings, tie tape, labels, wire, burlap, and other debris from transplanted trees, planting areas, and Project site.

END OF SECTION

SECTION 33 05 07.23
UTILITY BORING AND JACKING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Detailed requirements for furnishing and installing steel casing pipes and carrier pipes by means of boring and jacking. Also included in this section are requirements for casing spacers, casing end seals, and boring and jacking pits.

1.02 SUBMITTALS

A. Shop drawing and Product Data:

1. Submit manufacturer's specifications, catalog cuts, and literature for the following in accordance with the General and Supplementary Conditions:
 - a. Casing pipe.
 - b. Casing spacers.
 - c. Casing end seals.

B. Submit to Engineer a Boring and Jacking Plan. The plan shall include all the following information as applicable:

1. An indication of where the leading edge of the casing is to be located with respect to the line and grade, and the intervals for checking line and grade during installation. The plan shall indicate that a record of progress will be maintained at the job site.
2. Listing of the equipment to be used, demonstrating adequacy of size and capability to install the casing, and include the equipment manufacturer's information for all power equipment used in the installation.
3. The means proposed for controlling line and grade.
4. The means proposed for centering the cutting head inside the borehole.
5. Demonstrate the means for preventing voids by assuring:
 - a. The rear of the cutting head shall not advance in front of the leading edge of the casing by more than 1/3 times the casing diameter, and in stable cohesive soil conditions this distance shall not exceed eight inches.
 - b. In unstable conditions, such as granular soil or loose/flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement and soil conditions.
6. Adequate casing lubrication with a bentonite slurry, or other approved techniques.
7. An adequate band around the leading edge of the casing to provide extra strength in loose unstable materials when the cutting head has been retracted into the casing to

reduce skin friction as well as provide a method for the slurry lubricant to coat the outside of the casing.

8. At least 20 feet of full diameter auger at the leading end of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least 75% of the full auger diameter.
9. Water to be injected inside the casing to facilitate spoil removal. The point of injection shall be no closer than two feet from the leading edge of the casing.

1.03 REFERENCES

- A. The description of work, material, and methods of construction under this part of the specifications shall be in accordance with the provisions of the document entitled "Standard Specifications for Water and Sewer Main Construction in Illinois", latest edition, jointly published by the Illinois Society of Professional Engineers, the Consulting Engineers Council of Illinois, the Illinois Chapter of the American Public Works Association, the Illinois Municipal League and the Associated General Contractors of Illinois. Copies of said document may be obtained from the Illinois Municipal League at the following web site: www.iml.org.

PART 2 – PRODUCTS

2.01 CASING PIPE FOR BORED AND JACKED UTILITIES

- A. Casing pipe shall be new butt-welded, seamless, or electric resistance welded steel pipe conforming to ASTM A139 (straight seam only) and AWWA C200. Casing pipe shall be Grade "B" and have a minimum yield strength of 35,000 psi and a minimum wall thickness of 0.375", unless otherwise indicated on the Drawings.
- B. Steel casings shall have protective bituminous coatings on the pipes' exterior surfaces as per AWWA C203.
- C. Joints in steel casing pipe shall be butt-welded. Shop welds of the casing pipes shall conform to the American Welding Society (AWS) standard specifications and shall be performed by qualified welders

2.02 CASING SPACERS

- A. Model CCS as manufactured by Cascade Waterworks Mfg. of Yorkville, IL
- B. Approved equal.

2.03 CASING END SEALS

- A. Casing end seals shall be one of the following:
 1. PSI Seal and Insulator, Inc. Model "W" wrap around type, synthetic rubber seal.
 2. Advance Products & Systems' Model "AW" wrap around type seal.
 3. Or equal.

2.04 CARRIER PIPE MATERIALS

- A. Solid wall PVC pipe in accordance with Section 33 31 23.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Contractor shall determine exact location and elevation of underground piping and conduits at all locations where new piping will cross existing utilities, including service lines. Contractor shall determine exact location and elevation of underground piping and conduits in close proximity to the proposed piping as required to satisfy themselves that no conflicts exist with the proposed piping route.
- B. Contractor shall excavate for bore pits where indicated as such on the Drawings. Bore pits shall be of the approximate size, depth and location as indicated on the Drawings. Prior to excavation for the bore pit, Contractor shall contact Engineer to confirm bore pit location and depth. Provide suitable pit sidewall stabilization as necessary to meet applicable safety regulations and as per the Cook County Department of Highways and Transportation utility permit. Bracing, shoring, sheeting or other supports shall be installed in the bore pit as needed. Contractor shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions that might cause the casing to "freeze" in place. Upon completion of jacking operations, the reaction blocks, braces, and all other associated construction materials shall be completely removed from the site.
- C. Dewatering: If ground water is encountered at any point during the casing pipe or carrier pipe installation, develop and maintain a dewatering system of sufficient capacity to remove water continuously, keeping excavations free of water until backfill operation is in progress.
 - 1. Keep removal of soils particles to minimum.
 - 2. Dewater into sediment trap as per Section 31 25 00.
 - 3. Observe settlement or displacement of surface facilities due to dewatering.
 - 4. Should settlement or displacement be detected, notify Engineer immediately and act to maintain safe conditions and prevent damage.
- D. Overcut of the cutting head: The cutting head diameter shall not to exceed the outside diameter of casing pipe by more than ½-inch.
- E. Contractor shall be responsible for any damage to the carrier mains caused by improper installation of the casing pipe. If the alignment of the casing is such that the pipe grade cannot be met, the grade of the pipe shall be adjusted, if required by the Engineer. If realignment is not deemed feasible, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with grout and the ends plugged with 12-inch thick masonry plugs. Realignment or replacement work shall not result in extra cost to the Owner.

- F. Field welds in the steel casing pipe shall be complete penetration (butt-welded), single-bevel groove type joints in accordance with the requirements of ANSI/AWWA C206 and AWS D7.0. Welds shall be airtight, continuous over the entire circumference of the pipe, and shall not increase the outside pipe diameter by more than 3/4-inch. Nor shall there be intrusion of the weld metal into the bore of the casing. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved. Contractor shall wire brush the welded joints and paint with one coat of Wohl Coatings' DD-45 black, quick-dry (20 minutes) pipe coating, to 3 mil dry film thickness.

- G. When installing the casing pipe, the rear of the cutting head shall not advance in front of the leading edge of the casing by more than 1/3 times the casing diameter, and in stable cohesive soil conditions this distance shall not exceed 8 inches. Excavation shall be performed entirely within the jacking head and no excavation in advance thereof shall be permitted. Earth within the casing shall not be removed too close to the leading edge in order to prevent the formation of voids outside the casing. If voids are formed, they shall be satisfactorily filled with grout by pumping.

- H. The pressure of sliding the carrier pipe into the casing shall not be applied directly to carrier pipe. A plank, timber, or other material acceptable to the Project Manager shall be placed over the pipe end, during pushing, to protect it from damage.

- I. Casing spacers shall be installed on all carrier pipes placed inside all casings:
 - 1. Within 12-inches of each end of the casing.
 - 2. On both sides of each carrier pipe joint, within 12 inches of the joint.
 - 3. At mid-span of each pipe section.
 - 4. At points required such that the maximum distance between any two spacers on the carrier pipe is less than 6 lineal feet.

- J. After each carrier pipe has been installed in the casing pipe, each end of the casing pipe shall be sealed with rubber end seals as specified above. Pierce each rubber end seal with a 1-inch diameter hole at the base of the end seal, to allow minor amounts of drainage to freely drain from the casing. Upon completion of the end seal installations, backfill the bore in accordance with Section 31 23 16.

END OF SECTION

SECTION 33 05 13

PRECAST CONCRETE MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
1. M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
- B. ASTM International (ASTM):
1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 2. ASTM A48 – Standard Specification for Gray Iron Castings.
 3. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 4. ASTM A536 – Standard Specification for Ductile Iron Castings.
 5. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 6. ASTM B139 – Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.
 7. ASTM C14 – Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 8. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 9. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 10. ASTM C150 – Standard Specification for Portland Cement.
 11. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
 12. ASTM C387 – Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 13. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
 14. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections.
 15. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
 16. ASTM C858 – Standard Specification for Underground Precast Concrete Utility Structures.
 17. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 18. ASTM C990 – Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants.
 19. ASTM C1311 – Standard Specification for Solvent Release Sealants.
 20. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

21. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 22. ASTM D4101 – Standard Specification for Propylene Injection and Extrusion Materials.
 23. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 24. ASTM F594 – Standard Specification for Stainless Steel Nuts.
- C. Illinois Society of Professional Engineers (ISPE): Standard Specifications for Water & Sewer Main Construction in Illinois, Current Edition.
- D. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, Current Edition including Supplementary Specifications.

1.2 SUBMITTALS

- A. Submit in accordance with 01 33 00 – Submittal Procedures.
- B. Product data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 2. Manufacturers recommended installation procedures.
- C. Provide certification reports attesting that materials supplied meet referenced specifications.
- D. Shop drawings for manholes showing all components to be installed.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Precast Concrete and Precast Prestressed Concrete: Product of manufacturer with 3 years' experience producing precast concrete products of quality specified.
 2. Precast Plant: PCI certified plant with current certification.
 3. IDOT Certified Precast Concrete Producer per most current listing.

PART 2 – PRODUCTS

2.01 PRECAST MANHOLE SECTIONS

- A. Provide reinforced precast concrete manhole, catch basin or inlet sections complying with ASTM C478.
- B. All lift holes on structures shall be thoroughly wetted and completely filled with non-shrink mortar or epoxy grout; then smoothed and covered on the outside, with a trowelable grade butyl rubber base backplaster material to minimize leakage.

- C. Provide precast eccentric cone or flat top slabs as shown on Drawings.
- D. Joints: Tongue-and-groove with butyl rubber gaskets meeting the requirements of ASTM C990. Joints shall be soil tight.
- E. Mark each precast section with name or trademark of manufacturer and date of manufacture. Marking shall be indented into manhole section or shall be painted thereon with waterproof paint.
- F. Source Quality Control:
 - 1. Test risers and tops in accordance with ASTM C497 for compressive strength compliance by compression tests on cores drilled from 5% of lot.
 - 2. Number of compression tests may be reduced to 1% of lot, with minimum of two cores per lot, for manhole sections fabricated on sewer pipe machine.
 - 3. Manufacturer's core drilling machine shall conform to ASTM C497. Operator shall take test cores as directed by testing laboratory.
 - 4. Stamp base sections, risers and tops, meeting strength requirements, with appropriate monogram.

2.02 MANHOLE FRAMES AND COVER

- A. ASTM A48, Class 30-B minimum.
- B. Free from cracks, holes, swells, and cold shuts.
- C. Provide all frames, gratings and covers from the same manufacturer unless approved by Engineer.
- D. Provide standard finish, supplied as a total unit.
- E. Cover: As shown on the Drawings.

2.03 PIPE TO MANHOLE CONNECTIONS

- F. All connections shall provide for a watertight seal between pipe and manhole.
- G. Connect flexible storm sewer pipe to manholes and inlets by means of boot-type or compression-type connector, meeting the requirements of ASTM C923.
 - 1. Kor-N-Seal I, by Trelleborg
 - 2. A-Lok, by A-Lok Products, Inc.
 - 3. Z-Lok Cast in Boots, by A-Lok products, Inc.
 - 4. PSX Direct Drive, by Press-Seal Gasket Corporation
 - 5. Or equal.
- H. Connect concrete storm sewer pipes to manholes and inlets by means of brick and mortar connection.

2.04 STEPS

- A. Conform to requirements of ASTM C478 and U.S. Department of Labor Occupational Safety and Health Standards.
- B. Steel Reinforced Plastic:
 - 1. Approved plastic such as copolymer polypropylene meeting with requirements of ASTM D4101, Type II, Grade 49108, reinforced with deformed 3/8 inch diameter reinforcing bar which conforms to requirements of ASTM A615, Grade 60.
- C. Equally space steps in true vertical alignment to form continuous ladder at distance of 16 inches on center. Place steps within allowable tolerance of +/- 1 inch.
- D. Manufacturer shall install steps. Embed steps into wall minimum of 3 inches.

2.05 MORTAR

- A. Comply with ASTM C270, type M.

2.06 ADJUSTING RINGS

- A. Precast concrete with one line of steel reinforcements, centered in normal handling and use.
- B. Mating Faces: Smooth, parallel, and free from cracks, chips, spalls, or casting irregularities.
- C. Minimum thickness: 2 inches
- D. Maximum thickness: 6 inches.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FIELD MEASUREMENTS

- A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.03 INSTALLATION

A. Trench, backfill, and compact for work of this Section in accordance with pertinent provisions of Section 31 23 15.

B. Standard Precast Manhole with Integral Base:

1. Excavate deep enough so bottom manhole barrel section with integral base rests on 6 inches minimum of bedding material.
2. Bedding material shall conform to requirements of adjacent pipe.
3. Set manholes plumb with orientation of cast-in items as shown on Drawings.

3.04 BACKFILL

A. Backfill with pipe bedding and cover material to spring line of incoming pipe in accordance with Section 31 23 16.

3.05 MANHOLE BENCH (CONSTRUCTED IN FIELD)

- A. Shape invert channels to be smooth and semicircular, conforming to inside of adjacent sewer sections.
- B. Make changes in direction of flow with a smooth curve of as large a radius as size of manhole will permit.
- C. Make changes in size and grade of channels smoothly and evenly.
- D. Form invert channels directly manhole base, with concrete. On manholes with straight through pipe invert may be formed by laying full section sewer pipe through manhole and cleanly breaking out top half after surrounding concrete has hardened.
- E. Smooth floor of manhole outside channels, and slope toward channels at not less than 1 inch per foot or more than 2 inches per foot.
- F. Construct outside drop at sanitary manholes whenever free drop inside manhole exceeds 24 inches measured from invert of inlet pipe to top of floor of manhole outside channels.

3.06 PIPE TO MANHOLE CONNECTION

- A. Support pipe entering manhole above manhole base from wall of manhole back to face of first pipe joint bell with wall of backfill concrete, brick or solid concrete block columns.
- B. Connect by means of an approved flexible watertight pipe to manhole seal.

3.07 SETTING CASTINGS

- A. Set at elevation shown on Drawings.

- B. Adjust castings to grade with adjusting rings. Do not use more than 8 inches of adjusting rings.
- C. Sealing: Seal interior and exterior of adjusting rings and castings with trowelable mastic sealing material.

3.08 MANHOLE OVER EXISTING PIPE

- A. Construct new manhole as specified, breaking upper half of existing pipe after base of manhole is completed so as not to obstruct flow of existing pipe.

3.09 TESTING AND INSPECTING

- A. Do not allow or cause any of Work of this Section to be covered up or enclosed until after it has been inspected.
- B. Precast reinforced concrete manholes, inlets, catch basins, risers and tops shall be subject to rejection on account of failure to conform to any specification requirements. In addition, individual sections may be rejected because of any of the following reasons:
 - 1. Fractures or cracks passing through shell, except for single end crack not exceeding depth of joint.
 - 2. Defects indicating imperfect proportioning, mixing, and molding.
 - 3. Surface defects indicating honeycombed or open texture.
 - 4. Damaged ends where such damage would prevent making satisfactory joint.
 - 5. Manhole steps out of line, or not properly spaced.
 - 7. Internal diameter of section varying more than 1% from nominal diameter.
 - 8. Any continuous crack having surface width of 0.01 in. or more and extending for length of 12 in or more, regardless of position.
- C. Manhole seals shall be approved by inspecting Engineer after application and prior to backfilling.

END OF SECTION

SECTION 33 42 11

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Storm sewer pipe materials and installation.

B. Related Documents:

1. Applicable provisions of the General Conditions, General Specifications, Special Provisions, and Detailed Specifications shall govern all work under this Section.

A. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. MWRD General and Detailed Technical Specifications utilized for this project.
3. Section 31 23 16 – Trench Excavation, Backfill, and Compaction.
4. Section 33 05 13 – Manholes and Structures.

1.02 REFERENCES

A. ASTM International:

1. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
2. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
3. ASTM C497 – Standard Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile
4. ASTM C655 – Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
5. ASTM C1619 – Standard Specification for Elastomeric Seals for Joining Concrete Structures
6. ASCE 27-17 – Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
7. ACPA Design Data 4 – Jacking Concrete Pipe

B. AASHTO: American Association of State Highway and Transportation Officials

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittal Procedures.

B. Submit Product Data in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package. Partial submittals are unacceptable.

- C. Product data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's recommended installation procedures.
 - 3. Certification reports attesting that materials supplied meet referenced specifications

- D. Results of plant tests shall be provided and included with shipment of materials, with two additional copies of each test result to be furnished to MWRD.

- E. Storm sewer post-installation sewer televising results.

- F. For Reinforced Concrete Pipe, provide:
 - 1. Calculations verifying pipe D-Load (ASTM C655), and pipe floatation (for depths less than 6 feet), shall be furnished to MWRDGC prior to pipe manufacture.

1.04 QUALITY ASSURANCE

- A. Pipe manufacturer shall have minimum of five (5) years experience manufacturing pipe in accordance with ASTM Standard Specifications.

- B. Plant Testing:
 - 1. Reinforced Concrete Pipe
 - a. Three-edge bearing load test circular reinforced concrete sewer pipe (per ASTM C497), to 0.01 inch crack D-load specified in tables 1 through 5 of ASTM C76, on pipe manufactured for this project.
 - b. For pipe testing frequency, pipe lot shall be defined as pipe of same diameter and class or D-Load manufactured by same process in one plant, over period not to exceed approximately 2 weeks.

 - 2. Ductile Iron Pipe:
 - a. Hydrostatic testing of each pipe to 500 psi per AWWA C-151.
 - b. Tensile strength testing (60,000 psi minimum).
 - c. Impact strength testing (7ft-lb minimum).

 - 3. Plant Testing for AWWA C900 PVC Pipe:
 - a. Testing shall consist of flattening, sustained pressure, burst pressure, and extrusion quality per AWWA C900.
 - b. Pipe diameter, wall thickness and other dimensions shall be verified as per ASTM D2122.
 - c. PVC cell classification meets requirements for 12454-B in accordance with ASTM D-1784.

PART 2 - PRODUCTS

2.01 REINFORCED CONCRETE PIPE

- A. Reinforced Concrete Pipe:
 - 1. Conform to ASTM C76.
 - 2. Wall thickness: Minimum “B” wall
 - 3. Size as indicated on the drawings.
 - 4. Class:
 - a. 12-inch diameter: Class IV
 - b. 15-inch diameter: Class IV
 - c. 36-inch diameter: Class III
 - d. 42-inch diameter: Class III
- B. Pipe joints and gaskets:
 - 1. Conform to ASTM C443.
 - 2. Gaskets shall be flexible, watertight, rubber conforming to ASTM C1619 Class A.
- C. Handling holes not permitted.
- D. Precast manufacturer shall be on IDOT’s Certified Precast Concrete Producers list.

2.02 DUCTILE IRON PIPE

- A. Pipe:
 - 1. Ductile iron in accordance with AWWA C151, Pressure Class 350.
 - 2. Manufacturers:
 - a. American Cast Iron Pipe Company
 - b. U.S. Pipe and Foundry Company
 - c. Approved equal.
 - 3. Pipe shall be marked by manufacturer indicating the weight; class or thickness; manufacturer’s identification; country where cast; year the pipe was manufactured; the letters “DI” or the word “Ductile”.
- B. Joints: Push-on joints with circular rubber gasket meeting the requirements of AWWA C111 rated for 350 psi working pressure with a surge safety factor of 100 psi.
- C. Lining: Cement mortar lining and internal seal coat complying with AWWA C104 / ANSI A 21.4, standard thickness.
- D. External Seal Coat: Asphaltic top coating, 1 mil thick, in accordance with AWWA C151 / ANSI A 21.51.

2.03 AWWA C900 PVC PIPE

- A. PVC pipe shall be made from virgin compounds as defined in ASTM D1784 and as per AWWA C900.
- B. Pipe shall have a minimum dimension ratio (DR) of 18 (150 psi rating) for 12-inch diameter and smaller. Pipe shall have a minimum dimension ratio (DR) of 25 (165 psi rating) for pipes larger than 12 inches in diameter.
- C. Pipe shall conform to cast iron outside diameters per AWWA C900.
- D. Gaskets and Lubricants: Gaskets and lubricants intended for use with the PVC pipe and appurtenances shall be made materials that are compatible with the plastic material and with each other when used together as per AWWA C900.
- E. Color: Green.
- F. Joints: Push-on with flexible elastomeric seals for plastic pressure pipe per ASTM D3139.
- G. Gaskets: Elastomeric for push-on plastic pipe joints per ASTM F477.

2.04 DUCKBILL CHECK VALVES

- A. Series TF-1 by Tideflex Technologies, or approved equal.

2.05 PRECAST CONCRETE FLARED END SECTIONS

- A. Conform to IDOT Standard 542301-03 and Article 1042.07.
- B. Precast manufacturer shall be on IDOT's Certified Precast Concrete Producers list.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FIELD MEASUREMENTS

- A. Make necessary measurements in the field to assure precise fit of items in accordance with approved design.

3.03 INSTALLATION

- A. Trenching and backfill for Work of this Section shall conform to Section 31 23 16 and pipe manufacturer's recommendations.
- B. Pipe laying:

1. Protect pipe during handling against shocks and free fall. Remove extraneous material from pipe interior.
2. Between manholes all gravity pipe shall be of same strength class and as shown on layout/installation guide.
3. Lay pipe by proceeding upgrade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
4. Lay each pipe accurately to indicated line and grade, aligning so sewer has a uniform invert. Noticeable variations from true alignment and grade shall be considered sufficient cause for rejection of Work.
5. Continually maintain interior of pipe free from foreign material. Provide watertight plugs for open ends of pipe when laying not in progress.
6. Before making pipe joints, clean and dry all surfaces of pipe to be joined.
7. Use lubricants recommended by pipe manufacturer.
8. Place, fit, join, and adjust joints to obtain water tight seal.
9. Lay pipe to line and grade so horizontal and vertical joint deflection will not be more than 50% maximum deflection as recommended by manufacturer.
10. Laying of Pipe in Cold Weather:
 - a. Heat pipe and jointing material to prevent freezing of joints, as recommended by manufacturer.
 - b. Do not lay pipe on frozen ground.
 - c. Pipes with rubber gaskets or resilient type joints: Warm gasket or joint material to facilitate making proper joint.

3.04 TESTING AND INSPECTING

- A. Do not allow or cause any work of this Section to be covered until after it has been inspected.
- B. Test and inspect sewer installation using the following methods:
 1. Televiser sewer installation.

END OF SECTION