

**SECTION 00 90 01  
BIDDING AND CONTRACT REQUIREMENTS  
ADDENDUM NUMBER (03)**

**SmithGroup, Inc.  
35 E Wacker Dr #900  
Chicago, IL 60661  
312.641.0770**

To: Prospective Bidders

Issued: May 2, 2024

**Re: ADDENDUM NUMBER (03) TO THE BIDDING DOCUMENTS FOR**

**Bid 24-032 Elgin Sports Complex Expansion**

Architect's Project Number: 14106

This addendum forms a part of the bidding and contract documents and modifies the original bidding documents dated April 11, 2024. Acknowledge receipt of this addendum in the space provided on Bid Form. FAILURE TO DO SO MAY SUBJECT BIDDER TO DISQUALIFICATION.

**ADDENDA TO THE PROJECT MANUAL – Volume 1**

1. Update to Schedule of Prices additional items added.
2. The new bid opening date of May 16, 2024, at 3:00 pm was addressed in Addendum #2 but was not updated on the website. The website has now been updated.
3. Agreement document timely completion date modified.
4. Instructions To Bidders, 8. COMPLETION TIME modified.
5. SECTION 265668 – S-EXTERIOR ATHLETIC LIGHTING: Delete and replace with the attached
6. Added SECTION 270413 - COMMON SUBMITTAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
7. Added SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
8. Added SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS
9. Added SECTION 271300 - COMMUNICATIONS BACKBONE CABLING
10. Added SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING
11. Added SECTION 280413 - COMMON SUBMITTAL REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY
12. Added SECTION 282300 - VIDEO SURVEILLANCE
13. SECTION 321813 S-SYNTHETIC TURF, delete paragraph 1.6.A and replace with the following:
  - A. The Contractor shall provide a single Manufacturer's Warranty which guarantees the usability and playability of the synthetic turf system for its intended use. The warranty coverage shall not be prorated nor limited to the amount of usage. The single warranty shall cover the entire turf system including infill, carpet and shock pad (if Alternate is awarded).
14. SECTION 321813 S-SYNTHETIC TURF, add paragraph 2.2.A.i. Greenfields: MST PRO-BLEND, 847-894-3746.
15. SECTION 311000 S-SITE CLEARING, add paragraph 3.8:
  - 3.8 **ABANDONING UTILITIES**
    - A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
      1. Close open ends of piping with a minimum 8-inch thick concrete bulkhead.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:
  1. Remove manhole and close open ends of remaining piping with concrete bulkhead.
  2. Break up bottom of manhole to allow for free drainage.
  3. Remove top of manhole down a minimum of 24 inches from final grade and fill with CA-7 aggregate.
  4. Backfill to grade according to Section 312000 "Earth Moving".
16. SECTION 332200 S-SEWAGE PUMPING STATION, revise paragraph 2.2.A. Piping to the following:
  - A. Piping in the basin shall be 4 inch ductile iron pipe and shall terminate with a flange outside the basin wall for connection to valves in an external valve vault. The valve vault shall include two 4" check valves with stainless steel lever and stainless steel spring and two 4" plug valves. Inlet or inlets into basin shall be grout sleeves for inlet pipes as indicated on the plans. The pump guide rails shall be 2.0" stainless steel pipe. Valve vault piping shall include a bypass connection with a riser pipe, 4" shut-off valve, and quick disconnect hose coupling for portable pump connection. All components shall be corrosion resistant.
17. SECTION 332200 S-SEWAGE PUMPING STATION, revise paragraph 2.3.A. Metal-to-Metal Rail System to the following:
  - A. The MTM rail system shall include a discharge base elbow, sealing flange with rail guide, upper guide bracket, stainless steel lifting chain, and stainless steel guide rails. All components of the MTM rail system shall be stainless steel including the middle puck or stainless steel guide rails shall be welded together to prevent deterioration of joint.
18. SECTION 332200 S-SEWAGE PUMPING STATION, add paragraph 2.8.M. Control Panel Construction as follows:
  - M. Control panel shall be provided with lightning and surge suppression components.

#### **ADDENDA TO THE DRAWINGS – Volume 1**

1. CD-100 SITE PREPARATION PLAN – OVERALL: Identified existing infrastructure to be removed, modified, salvaged and replaced
2. CD-101 through CD-103 – SITE PREPARATION PLAN: Identified existing infrastructure to be removed, modified, salvaged and replaced.
3. CE-101 through CE-103 – EROSION CONTROL PLAN: No new control measures but was updated to reflect revised grading plan.
4. CS-101-104 LAYOUT AND MATERIALS PLAN – AREA A: New Bike Path meet existing bike Path, NW Corner. Asphalt Pavement hatch extension, upper west corner; revised Sports Way hatching to reflect City of Elgin Standard.
5. CS-102 LAYOUT AND MATERIALS PLAN – AREA B: Added Portable Soccer and Lacrosse goals; revised Sports Way hatching to reflect City of Elgin Standard.
6. CS-103 LAYOUT AND MATERIALS PLAN – AREA C: Updated Ramp, Middle Rd and Sports Way; revised Sports Way hatching to reflect City of Elgin Standard.
7. CS-300 through CS-308 – SPORTS WAY PLAN AND PROFILE: updated to reflect revised grading plan
8. CS-401: PLAZA ENLARGEMENT - Removed paver hatch from parking lot, not part of base bid, see alternate sheets.
9. CS-500 SITE DETAILS – HARDSCAPE: Detail 4 (Gravel Shoulder) and Detail 10 (Curb and Gutter) update.
10. CS-504 SITE DETAILS – FENCE: Detail 1 (Chain Link) and Detail 5 (Post and Chain) changes.
11. CG-100 through CG-103 – GRADNG AND DRAINAGE PLAN: revised to reflect updated grading with revised stormwater connectivity (as indicated on each AREA sheet). Changes also include the addition of riprap to detention pond inflow pipe outlet locations.
12. CG-500: Revised Detail 1 (Road to Bike Path Profiles)

13. CU-204 and CU-205 – SANITARY SEWER PLAN AND PROFILE: sheets CU-204 and CU-205 include revised pipe inverts, added pipe materials, adjusted MH-2 and MH-4 locations, added tracer wire on force main, and added requirements to rehabilitate existing manhole receiving force main.
14. CU-502 UTILITY DETAILS 3.24 CITY OF ELGIN MINIMUM PAVEMENT DETAIL: Remove strikethrough; notes modified for clarity and consistency.
15. CU-504 UTILITY DETAILS: Detail 3 – CONTROL STRUCTURE was updated to include the added control structures at bioswale facilities and detention ponds, and include the information needed to fabricate each outfall feature (type, size and elevation).
16. CU-504 UTILITY DETAILS: Details 2 & 3 removed and replaced with new Details 2-4 that provide product information for HDPE storm drain system structures (made by ADS).
17. IR-100 – IRRIGATION PLAN - Mainline realigned, IDPH note added, legend updated for alt 8 equipment & construction note 3 updated, and Construction note #3 callout added.
18. ALT-200 - ALTERNATE 2 – ATHLETIC FIELD 3 IRRIGATION - Construction note #3 callout added, legend updated for alt 8 equipment & construction note 3 updated and viewport adjusted to only show only alternate 2.
19. ALT-201 - ALTERNATE 8 - CORE AREA IRRIGATION - Sheet added for alternate 8
20. IR-200 - IRRIGATION DETAILS - Details related to alternate 8 added.
21. IR-201 - IRRIGATION DETAILS - Tank shape adjusted to better represent actual tank to be installed.
22. E-000 - ELECTRICAL SYMBOLS LIST AND ABBREVIATIONS - Added Technology Device Symbols for security cameras and wireless access points. Modified information for handhole devices HH3 and HH4.
23. E-101 - ELECTRICAL PLAN - AREA A - Removal of flagpole lighting per P+Z, roadway fixture tag adjustment
24. E-102 - ELECTRICAL PLAN - AREA B - Removal of flagpole lighting per P+Z, roadway fixture tag adjustment & wiring tag changes
25. E-103 - ELECTRICAL PLAN - AREA C - Roadway fixture tag adjustment
26. Added sheet E-121 - TECHNOLOGY SYSTEMS PLAN AREA A - Identified Communications and Security scope requirements. Refer also to added Division 27 and Division 28 specification sections.
27. Added sheet E-122 Technology Systems Plan Area B, identifying Communications and Security scope requirements. Refer also to added Division 27 and Division 28 specification sections.
28. E-500 - ELECTRICAL ONE-LINE DIAGRAM AND DETAILS - Added to pole detail for camera scope and grounding requirements.
29. E-502 - ELECTRICAL SCHEDULES - Fixture selection changes per P+Z, some circuiting changes
30. E-503 - LIGHTING FIXTURE PRODUCT DATA - Fixture selection changes per P+Z
31. ALT-105 – ALTERNATE 5 – PARKING LOT 3 - Added general Sheet Notes. Added Communications and Security scope requirements to Detail 2. Refer also to added Division 27 and Division 28 specification sections.
32. ALT-102 – ALTERNATE 2 – ATHLETIC FIELD 3 – Added soccer, lacrosse and football goals.

## **ADDENDA TO THE DRAWINGS – Volume 2**

### **GENERAL**

1. G-002 - COVER SHEET - VOLUME 2 - Reissued for Addendum 3.
2. G-101 - SHEET INDEX, GRAPHIC STANDARDS, AND ABBREVIATIONS - Reissued for Addendum 3.

### **ARCHITECTURE**

3. A-001 - ARCHITECTURAL SITE PLAN\_ - Drawings and notes revised; sitework coordination keynote added.
4. A-101 - CONSTRUCTION PLANS - CONCESSIONS - Drawings and notes revised; equipment enclosure fencing and gates revised, security camera locations shown.
5. A-102 - FINISH PLAN & REFLECTED CEILING PLAN – CONCESSIONS - Drawings revised; equipment enclosure fencing and gates revised, security camera locations shown.
6. A-111 - CONSTRUCTION PLANS - MAINTENANCE - Drawings revised; equipment enclosure fencing and gates revised, security camera locations shown.
7. A-112 - FINISH PLAN & REFLECTED CEILING PLAN - MAINTENANCE - Drawings revised; equipment enclosure fencing and gates revised, security camera locations shown.

8. A-201 - EXTERIOR ELEVATIONS - CONCESSIONS - Drawings and notes revised; equipment enclosure fencing and gates revised, gabion wall and gabion fill notes revised, gabion wall flashing cap added.
9. A-301 - BUILDING SECTIONS \_ - Drawings revised; equipment enclosure fencing and gates revised, gabion wall flashing cap detail revised.
10. A-311 - WALL SECTIONS - Wall Section 9/A-311 revised, exterior assembly notes added.
11. A-521 - SECTION DETAILS - Details 3/A-521, 4/A-521, 6/A-521, 9/A-521 and 10/A-521 revised; keynotes revised.

## **STRUCTURE**

12. S-101 - SITE PLAN - Cistern foundation coordination note added.
13. S-110 - CONCESSIONS BUILDING FOUNDATION PLAN - Foundations revised; columns and piers added to support equipment enclosure fencing.
14. S-111 - CONCESSIONS BUILDING ROOF PLANS - Steel framing revised, steel track removed at gabion wall lighting; columns added to support equipment enclosure fencing.
15. S-401 - SUPERSTRUCTURE SECTIONS - Detail removed, for steel track removed at gabion wall lighting.
16. S-601 - SCHEDULES - Column Base Plate Schedule revised; Pier Schedule revised.

## **ELECTRICAL**

17. E-301 - CONCESSIONS LEVEL 1 POWER PLAN - Drawings and notes revised, per security and lightning protection scope.
18. E-303 - MAINTENANCE LEVEL 1 POWER PLAN - Drawings and notes revised, per security and lightning protection scope.
19. E-701 - ELECTRICAL SCHEDULES - Branch Panel MP-1 revised.

## **PLUMBING**

20. P-001 - PLUMBING DATA SHEET - IDPH rainwater re-use and irrigation notes revised.
21. P-301 - CONCESSIONS LEVEL 1 PLUMBING PLAN - \_\_\_ Rainwater harvesting and irrigation coordination notes revised.
22. P-401 - CONCESSIONS BUILDING ROOF PLAN - Rainwater harvesting equipment, piping, and related notes revised; irrigation pump indicated for coordination.
23. P-703 - PLUMBING DETAILS - Rainwater harvesting notes revised.

## **CLARIFICATIONS for Volume 1:**

1. The Employee Utilization form states under item 4 that all subcontractors will also need to provide this form. Do we need to have all subs submit this form with their bids for submission with our bid? If we don't have one at time of bid can we follow up prior to contract award? *We only need subs after it is awarded. Just complete your employee demographics.*
2. Do you know if dirt is staying on site? *See Grading Plans.*
3. Could you please give us a rough estimate of this project size so we can give it to our bonding company. *See The Work in the Agreement.*
4. Do you know if dirt is staying on site? *See revised Grading sheets - Addendum 3*
5. I am writing to seek approval to provide LED Sports Lighting for the Elgin Sports Complex Expansion project. (Shineto) *See SECTION 265668 – S-EXTERIOR ATHLETIC LIGHTING - Addendum 3*
6. Paragraph 7 of the instructions to bidders states that the City will award the contract within 60 days of the bid opening. Article 3.1 of the agreement states that substantial completion is 15 months from the date of the notice to proceed with final completion not later than September 15, 2025. Will the final completion date be adjusted if the City takes, as an example, the full 60 days to award the contract? If that happens, the substantial completion date would be around October 9, 2025. *See Instructions to Bidders - Addendum 3*

7. I see that you have a specified manufacturer for this project. Would you consider Qualite Sports Lighting an approved equal for a competitive bid on this particular project? **See SECTION 265668 – S-EXTERIOR ATHLETIC LIGHTING - Addendum 3**
8. Attached is the Substitution Request for the Synthetic Turf component of the Bid for the City of Elgin. I did attend the mandatory pre-Bid meeting on April 24. I wanted to confirm our Turf System is accepted for the bid? **See Addendum 3 Narrative**
9. Is there an approximate schedule for the start and finish dates of the buildings? **Contractor to determine building construction schedule so long as it conforms to Completion Time. See Instructions to Bidders - Addendum 3 for Completion Time.**
10. Will the RFI date be extended? **See Instructions to Bidders**
11. The description for Alternate #4 in both the schedule of prices and in specification section 012300 reference lighting in the proposed scope of work. However, when comparing the base bid plan on E-102 with the alternate plan on 2/ALT-104 the scope of work regarding site electrical appears identical. Please clarify if any additional site lighting will be needed for the north parking lot in Alternate #4. **See Bid Form Update – Addendum 3 for schedule of price update.**
12. It appears the playground turf spec was written using the spec for an athletic field and not the recommended Playground Grass Ultra CSI as provided by ForeverLawn and listed as the basis of design. This seems to be a general field spec and doesn't include the important product features and testing requirements of Playground Grass Ultra (PFAS, electrostatic testing, environmentally friendly backing, proprietary seaming system, etc.). I've included the Playground Grass Ultra CSI below. If the basis of design is truly Playground Grass Ultra, can this spec be updated to reflect the appropriate testing requirements/features that are written into the one shown below as provided by ForeverLawn? **See SECTION 321813.10 - S-PLAYGROUND TURF - Addendum 3**
13. Is there any reference or cores taken to indicate the existing pavement thickness of Central Rd. and the roadway leading into the project from the West as shown on CD-101? **All cores available provided are in the Geotech report.**

**This addendum consists of (7) pages, excluding attachments.**

**END 00 90 01.**

**Attachments:**

1. **Specifications – Volume 1:**
  - a. AGREEMENT – See updated document on procurement website
  - b. SCHEDULE OF PRICES – See updated document on procurement website
  - c. INSTRUCTIONS for BIDDERS
  - d. SECTION 265668 – S-EXTERIOR ATHLETIC LIGHTING
  - e. SECTION 270413 - COMMON SUBMITTAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
  - f. SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
  - g. SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS
  - h. SECTION 271300 - COMMUNICATIONS BACKBONE CABLING
  - i. SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING
  - j. SECTION 280413 - COMMON SUBMITTAL REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY
  - k. SECTION 282300 - VIDEO SURVEILLANCE
  - l. SECTION 321813.10 - S - PLAYGROUND TURF
2. **Drawings – Volume 1:**
  - a. CD-100 SITE PREPARATION PLAN – OVERALL
  - b. CD-101 SITE PREPARATION PLAN – AREA A
  - c. CD-102 SITE PREPARATION PLAN – AREA B
  - d. CD-103 SITE PREPARATION PLAN – AREA C
  - e. CS-101 LAYOUT AND MATERIALS PLAN – OVERALL
  - f. CS-102 LAYOUT AND MATERIALS PLAN - AREA B
  - g. CS-103 LAYOUT AND MATERIALS PLAN - AREA C
  - h. CS-300 SPORTS WAY PLAN AND PROFILE OVERALL
  - i. CS-301 SPORTS WAY PLAN AND PROFILE

- j. CS-302 SPORTS WAY PLAN AND PROFILE
- k. CS-303 SPORTS WAY PLAN AND PROFILE
- l. CS-304 SPORTS WAY PLAN AND PROFILE
- m. CS-305 SPORTS WAY PLAN AND PROFILE
- n. CS-306 SPORTS WAY PLAN AND PROFILE
- o. CS-307 SPORTS WAY PLAN AND PROFILE
- p. CS-308 SPORTS WAY PLAN AND PROFILE
- q. CS-401 PLAZA ENLARGEMENT
- r. CS-500 SITE DETAILS – HARDSCAPE
- s. CS-504 SITE DETAILS – FENCE
- t. CD-100 SITE PREPARATION PLAN – OVERALL
- u. CE-100 EROSION CONTROL PLAN – OVERALL
- v. CE-100 EROSION CONTROL AREA A
- w. CE-101 EROSION CONTROL AREA B
- x. CE-102 EROSION CONTROL AREA C
- y. CG-100 GRADING & DRAINAGE PLAN – OVERALL
- z. CG-101 GRADING & DRAINAGE PLAN – AREA A
- aa. CG-102 GRADING & DRAINAGE PLAN – AREA B
- bb. CG-103 GRADING & DRAINAGE PLAN – AREA C
- cc. CG – 500 GRADING DETAILS
- dd. CU-204 – SANITARY PLAN PROFILE
- ee. CU-205 – SANITARY PLAN PROFILE
- ff. CU-502 UTILITY DETAILS
- gg. CU-504 UTILITY DETAILS
- hh. IR-100 – IRRIGATION PLAN
- ii. ALT-200 - ALTERNATE 2 – ATHLETIC FIELD 3 IRRIGATION
- jj. ALT-201 - ALTERNATE 8 - CORE AREA IRRIGATION
- kk. IR-200 - IRRIGATION DETAILS
- ll. IR-201 - IRRIGATION DETAILS
- mm. E-000 - ELECTRICAL SYMBOLS LIST AND ABBREVIATIONS
- nn. E-101 - ELECTRICAL PLAN - AREA A
- oo. E-102 - ELECTRICAL PLAN - AREA B
- pp. E-103 - ELECTRICAL PLAN - AREA C
- qq. E-121 - TECHNOLOGY SYSTEMS PLAN AREA A
- rr. E-122 Technology Systems Plan Area B
- ss. E-500 - ELECTRICAL ONE-LINE DIAGRAM AND DETAILS
- tt. E-502 - ELECTRICAL SCHEDULES
- uu. E-503 - LIGHTING FIXTURE PRODUCT DATA
- vv. ALT-105 – ALTERNATE 5 – PARKING LOT 3
- ww. ALT-102 – ALTERNATE 2 – ATHLETIC FIELD 3

3. **Drawings – Volume 2:**

- a. G-002 - COVER SHEET - VOLUME 2
- b. G-101 - SHEET INDEX, GRAPHIC STANDARDS, AND ABBREVIATIONS
- c. A-001 - ARCHITECTURAL SITE PLAN
- d. A-101 - CONSTRUCTION PLANS – CONCESSIONS
- e. A-102 - FINISH PLAN & REFLECTED CEILING PLAN - CONCESSIONS
- f. A-111 - CONSTRUCTION PLANS - MAINTENANCE
- g. A-112 - FINISH PLAN & REFLECTED CEILING PLAN - MAINTENANCE
- h. A-201 - EXTERIOR ELEVATIONS – CONCESSIONS
- i. A-301 - BUILDING SECTIONS
- j. A-311 - WALL SECTIONS
- k. A-521 SECTION DETAILS
- l. A-551 FINISH & MILLWORK DETAILS
- m. A-611 OPENINGS SCHEDULES & TYPES
- n. S-101 SITE PLAN

**ELGIN SPORTS COMPLEX EXPANSION  
SCHEDULE OF PRICES**

**BASE BID LINES**

The total of all Bid Lines shall equal the Bidder's Total Lump Sum Bid.

1. Site Electrical (lump sum) Specification Volume 1 of 2 Division S-26	\$ _____
2. IT and Security (lump sum) Specification Volume 1 of 2 Divisions 27 and 28	\$ _____
3. Site Earthwork (lump sum) Specification Volume 1 of 2 Division S-31	\$ _____
4. Site Exterior Improvements (lump sum) Specification Volume 1 of 2 Divisions S-03, S-05 and S-32	\$ _____
5. Site Utilities (lump sum) Specification Volume 1 of 2 Division S-33	\$ _____
6. Restroom Concession Building (lump sum) Specification Volume 2 of 2, all "B" Divisions	\$ _____
7. Maintenance Building (lump sum) Specification Volume 2 of 2, all "B" Divisions	\$ _____
8. Any items not included in Bid Lines 1 thru 7 (lump sum) Provide description _____ _____	\$ _____
9. ALLOWANCE – Items ordered by the Engineer	\$ <u>2,000,000</u>
<b>TOTAL LUMP SUM BID</b>	\$ _____

**ALTERNATES**

1. Alternate No. 1: Synthetic Turf Alternative Infill and Shock Pad in lieu of rubber infill.
2. Alternate No. 2: Athletic Field #3 including earthwork, utilities, containment curb, synthetic turf, chain link fence and gates, backstop netting, irrigation and lighting in lieu of lawn and irrigation.
3. Alternate No. 3: Playground including earthwork, utilities, containment curb, playground turf, playground equipment, decorative fence, landscape and site furnishings in lieu of lawn.
4. Alternate No. 4: North Parking Lot #2 including earthwork, utilities, concrete curb, asphalt paving, permeable pavers, pavement markings and landscape in lieu of lawn.

5. Alternate No. 5: East Parking Lot #3 including earthwork, utilities, concrete curb, asphalt paving, permeable pavers, pavement markings, landscape and lighting in lieu of lawn.
6. Alternate No. 6: Plaza Permeable Pavers including earthwork, utilities and permeable pavers.in lieu of decorative concrete paving.
7. Alternate No. 7: West Parking Lot #1 Permeable Pavers including earthwork, utilities and permeable pavers in lieu of asphalt paving.
8. Alternate No.8 Native Landscape Year Three Maintenance.
9. Alternate No.9 Additional irrigation including valves, lines and sprinkler heads.



- o. S-110 CONCESSIONS BUILDING FOUNDATION PLAN
- p. S-111 CONCESSIONS BUILDING ROOF PLANS
- q. S-401 SUPERSTRUCTURE SECTIONS
- r. S-601 SCHEDULES
- s. E-301 CONCESSIONS LEVEL 1 POWER PLAN
- t. E-303 MAINTENANCE LEVEL 1 POWER PLAN
- u. E-701 ELECTRICAL SCHEDULES
- v. P-001 PLUMBING DATA SHEET
- w. P-301 CONCESSIONS LEVEL 1 PLUMBING PLAN
- x. P-401 CONCESSIONS BUILDING ROOF PLAN
- y. P-703 PLUMBING DETAILS

# INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

## 1. DEFINITIONS AND TERMINOLOGY

Definitions, of the General Terms and Conditions of the Contract (“General Terms and Conditions”) included in the Project Manual are incorporated by reference as if fully rewritten herein. In the event of a conflict between the definitions herein and those found in the General Terms and Conditions, the former shall govern for the purpose of this section only. All other terms which are not herein defined have their ordinary dictionary meaning.

**ADDENDUM (ADDENDA, PLURAL)**-An Addendum is a document issued by the City prior to the opening of the General Bids which clarifies, amends, or modifies the Bidding Documents or the Contract Documents.

**ALTERNATE BID**-An Alternate Bid (or An Alternate) is a proposal for work which is bid alternatively to the original bid proposal pursuant to instructions contained in the Bid Form. Such alternative bids may include proposals for work that is different in scope from that contained in the Base Bid.

**BASE BID**-A Base Bid is the sum proposed by a Bidder to perform the Work and does not include any Alternate Bids.

**BID**-A Bid is a proposal to do the Work for a specified sum and includes accompanying forms which are required to be submitted.

**BIDDER**-A Bidder is an entity that submits a Bid.

**BIDDING DOCUMENTS**-The Bidding Documents are comprised of the entire Project Manual, which includes, but is not limited to, the Invitation to Bid (advertisement), the Instructions to Bidders, all of the forms (e.g., Bid forms, sample Agreement form, bond forms), the wage rates, the General Terms and Conditions of the Contract, any supplementary terms and conditions thereto, the Drawings, the Specifications, and all addenda.

**BUSINESS DAYS**-Business days are defined as all days of the week excluding Saturdays, Sundays, and those holidays for which the City offices are closed for observance.

**CONTRACT DOCUMENTS**- The Contract Documents consist of the Agreement, the Certificates of Insurance, Bonds, Notice of Award, Notice to Proceed, General Conditions, Supplementary Conditions, Specifications, Drawings, Addenda, Contractor’s Bid, City Forms, and any subsequent written amendments to the documents listed herein.

**PROJECT**-The Project is the total Construction to be provided under the Contract Documents and the Work may be the whole or a part of the Project as indicated elsewhere in the Contract Documents and may include construction by the City or by separate contractors. The Project is the Work described in the Bidding Documents.

**PURCHASING DEPARTMENT**-The Purchasing Department refers to the City of Elgin Purchasing Department located at 150 Dexter Court, Elgin IL.

**WORK**-Work refers to the services and the entire completed construction or the various separately identifiable parts thereof required by the Contract Documents, including all labor, materials, and equipment furnished, furnished and incorporated into the Project, or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

## **2. COPIES OF BIDDING DOCUMENTS**

A Bidder may obtain complete sets of Bidding Documents <https://cityofelgin.ionwave.net/VendorRegistration/PreliminaryInfo.aspx>.

No partial sets of Bidding Documents shall be issued.

It is the responsibility of the Bidder to insure that it has obtained a complete set of Bidding Documents. Complete sets of Bidding Documents shall be used in preparing Bids. The City shall not be liable for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents, or any other reason, in preparing the Bids.

Distribution of the Bidding Documents is for the sole purpose of obtaining Bids and does not confer a license or grant permission for any other use of the Bidding Documents.

## **3. STATE WAGE RATE REQUIREMENTS**

The minimum prevailing wage rates are included with the Bidding Documents and apply to this Project. Bidder shall comply with all statutory requirements regarding prevailing wage rates.

Bidder, if awarded the contract, will keep accurate records showing the name, address, telephone number, social security number, occupation, hourly wages (including itemized hourly cash and fringe rates), hours worked each day, gross and net weekly wages for each laborer, worker and mechanic employed on the Work. The records shall be provided on a weekly basis to the City. The bidder shall collect and forward to the City the certified payrolls of all its subcontractors. The prevailing wage for any trade may change during the life of the Project. The selected Bidder and all its subcontractors shall be responsible for checking the Illinois Department of Labor web page (<http://www.state.il.us/agency/idol/>) to ensure that they are paying the current rate. If the City discovers any discrepancies between the prevailing wage rates as apply to the Work and the Bidder's payrolls, or if the Bidder or a subcontractor fails to submit payrolls, no further payments shall be made to the Bidder until the discrepancy is corrected.

## **4. QUESTIONS AND INTERPRETATIONS**

All questions about the meaning or intent of the Bidding Documents shall be submitted in writing to the City's Purchasing Director or applicable department contact specified in the Invitation no later than five calendar days prior to the date set for the opening of Bids. Any questions received after such time shall be answered at the discretion of the City.

Written clarifications or interpretations shall be issued by the Purchasing Department in the form of an Addendum. Only questions answered by an Addendum shall be binding. Oral clarifications or interpretations shall be without legal effect. Addenda shall either be faxed or emailed to all persons having received Bidding Documents from the Purchasing Department.

Each Bidder shall be responsible for determining that it has received all Addenda issued.

A Mandatory Pre-Bid meeting will be held on April 24, 2024 at 3:00 pm CDT. The meeting will be held at the Centre of Elgin, 100 Symphony Way, Elgin, IL 60120 in the Administration Offices conference room. The Mandatory Pre-Bid meeting will also be held via ZOOM at this link <https://us06web.zoom.us/j/5244460513?pwd=QXkzSkIOMjl2T1hKTVh2eG9hbG9Odz09&omn=89574302964>. Meeting ID: 524 446 0513, Passcode: 0K70sB. Or one tap mobile 13126266799,,5244460513#. Any entity planning to submit a Bid must attend or participate.

## 5. THE BID

### BIDDER'S REPRESENTATIONS.

In submitting a Bid, the Bidder represents that:

- it has read and examined the Bidding Documents thoroughly;
- it understands the Bidding Documents;
- the Bid is made in accordance with the Bidding Documents;
- it has visited the site, has become familiar with the conditions of the site and the surrounding area, and has familiarized itself with local conditions that may in any manner affect cost, progress, or performance of the Work;
- it has correlated its own observations with the Bidding Documents;
- it has found no errors, conflicts, ambiguities, or omissions in the Bidding Documents, except for those that it has brought to the City's attention either orally at a pre-bid conference or in writing at least five (5) calendar days prior to submitting its Bid;
- it is familiar with all of the applicable Federal, State, and City laws, rules, regulations, and procedures affecting its Bid and its Bid is in conformity with those laws, rules, regulations, and procedures;
- the Bidder has complied with every requirement of these Instructions and that the Bidding Documents are sufficient in scope and detail to indicate and convey an understanding of all terms and conditions for the performance of the Work; and
- Bidder hereby waives and releases any and all rights it may have pursuant to the Public Construction Contract Act, 30 ILCS 557/1 et.seq.

### BID CONTENTS.

The checklists below are included for the bidders' convenience only and shall not be construed to constitute a waiver or abridgement of the City's right to reject any or all bids.

A Bid shall include:

- a completed Bid form
- a Bid deposit;
- Certification Requirements
- Bidder's Employee Utilization
- Sexual Harassment Forms
- Responsible Bidder's Affidavit
- Qualifications of Bidder
- Signed Agreement

### RIGHT TO WAIVE INFORMALITIES AND PERMIT CURATIVE MEASURES.

The City reserves the right to waive any Bid informalities. The City may permit bidders who fail to include forms not otherwise required by law to cure such omission(s) within five days of bid opening, in the City's sole discretion

**Bid Deposits:** Unless otherwise stated, every Bid shall be accompanied by a Bid deposit in the form of an original Bid bond, certified check or a treasurer's, or cashier's check issued by a responsible bank or trust company, payable to the City of Elgin. The Bid bond shall be (a) in a form satisfactory to the City; (b) with a surety company qualified to do business in the state of Illinois and satisfactory to the City; and (c) conditioned upon the faithful performance by the bidder of the terms contained in the Bid. The Bid deposit shall be not less than *five percent ( 5%)* of the value of the Bid.

**Bids Forms.** Each Bid shall be submitted on the Bid form included in the Project Manual. In the case of a conflict between dollar figures and words, written amounts shall control over dollar figures. All blank spaces shall be filled. Any and all blank spaces shall constitute sufficient cause to reject any bid. The Bid form shall be completed in ink or by typewriter.

**Acknowledgment of Addenda.** Each Bidder shall acknowledge the receipt of all Addenda (the numbers of which are to be filled in on the Bid form by the Bidder). A Bidder's failure to acknowledge any Addendum shall constitute sufficient cause for rejection of a bid at the City's sole discretion.

**SUBMISSION OF A BID.**

Prior to the deadline for receipt of Bids, each Bid Bond shall be submitted to the Purchasing Department in a sealed envelope which is plainly marked on the outside with the name and address of the Bidder, the title of the Project, and the date and time of the Bid opening no later than **May 16, 2024 at noon CDT.** All Bid submissions must be entered into the City of Elgin's web portal at <https://cityofelgin.ionwave.net/VendorRegistration/PreliminaryInfo.aspx>, no later than **May 16, 2024 at 3:00 pm CDT.** Any Bid received after the deadline shall not be accepted. Any Bid submitted to any other office or department of the City and received by the Purchasing Department after the deadline for receipt of Bids shall not be accepted. It is the responsibility of the Bidder to ensure that its Bid is received by the Purchasing Department in a timely fashion. The deadline for receipt of Bids can be extended by Addendum only.

Bids may not be submitted orally, by facsimile, by telephone, or by any other method except for the method described above.

**MODIFICATION OF A BID.**

A Bid may be modified only by submitting any such modification executed in the same manner as a Bid, through the City of Elgin's web portal at <https://cityofelgin.ionwave.net/VendorRegistration/PreliminaryInfo.aspx>. Contact the Purchasing Department for instructions.

**WITHDRAWAL OF A BID.**

**Prior to Bid opening.** A Bid may be withdrawn before the time designated for opening Bids. All requests for withdrawal of a bid shall go through the City of Elgin's web portal at <https://cityofelgin.ionwave.net/VendorRegistration/PreliminaryInfo.aspx>. Contact the Purchasing Department for instructions. Withdrawal of a Bid prior to the Bid opening time shall not prejudice the right of a Bidder to resubmit a Bid. A Bid cannot be withdrawn after the Bid opening time except as provided in the Bidding Documents.

**After Bid opening.** In the case of death, disability, clearly apparent clerical error, a Bidder may withdraw its Bid after the time designated for Bid opening, if within five (5) days of the date designated for opening its Bid, such Bidder submits a statement under the penalties of perjury to the Purchasing Department detailing the basis for withdrawal. The City shall then make a determination as to whether

such Bidder shall be permitted to withdraw such bid. Such a determination shall be in the City's sole discretion. In such case, the Bid Deposit shall be returned to the Bidder.

**BID OPENING.**

All Bids received prior to the date and time designated for the Bid opening shall be available on the City's electronic web portal at <https://cityofelgin.ionwave.net/AwardedSourcingEvents.aspx>.

**PUBLIC BID REVIEW AND INSPECTION.**

Upon opening, all Bids become public records except for any portions thereof that are not subject to public disclosure as a matter of law.

Bids may be reviewed by the public in a manner set forth by the Purchasing Department.

Any Bidder who objects to a Bid may protest the Bid. Bid protests shall be governed by Elgin Municipal Code Chapter 5.26.

**LOCAL PURCHASING PREFERENCE:** Bids from responsible and responsive local businesses that do not exceed the lowest bid price from a responsive and responsible nonlocal business by more than two percent (2%) but no more than \$500 for contracts of \$25,000 or less or by more than one percent (1%) but no more than \$2,500 for contracts in excess of \$25,000 shall be awarded to the local businesses. A local business is a business authorized to do business under the laws of the City of Elgin, a business with its principal place of business located within the corporate limits of the City of Elgin, which has the majority of its regular, full-time workforce located within the City of Elgin and is subject to City of Elgin taxes including, but not limited to, sales taxes.

**6. RESERVATION OF RIGHTS TO REJECT BIDS**

The City reserves the right to reject any or all Bids, if it is in the public interest to do so.

The City reserves the right to reject the Bid of any Bidder who, either in its own right or through an affiliation with another entity which the City has determined has not completed a prior project, whether with the City or elsewhere, because of the fault of the Bidder, its Subcontractors or employees; has been declared in default on a prior contract whether with the City or elsewhere; has failed to complete a prior project in a timely fashion whether with the City or elsewhere; based on its work record, is not capable of performing the within Contract whether due to lack of sufficient prior experience, as determined by the City, or any other reason; has a work record of its Subcontractors demanding direct payment from the owner; has a work record of its Subcontractors, employees or material suppliers complaining to the City or other awarding authority regarding the Bidder's failure to pay them; has a record of complaints made to the City or other awarding authority by persons offended by the behavior of the Bidder, its Subcontractors or employees; or has a record of its failure to comply with State of Illinois and/or City laws or requirements. "Work record" or "record" constitutes a minimum of one event in the work history of the Bidder.

The City shall reject every Bid that is not accompanied by a Bid deposit.

**7. AWARD OF CONTRACT**

The City shall award the contract to the lowest responsible (as defined in Elgin Municipal Code Chapter 5.04) and responsive (as defined in Elgin Municipal Code Chapter 5.04) Bidder within 60 days after the date of the opening of the Bids. If the successful Bidder fails to execute a contract in accordance with the terms of its Bid and to furnish all applicable bonds, an award shall be made to the next lowest

responsible and responsive Bidder. The time limit provided above shall not be applicable to a second or subsequent award.

Any Bidder who fails to execute a contract and furnish applicable bonds shall forfeit its Bid deposit which shall become the property of the City. The amount retained by the City shall not exceed the difference between the lowest Bid price and the Bid price of the next lowest responsible and eligible bidder.

The City shall notify the selected Bidder and all other Bidders of the award.

The City shall submit to the selected Bidder a Notice of Award and at least four (4) unsigned copies of the Agreement between the City and the Contractor. The Bidder shall return all executed copies of the Agreement, all bonds and insurance certificates to the City's Purchasing Director within 10 Business Days of the notice of the notice of award.

The selected bidder will be required to furnish a Performance and Payment Bond equal to one hundred percent (100%) of the total contract price in accordance with the provisions stated in the Information for Bidders.

The selected Bidder shall also provide a written substance abuse program that conforms with the requirements of Public Act 095-0635, or a copy of its union contract that establishes a drug/alcohol testing program, prior to the performance of the Work.

Failure of the selected Bidder to submit such documents in a timely fashion as provided above may result in the withdrawal of the award, at the City's discretion. The City shall return one executed copy of the Agreement to the Contractor. Time is of the essence in the performance of the Agreement.

**ALL certified payroll must be submitted with an Application for Payment. All invoices go to City of Elgin Parks and Recreation Department, 100 Symphony Way, Elgin, IL 60120. All certified payroll should be submitted on a flash drive and mailed to City of Elgin Purchasing Department, 150 Dexter Court, Elgin, IL 60120 or emailed on a monthly basis to [denye\\_d@cityofelgin.org](mailto:denye_d@cityofelgin.org).**

## **8. COMPLETION TIME**

The selected Bidder shall commence work not less than 10 days following receipt of a written "Notice to Proceed" and shall substantially complete the project within 15 Months from the date of the Notice to Proceed. If any conflict exists between the date provided in the Agreement and these instructions, the Agreement shall prevail. Selected Bidder shall also pay as liquidated damages the sum of \$1,000 for each calendar day thereafter that the work remains unfinished.

Selected Bidder agrees that such liquidated damages constitute a reasonable, good faith estimate of damages actually incurred by the City and do not constitute a penalty. Such aforementioned liquidated damages shall constitute the sole recourse for the City for violation of this paragraph.

DAINA L. DENYE  
PURCHASING DIRECTOR

**END OF INFORMATION FOR AND INSTRUCTIONS TO BIDDERS**

SECTION 265668 – S - EXTERIOR ATHLETIC LIGHTING

PART 1 – GENERAL

1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for the Elgin Sports Complex using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The primary goals of this sports lighting project are:
  - 1. Guaranteed Light Levels: Light levels are guaranteed to not drop below specified target values for a period of 25 years.
  - 2. All maintenance costs shall be the responsibility of the athletic lighting vendor for the duration of the warranty.
  - 3. Control and Monitoring – The system shall include a remote on/off control system. Fields shall be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

1.2 ONFIELD LIGHTING PERFORMANCE

- A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below.

Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Field 3	30 Footcandles	2.5:1.0	104	30' X 30'
Field 2	30 Footcandles	2.5:1.0	104	30' X 30'
Field 1	30 Footcandles	2.5:1.0	104	30' X 30'
Parking North Lot 2	3 Footcandles	4.0:1.0	276	10' X 10'

- B. Color Temperature: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.
- C. Playability: Lighting design and luminaire selection should be optimized for playability by reducing on field glare and providing sufficient uplight.
  - 1. Aiming Angles: To reduce glare, luminaire aiming shall ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
  - 2. Glare Control Technology – Luminaires shall have glare control technology including, but not limited to: external visors, internal shields and louvers. No symmetrical beam patterns are acceptable.
  - 3. Mounting Heights: To ensure proper aiming angles, minimum mountings heights shall be as described below. Higher mounting heights may be necessary with luminaires with lesser glare control to meet field angle requirements of section 1.2.C.1.

# of Poles	Pole Designation	Pole Height
4	S1, S2, S7, S8	90'



4	S3, S4, S5, S6	100'
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1.3 ENVIRONMENTAL LIGHT CONTROL

- A. Spill Light and Glare Control: Spill light and candela values must not exceed the following levels taken at 3 feet above grade.

Edge of Highway 20	Average	Maximum
Specified Spill Line Horizontal Footcandles	.05 fc	.5 fc

- B. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be provided in 30-foot intervals along the boundary line at 3 ft above grade.
- C. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer’s laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.
- D. Field Verification: Lighting manufacturer shall supply field verification of environmental light control using a meter calibrated within the last 12 months:
1. Spill verification: Illumination levels shall be taken in accordance with IESNA RP-6-22. The light sensing surface of the light meter should be held 36 inches above the playing surface with the sensing surface horizontal (for horizontal readings) or vertically pointed at the brightest light bank (for max vertical readings)

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting product.
1. Arrange in order of luminaire designation.
  2. Include data on features, accessories, and finishes.
  3. Include physical description and dimensions of the luminaires.
  4. Ballast, including BF, UL listing and recognition, ANSI certification, and Energy Independence and Security Act of 2007 compliance.
  5. Lamps, including life, output (lumens, CCT, and CRI), and energy-efficiency data.
  6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides," of each lighting luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.
    - a. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    - b. Manufacturer Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
  7. Means of attaching luminaires to supports and indication that attachment is suitable for components involved.
- B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
  2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

- D. Delegated-Design Submittal: For exterior athletic lighting indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Drawings and specifications for construction of lighting system.
  2. Manufacturer's determination of LLF used in design calculations.
  3. Lighting system design calculations for the following:
    - a. Target illuminance.
    - b. Point calculations of horizontal and vertical illuminance, CV, and UG at minimum grid size and area.
    - c. Point calculations of horizontal and vertical illuminance in indicated areas of concern for spill light.
    - d. Calculations of source intensity of luminaires observed at eye level from indicated properties near the playing fields.
  4. Electrical system design calculations for the following:
    - a. Short-circuit current calculations for rating of panelboards.
    - b. Total connected and estimated peak-demand electrical load, in kilowatts, of lighting system.
    - c. Capacity of feeder required to supply lighting system.
  5. Wiring requirements, including required conductors, cables, and wiring methods.
  6. Structural analysis data and calculations used for pole selection.
    - a. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, complies with AASHTO LTS-6-M for location of Project.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
- 2 Luminaires.
  - 3 Luminaire support structures.
  - 4 Limits of athletic fields.
  - 5 Proposed underground utilities and structures.
  - 6 Existing underground utilities and structures.
  - 7 Athletic field support structures

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For entire system including operation and maintenance manuals.
- B. Manufacturer shall provide in-person on-site training.

### PART 2 – PRODUCTS

#### 2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

- C. System Description: Lighting system shall consist of the following:
1. Galvanized steel poles and cross-arm assembly or concrete poles. Light pole foundation shall be delegated design provided by the lighting manufacturer.
  2. Manufacturer will supply all drivers and supporting electrical equipment.
    - a. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
  3. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections.
  4. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
  5. Control cabinet to provide remote on-off control and monitoring of the lighting system.
  6. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    - a. Integrated grounding via concrete encased electrode grounding system.
    - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.
- D. Safety: All system components shall be UL listed for the appropriate application.

## 2.2 ELECTRICAL

- A. Electric Power Requirements for the Sports Lighting Equipment:
1. Electric power: Voltage and phasing to be confirmed.
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

## 2.3 CONTROL

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Contactor control of lights: Circuits must be controlled via contactor switching, not dimming driver output to zero.
- D. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming will be set via scheduling options (Website, app, phone, email)
- E. Remote Lighting Control System: System shall allow users with a security code to schedule on/off system operation via a web site, phone, or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

- F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS and Android devices.
- H. Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system.
  - 1. Cumulative hours: shall be tracked to show the total hours used by the facility.
  - 2. Report hours saved by using early off and push buttons by users.
- I. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- J. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

2.4 STRUCTURAL PARAMETERS

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 115 and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report.
- K. Foundation Drawings: Project specific foundation drawings stamped by an Illinois registered structural engineer are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

2.5 MANUFACTURER

- A. Approved Product: Musco’s Light-Structure System™ with TLC for LED®, or approved equal.
- B. Substitution requests shall include the following:

Yes/ No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer’s local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: <ul style="list-style-type: none"> <li>a. Field Name, date, file number, prepared by</li> <li>b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x &amp; y), Illuminance levels at grid spacing specified</li> <li>c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics</li> <li>d. Height of light test meter above field surface.</li> <li>e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number</li> </ul>

			of luminaries, total kilowatts, average tilt factor; light loss factor.
<b>D</b>	Off Field Lighting Design		Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
<b>E</b>	Photometric Report		Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
<b>F</b>	Performance Guarantee		Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
<b>G</b>	Structural Calculations		Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Illinois, if required by owner. (May be supplied upon award).
<b>H</b>	Control & Monitoring System		Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system and entertainment system. They will also provide ten (10) references of customers currently using proposed system in the state of Illinois.
<b>I</b>	Electrical Distribution Plans		Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Illinois.
<b>J</b>	Warranty		Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Illinois.
<b>K</b>	Project References		Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Illinois. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
<b>L</b>	Product Information		Complete bill of material and current brochures/cut sheets for all products being provided.
<b>M</b>	Delivery		Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
<b>N</b>	Non-Compliance		Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.

**PART 3 – EXECUTION**

**3.1 FIELD QUALITY CONTROL**

- B. Illumination Measurements: Upon substantial completion of the project, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.
- C. Field Light Level Accountability
  - 1. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system one year from the date of commissioning of the lighting.
  - 2. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- D. Correcting Non-Conformance: If, in the opinion of the Owner, the actual performance levels including footcandles, uniformity ratios, and offsite candela readings are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

**3.4 WARRANTY AND GUARANTEE**

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
  
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

END OF SECTION

## **SECTION 270413 - COMMON SUBMITTAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes:
  - 1. Supplementary administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, Closeout Documents, and other submittals specific to the work of this Division.

#### **1.2 RELATED DOUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 01 submittal requirements.
- C. This section is inclusive of all Division 27 sections.

#### **1.3 DEFINITIONS**

- A. Contractor: Refers to an entity in direct Contract with the Owner to furnish and/or perform any portion of the Work of the Contract, including but not limited to a Construction Manager.
  - 1. Contractor shall review and approve Product Submittals prior to forwarding them to the Architect.
- B. Product Submittals: In general, Product Submittals show characteristics of the proposed construction in the following forms:
  - 1. Shop Drawings.
  - 2. Product Data.
  - 3. Samples.
- C. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- D. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- E. Certification Information: In general, Certification Information includes any requirements for Contractor Certification specific to this Division, as identified within other Division 27 specifications.
- F. Closeout Documentation: In general, Closeout Documentation includes post construction items the following forms:
  - 1. As-Built Drawings.
  - 2. Operation and Maintenance Manuals (O&Ms).
  - 3. Certification and/or Test Results.
  - 4. Warranty Information.

#### **1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

- A. Requirements specified for submittals are intended to provide efficient handling, while permitting review responsibilities to be carried out.
- B. **Avoidable Resubmittals:** The first two reviews of each specified submittal will be processed without cost to the Contractor. After the second review, the Owner may charge the Contractor for the cost of such additional processing, unless the processing results from approved Change Orders causing revisions to previously approved submittals.
- C. **Coordination:** Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- D. **Processing Time:** Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. **Initial Review:** Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
  - 2. When a large volume of submittal materials is scheduled, additional review time may be required. Similarly, a particular submittal may require review completion in less than the agreed normal time. Due to variations in submittal volume and processing needs, agreed review time is not intended to apply to extreme conditions.
  - 3. **Resubmittal Review:** Allow 10 business days for review of each resubmittal.
  - 4. **Sequential Review:** Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.
- E. Maintain at the Project Site ready access to the latest reviewed Shop Drawings and Product Data, and one set of samples.

#### **1.5 DELEGATED-DESIGN SERVICES**

- A. **Definitions:**
  - 1. **Delegated Design:** A portion or component of the Work identified by the Contract Documents to be designed by the Contractor, or an entity assigned by the Contractor, to satisfy performance and design criteria specified in the Contract Documents for that portion or component.
  - 2. **Registered Design Professional:** Design professional, assigned by the Contractor, who is responsible for providing the delegated design work, and for certifying that the work is in compliance with the specified performance requirements and design criteria. Design professional shall be legally qualified to practice in jurisdiction where Project is located and shall be experienced in providing delegated design services of the kind indicated. Delegated design services are defined as those performed for installation of the system, assembly or product that are similar in material, design, and extent to those indicated for this Project.
- B. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.



- C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## **PART 2 - PRODUCTS – NOT USED**

## **PART 3 - EXECUTION**

### **3.1 CONTRACTOR'S REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Combine with Submittal Review Sheet before submitting to Architect.
1. Submittal Compliance Form: Allowed in lieu of some product data and sample submittals. See individual specification sections for specific allowable use. By submitting the form, the Contractor certifies that all products specified in the Section are being submitted exactly as indicated, including all options and features indicated, with no substitutions or comparable products. Where a Basis-of-Design manufacturer/product is indicated, along with a list of other manufacturers, the Contractor certifies that only the Basis-of-Design manufacturer/product will be provided and not any other listed manufacturers/products. Where a single manufacturer/product is indicated, even if specified as "available manufacturer" or manufacturer "included but not limited to the following", Contractor certifies that only the indicated single manufacturer/product will be provided.
    - a. Obtain a copy of the Submittal Compliance Form from the Architect, fill in the information required and include as a line item on the Submittal Cover Sheet for each applicable Submittal.
    - b. Upon receipt, the Architect will complete the form in the space below "Architect Action" and indicate the Action on the Submittal Cover Sheet.
- B. Project Closeout and Maintenance Material Submittals:
1. As-Built Drawings.
  2. Operation and Maintenance Manuals (O&Ms).
  3. Certification and/or Test Results.
  4. Warranty Information.
  5. See additional requirements in Division 01.
- C. Be responsible for quantities, weights, and dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes and to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of every trade, supplier, and subcontractor.
- D. Be responsible for each submittal to be in conformance with information given and the design intent expressed in the Contract Documents.
- E. Provide with each submittal specific written notice of any variation from the requirements of the Contract Documents by causing a specific notation to be made on the Submittal Review Sheet and Submittal Transmittal.
- F. Product substitution of any specified "Basis-of-Design manufacturer/product" will not be considered without prior, written Architect pre-approval of the proposed substitution manufacturer/product.

**3.2 ARCHITECT'S AND GENERAL CONTRACTOR'S ACTION**

- A. General: Architect will not review submittals that do not include the Submittal Review Sheet.
- B. Action Submittals: Architect's staff and consultants will review the submittal, and mark the Submittal Review Sheet with an action code. The code meanings are described below.
- C. Additional codes may be provided within comments or as an electronic submittal review stamp and shall be used in help indicating return of partial submittals.
- D. The Final Review Code on the Submittal Review Sheet prevails and governs the action of the overall submittal.
- E. Review Code meanings are as follows:
  - 1. Action Codes Permitting Use:
    - a. When an action code permitting use is assigned to a submittal, it does not authorize work that does not comply with the requirements of the Contract Documents. Acceptance of the Work will depend on compliance.
    - b. Code AP - Approved: The Work covered by the submittal item may proceed, provided it complies with Contract Document requirements.
    - c. Code AN - Approved as Noted: The Work covered by the submittal item may proceed, provided it complies with the Architect's notations and Contract Document requirements.
    - d. Code AN-R - Approved as Noted - Resubmit: Do not deliver or install the related work until the resubmittal has received Code AP or AN. However, fabrication and other off-site work covered by the submittal item may proceed, at the Contractor's risk, provided it complies with the Architect's notations and Contract Document requirements.
  - 2. Action Code Prohibiting Use:
    - a. Action Code REJ - Not Approved: The Work covered by the submittal item, including purchasing, fabrication, delivery, and other activity, shall not proceed. Revise the submittal item or prepare a new item in accordance with the Architect's notations. Resubmit the corrected or new item without delay; do not permit submittal items marked "Not Approved" to be used. Work incorporating such items will be rejected.
  - 3. Action Code for Items Not Required:
    - a. Action Code X - Not Requested by Contract Documents: The submittal item is not called for by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.
- F. Informational Submittals: For Architect's information only. Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
  - 1. Action Code for Information Only:
    - a. Action Code INF - Information Only - Received: The submittal item is not called for a return with a reviewed action code by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.
- G. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- H. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- I. Architect will return without review submittals received from sources other than the Contractor.
- J. Submittals not required by the Contract Documents may be returned by the Architect without action.
  - 1. Do not submit Material Safety Data Sheets. They will be returned without review.

### 3.3 SUBMITTAL TRANSMITTAL REQUIREMENTS

- A. Submittal Transmittal shall be a PDF file in electronic format. It is recommended, to expedite the submittal review, the electronic form be emailed for review to the Architect as early as possible.
  - 1. Submittal Numbering: See below.
  - 2. Contact Information: Full Name, Phone Number and Email Address.
  
- B. Submittal Definition
  - 1. Each submittal consists of items from only ONE Specifications section.
  - 2. Complete Submittal: If ALL the items required by the Specifications section are listed on one Submittal Form (including continuation sheet), it is a complete submittal.
  - 3. Partial Submittals: If it is necessary to divide the required items of a given Specifications section into two or more submittals to meet schedule or handling requirements, the separate submittals are partial submittals. All partial submittals have the same submittal number and are differentiated by sequential P-numbers (see below).
  - 4. All items in each submittal, whether complete or partial, will be processed together: Individual items will not be 'broken out' for special handling. Arrange submittals accordingly.
  
- C. Submittal Numbering
  - 1. Number submittals as described below to assist tracking.
  - 2. Number each submittal in the format nnnnnn-pp.
    - a. The 6-digit number is the number of the section that requires the submittal. For example, 044200.
    - b. The 2-digit number is based on the numerical sequence of submittals from that section. In other words, for each section, the first submittal is 01, the second is 02, and so on. The 2-digit number does not change for partial or re-submittals, so that the submittal can be tracked.
    - c. P-Number for Partial Submittals: Number each partial submittal in the ppp space, beginning with P1, and increasing by one for each partial submittal of that submittal. If the submittal is a complete submittal, leave the P space blank.
    - d. R-Number for Re-submittals: Number each re-submittal in the rrr space, beginning with R1, and increasing by one for each re-submittal of that submittal. Do not include an R-Number for the initial submittal.
    - e. Examples:
      - 1) Initial Complete Submittal: 044200-01. First Re-Submittal: 044200-01-R1.
      - 2) Initial Partial Submittal: 044200-01-P1. Second Partial Submittal: 0044200-01-P2. First Re-submittal of Second Partial Submittal: 044200-R1-P2.

### 3.4 SUBMITTAL REVIEW SHEET REQUIREMENTS

- A. Provide Submittal Review Sheet in PDF format. Submit as the page after the Submittal Transmittal.
- B. When attached, the Submittal Review Sheet shall not obscure information contained in the submittal.
- C. Do not edit any of the information contained within the Submittal Review Sheet except as follows:
  - 1. Submittal Number: See Submittal Numbering in Submittal Transmittal Requirements paragraph.
- D. The Contractor shall submit the PDF file in a manner that will allow editing of the Submittal Review Sheet fields by SmithGroup and its consultants.

END OF SECTION

## **SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Grounding conductors.
  - 2. Grounding connectors.
  - 3. Grounding busbars.

#### **1.2 RELATED DOUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Vol 2 Drawings, sheets E301 and E303.
- C. This section is inclusive of all Division 27 sections.

#### **1.3 DEFINITIONS**

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TBB: Telecommunications bonding backbone.
- D. TGB: Telecommunications grounding busbar.
- E. TMGB: Telecommunications main grounding busbar.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product to be used on Project.
- B. Shop Drawings: For communications equipment room signal reference grid. Include plans showing equipment locations, elevations, conductor routing, riser diagram, details, and attachments to other work.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. As-Built Data: As-Built Drawings showing final locations of grounding and bonding infrastructure, including the following:
  - 1. BCT, TMGB, TGBs, and routing of associated bonding conductors.
- B. Qualification Data: For Installer, installation supervisor, and field inspector.
- C. Qualification Data: For testing agency and testing agency's field supervisor.
- D. Field quality-control reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - 1. Include the following:
    - a. Result of the ground-resistance test, measured at the point of BCT connection.
    - b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Installation Supervision: Installation shall be under the direct supervision of ITS Installer 2 who shall be present at all times when Work of this Section is performed at Project site.
  - 2. Field Inspector: Currently registered by BICSI as a Registered Communications Distribution Designer (RCDD) to perform the on-site inspection.

## PART 2 - PRODUCTS

### 2.1 SYSTEM COMPONENTS

- A. Comply with ANSI/TIA-607-D, Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises.

### 2.2 CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Harger Lightning and Grounding
  - 2. Panduit Corp
  - 3. Tyco Electronics Corp
- B. Comply with UL 486A-486B.
- C. Insulated Conductors:
  - 1. Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
  - 2. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
  - 3. Cable Tray Equipment Grounding Wire: No. 6 AWG.
- D. Cable Tray Grounding Jumper:
  - 1. Not smaller than No. 6 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.
- E. Bare Copper Conductors:
  - 1. Solid Conductors: Comply with ASTM B 3.
  - 2. Stranded Conductors: Comply with ASTM B 8.
  - 3. Tinned Conductors: Comply with ASTM B 33.
  - 4. Bonding Conductor sizing: Refer to Part-3 Execution within for sizing requirements.

## 2.3 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. B-Line Systems.
  - 2. Burndy Corp.
  - 3. Chatsworth Products.
  - 4. Harger Lightning and Grounding.
  - 5. Panduit Corp.
- C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
  - 1. Electroplated tinned copper, C and H shaped.
- D. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.
- E. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.
- F. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.4 GROUNDING BUSBARS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. B-Line Systems
  - 2. Burndy Corp
  - 3. Chatsworth Products
  - 4. Harger Lightning and Grounding
  - 5. Panduit Corp
- B. TMGB: Provide where indicated on drawings. Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, 24" in length. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.
  - 1. Predrilling shall be with holes for use with lugs specified in this Section.
  - 2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
  - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- C. TGB: Provide where indicated on drawings. Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, 10" in length. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
  - 1. Predrilling shall be with holes for use with lugs specified in this Section.
  - 2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
  - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

- D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
  2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
  3. Rack-Mounted Vertical Busbar: 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

## 2.5 LABELING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brother International Corp
  2. HellermannTyton
  3. Panduit Corp
- B. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
- B. Inspect the test results of the ac grounding system measured at the point of BCT connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
- B. Comply with the latest revision of the following:
1. ANSI/TIA-607-D: Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises.
  2. ANSI/IEEE Std C2: 2007 National Electrical Safety Code (NESC).
  3. ANSI/IEEE Std 1100-2005: Recommended Practice for Powering and Grounding Electronic Equipment.
  4. ANSI/NFPA-70: 2011 National Electrical Code (NEC).
  5. ANSI/TIA-606-D: Administration Standard for Telecommunications Infrastructure.

6. NECA/BICSI 607-2011: Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings.
  7. Applicable local Codes, Regulations, or Ordinances.
- C. Where conflict may exist, NEC and applicable local Codes or Ordinances take precedence over low-voltage cabling Standards. Contractor is responsible make Architect aware of any conflicts between project documents and referenced codes or standards, prior to work. Contractor is responsible to remedy field installed code violations at Contractor's expense.

### **3.3 APPLICATION**

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
  2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
- B. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  3. Connections to Ground Rods at Test Wells: Bolted connectors.
  4. Connections to Structural Steel: Welded connectors.
- C. Conductor Support:
1. Secure grounding and bonding conductors at intervals of not less than 36 inches.
- D. Grounding and Bonding Conductors:
1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
  2. Install without splices.
  3. Support at not more than 36-inch intervals.
  4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
    - a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing, and bond both ends of the conduit to a TGB.

### **3.4 GROUNDING ELECTRODE SYSTEM**

- A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 (BCT length up to 52 feet), and not smaller than No. 3/0 (if BCT length is longer than 52 feet). Where specifically indicated on contract Drawings, BCT size indication on the Drawings shall dictate.

### **3.5 GROUNDING BUSBARS**

- A. Within telecommunications rooms, install busbars horizontally, on insulated spacers 2 inches minimum from wall. Locate 12 inches above finished floor, unless otherwise indicated on contract Drawings.

### **3.6 CONNECTIONS**

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.



- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
  - 1. Use crimping tool and the die specific to the connector.
  - 2. Pre-twist the conductor.
  - 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
- E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications bonding backbone (TBB) conductor. If more than one TMGB is installed, interconnect TMGBs using a grounding equalizer (GE) conductor. The telecommunications bonding backbone conductor and grounding equalizer conductor size shall not be less than 2 kmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG, unless otherwise indicated. Where specifically indicated on contract Drawings, TBB size indication(s) on the Drawings shall dictate.
- F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
- G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
- H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.
- I. Shielded Cable: Where screened twisted-pair cables and/or coaxial cables are installed in communications rooms, bond the shield of shielded cable to the signal ground. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.
- J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
- K. Access Floors: Bond all metal parts of access floors to the TGB.
- L. Ground system equipment and components as required, according to manufacturer's written instructions.

### **3.7 IDENTIFICATION**

- A. Labels shall be preprinted or computer-printed type.
  - 1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
  - 2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
  - 3. Label the BCT and each telecommunications bonding backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

### **3.8 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI Telecommunications Distribution Methods Manual (TDMM). Conduct tests with the facility in operation.
    - a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
  - 3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
    - a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.
- D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.
- E. Grounding system will be considered defective if it does not pass tests and inspections. Correct and retest grounding system until it passes applicable tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Backboards.
  - 2. 19-inch equipment cabinets.
  - 3. Cable managers.
  - 4. Power distribution units/UPS units.
  - 5. PoE edge and aggregation switches.
  - 6. Identification products.

#### **1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105.
- C. Refer to Vol 2 Drawings, sheets E301 and E303.
- D. This section is inclusive of all Division 27 sections.
- E. Owner Technology Standards:
  - 1. Refer to owner technology standards, as applicable to the Project.

#### **1.3 DEFINITIONS**

- A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.
- B. BICSI: Building Industry Consulting Service International.
- C. LAN: Local area network.
- D. RCDD: Registered communications distribution designer.
- E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.
- F. TDMM: BICSI Telecommunications Distribution Methods Manual
- G. TGB: Telecommunications grounding bus bar.
- H. TMGB: Telecommunications main grounding bus bar.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product to be used on Project.
- B. Shop Drawings: Reviewed and stamped by RCDD.

1. As part of communications system shop drawings, include telecom room enlarge plans, elevations, sections, typical details, and attachments to other work.
2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
4. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

C. Sustainable Design Submittals, if applicable to Project.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:
1. Certifications for RCDD, installation supervisor, and field inspector.
  2. Certification from cabling manufacturer.
- B. Field quality-control reports.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Closeout Documentation: In general, Closeout Documentation includes the following post construction items:
1. As-Built Drawings: Provide all items listed under Shop Drawings submittal. Show all information in the As-Built Drawings in its final installed condition, as was constructed.
  2. Operation and Maintenance Manuals (O&Ms).
  3. Warranty Information.

#### **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
  2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
  3. Field Inspector: Currently certified by BICSI as an RCDD to supervise on-site inspection.

#### **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install equipment until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

#### **1.9 COORDINATION**

- A. Coordinate telecom equipment room layouts, power requirements, and equipment rack elevations with owner IT prior to work.
- B. Coordinate power circuit requirements within telecom equipment rooms with EC and other trades, as applicable to scope of work.
- C. Coordinate related communication services within telecom equipment rooms with access providers, service providers, and owner IT.

## **PART 2 - PRODUCTS**

### **2.1 DRAWING REFERENCE**

- A. Refer to Vol 2 Drawings, sheets E301 and E303, for locations of support building equipment rooms.
  - 1. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105.
  - 2. Sheet E301: Concessions Building, Mech/Elec Room 102
  - 3. Sheet E303: Maintenance Building, Mechanical Room M102

### **2.2 GENERAL REQUIREMENTS FOR EQUIPMENT ROOM FITTINGS**

- A. Equipment room racks, cabinets, fittings, and accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
- B. UL listed.
- C. RoHS compliant.

### **2.3 BACKBOARDS**

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.
  - 1. If painted, leave fire rating stamp visible.

### **2.4 19-INCH EQUIPMENT CABINETS**

- A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inchequipment mounting with an opening of 17.72 inchesbetween rails.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- C. General Requirements:
  - 1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
  - 2. Material: Extruded steel.
  - 3. Finish: Manufacturer's standard, baked-polyester powder coat.
  - 4. Color: Black.
- D. Modular Wall Cabinets:
  - 1. Number of usable Rack Units:
    - a. Concessions Building: 18 RU
    - b. Maintenance Building: 24 RU
  - 2. Pivoting type wall rack with fixed wall base.
  - 3. Equipment Access: Front door, and integral rack swing.
  - 4. Overall Width: 23.4 inches.
  - 5. Depth: 26.3 inches overall, 24 inches usable.
  - 6. Threads: 10-32, or as required for supplied rack.
  - 7. Hinged and lockable front door.
  - 8. Screened ventilation openings in side panels.
  - 9. Cable access provisions in all sides of wall mount base.
  - 10. Grounding lug.
  - 11. Provide optional 550cfm roof mount fan, x2 per cabinet.
  - 12. Provide supplemental rack heater within cabinet, 400W, Hoffman or equivalent.
  - 13. All cabinets keyed alike

## 2.5 CABLE MANAGERS

- A. General Requirements:
  - 1. Provide cable management within telecom equipment rooms.
  - 2. Metal, baked-polyester powder coat finish, black.
- B. Manufacturer: Subject to compliance with requirements, match supplied equipment rack manufacturer.
- C. Horizontal Cable Managers within Cabinets
  - 1. Provide horizontal cable managers in equipment racks.
  - 2. Cable manager with integral wire retaining fingers, 19" rack mount, 2U (3.5") high, 5" deep.
  - 3. Provide one horizontal cable manager for each supplied Category cable patch panel, and each supplied fiber optic patch panel, or quantity of cable managers as indicated on Drawings.
  - 4. Coordinate telecom room equipment rack elevations and cable manager placement with owner IT.
- D. Cable Management on Telcom Backboard
  - 1. Provide 12"W cable runway ladder rack mounted on telecom backboard, as required to manage fiber and copper communications cabling within the equipment room, which is routed IT cabinet.
  - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Legrand Cablofil
    - b. Chatsworth Products
    - c. B-Line Systems
    - d. Hubbell
  - 3. Description:
    - a. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
    - b. Width: 12 inches, unless otherwise indicated on Drawings.
    - c. Height: 1.5 inches, unless otherwise indicated on Drawings.
    - d. Rung Spacing: 9" inches, unless otherwise indicated on Drawings.
    - e. Class Designation: Comply with NEMA VE 1, minimum Class 8A.
    - f. Splicing Assemblies: Bolted type using serrated flange locknuts.
  - 4. Provide supplemental wall-mount, metal D-Ring brackets, only as necessary, for peripheral cable management on telecom backboard.

## 2.6 POWER DISTRIBUTION UNITS

- A. Description: Power Distribution Units (PDUs) provide reliable rack-mount power distribution via a single input with multiple output receptacles.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. APC
  - 2. Eaton Tripp-Lite
- C. General Requirements:
  - 1. Listed and labeled as defined in NFPA 70, and marked for intended location and application.
  - 2. Comply with UL 1363 and UL/IEC 62368.
  - 3. Provide power distribution and surge protection, UL 1449 Type 3.
  - 4. Network management and active monitoring.
  - 5. Power cycling and reboot control.
  - 6. Single input, power circuit and connection type varies, per owner.
  - 7. Horizontal Application:
    - a. Rack mount, with detachable flanges.
    - b. Rear-facing receptacles.

- c. Height: 1 RU.
- d. Min (10) 5-20R outlets.

- D. Provide one horizontal PDU for each supplied equipment rack or cabinet.
- E. Coordinate telecom room equipment rack and cabinet elevations and PDU placement with owner IT.

## 2.7 UPS UNITS

- A. Description: Uninterruptible Power Supply (UPS) provide stand along back-up power in the event of mains power failure.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. APC
  - 2. Eaton Tripp-Lite
  - 3. CPI General Requirements:
    - 1. Listed and labeled as defined in NFPA 70, and marked for intended location and application.
    - 2. Comply with UL 1363 and UL/IEC 62368.
    - 3. Network management and active monitoring.
    - 4. Power cycling and reboot control.
    - 5. Rack mount UPS.
    - 6. Provide min 4 hour back-up for connected load; min 450VA.
- D. Provide one UPS for each supplied equipment rack or cabinet.
- E. Coordinate telecom room equipment rack and cabinet elevations and UPS placement with owner IT.
- F. UPS will be monitored by owner IT network for loss of input power or device alarms.

## 2.8 POE EDGE AND AGGREGATION SWITCHES

- A. Provide PoE edge switches and fiber SPF aggregation switches within equipment rooms.
  - 1. PoE switches will be used to connect local devices, attached to or within the respective buildings.
  - 2. SPF aggregation switches will be used to connect remote security cameras located on site light poles, connected with fiber media.
    - a. Aggregation switch SPF modules for security camera fiber circuits will be provided by security contractor, refer to section 282300.
- B. Switch manufacturer(s) will be owner IT standard, Extreme Networks and Ubiquiti products, no substitutions.
- C. Provide the following switches:
  - 1. Concessions Building, Mech/Elec Room 102:
    - a. (1) Extreme Networks 5320-24P-8XE PoE+ switch
  - 2. Sheet E303: Maintenance Building, Mechanical Room M102
    - a. (1) Extreme Networks 5320-48P-8XE PoE+ switch
    - b. (1) Extreme Networks 5520-24X SPF aggregation switch
      - 1) SPF modules provided by security contractor
  - 3. Confirm above product models with owner IT prior to procurement.
- D. Coordinate switch installation and configuration requirements with owner IT prior to work.

## **2.9 WIRELESS ACCESS POINTS (AP)**

- A. Provide and install wireless APs, where indicated on Drawings, refer to:
  - 1. Vol 1 Drawings, sheet E-122, outdoor pavilion.
  - 2. Vol 2 Drawings, sheet E301 Concessions Building.
  - 3. Vol 2 Drawings, sheet E303 Maintenance Building.
- B. AP manufacturer will be owner IT standard, Ubiquiti UniFi AP products.
- C. Provide the following wireless APs:
  - 1. Ubiquiti UniFi U6 Long-Range.
  - 2. No substitutions.
  - 3. Confirm product model with owner IT prior to procurement.
- D. Coordinate AP installation and configuration requirements with owner IT prior to work.

## **2.10 IDENTIFICATION PRODUCTS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Brady Worldwide
  - 2. HellermannTyton
  - 3. Panduit
- B. Comply with TIA-606-C and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine equipment room pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerances, and other conditions affecting installation.
- B. Examine roughing-in for equipment room communications conduit pathways to verify actual locations of conduit and back boxes before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Comply with TIA/EIA 606-D, "Administration Standard for Commercial Telecommunications Infrastructure."
- B. In meetings with Architect and Owner, present, review and coordinate Project planning documents.
- C. Verify and obtain all necessary licenses and construction permits required to complete the Project scope.

### **3.3 INSTALLATION**

- A. Drawings indicate general arrangement and layout of equipment and fittings within telecom equipment rooms.



- B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.
- C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.
- D. Backboards:
  - 1. Install from 24 inches to 10 feet above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
  - 2. Paint all sides of backboard with two coats of paint, leaving fire rating stamp visible. Confirm painting requirement and color with owner IT.
  - 3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.
- E. Coordinate layout and installation of communications equipment in racks and in room. Coordinate service entrance configuration with service provider.
  - 1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.
  - 3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
  - 4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
- F. Coordinate location of power raceways and receptacles with locations of communications and other equipment within telecom rooms requiring electrical power to operate.
- G. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- H. Comply with NECA 1.

### **3.4 INSTALLATION OF PATHWAYS**

- A. Drawings indicate general arrangement and routing of primary cabling pathways.
- B. Comply with the following Sections:
  - 1. 260533 "Raceways and Boxes for Electrical Systems"

### **3.5 FIRESTOPPING**

- A. Comply with project Penetration Firestopping specification, for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM "Firestopping Systems" article.

### **3.6 GROUNDING**

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" chapter.
- C. Comply with TIA-607-D and NECA/BICSI-607.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

### **3.7 IDENTIFICATION**

- A. Comply with requirements of TIA/EIA 606-C.

### **3.8 FIELD QUALITY CONTROL**

- A. Perform equipment room field inspections:
  - 1. Prior to permanently affixing racks, overhead cable runway, and related equipment room fittings, field walk each telecom with owner IT, to review and confirm the equipment layouts as planned.
  - 2. Following installation of racks and other primary equipment room fittings, arrange with owner IT to field survey each telecom room for progress review and owner approval of layout(s). Make necessary adjustments as requested by owner.
  - 3. After installing telecom equipment room racks and fittings, survey for compliance specifications and referenced standards documents.
  - 4. Visually inspect all associated equipment for damage and correct any deficiencies.
  - 5. Check bolted connections between equipment components. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
  - 6. Visually inspect each rack, cable tray and metallic equipment for grounding and bonding connections, check for improperly sized or installed bonding jumpers.
  - 7. Coordinate telecom room equipment rack and cabinet elevations with owner IT prior to terminating communications horizontal or backbone cabling within equipment room racks or cabinets.
- B. Prepare test and inspection reports.

END OF SECTION

## **SECTION 271300 - COMMUNICATIONS BACKBONE CABLING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Optical fiber connecting hardware.
  - 2. Identification products.

#### **1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105.
- C. Refer to Vol 2 Drawings, sheets E301 and E303.
- D. This section is inclusive of all Division 27 sections.
- E. Owner Technology Standards:
  - 1. Refer to owner technology standards, as applicable to the Project.

#### **1.3 DEFINITIONS**

- A. BICSI: Building Industry Consulting Service International.
- B. CATV: Community antenna television.
- C. CEA: Consumer Electronics Association.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. Jack: Also termed outlet, or fixed female connector.
- G. LAN: Local area network.
- H. MATV: Master antenna television.
- I. MMFO: Multimode Fiber Optic.
- J. Outlet: Cable connecting device at work area plate.
- K. Plug: Also termed connector, or male connector.
- L. RCDD: Registered Communications Distribution Designer.
- M. RF: Radio frequency.
- N. SMFO: Single Mode Fiber Optic.

- O. TDMM: BICSI Telecommunications Distribution Methods Manual.
- P. UTP: Unscreened (unshielded) twisted pair.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product to be used on Project.
- B. Shop Drawings: Reviewed and stamped by RCDD.
  - 1. Telecom structured cabling plan drawings, showing backbone cabling locations, routing, quantities, and types.
  - 2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
  - 3. Cabling administration drawings and printouts.
  - 4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
    - a. Telecommunications room plans and elevations.
    - b. Telecommunications pathways.
    - c. Telecommunications system access points.
    - d. Telecommunications grounding system.
    - e. Typical telecommunications details.
- C. Cable testing plan for each cable type provided.
- D. Sustainable Design Submittals, if applicable to Project.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:
  - 1. Certifications for RCDD, installation supervisor, and field inspector.
  - 2. Certification from cabling manufacturer.
- B. Field quality-control reports.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Closeout Documentation: In general, Closeout Documentation includes the following post construction items:
  - 1. As-Built Drawings: Provide all items listed under Shop Drawings submittal. Show all information in the As-Built Drawings in its final installed condition, as was constructed.
  - 2. Operation and Maintenance Manuals (O&Ms).
  - 3. Cabling Certification and Test Results.
  - 4. Warranty Information.

#### **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
  - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
  - 3. Field Inspector: Currently certified by BICSI as an RCDD to supervise on-site inspection.
  - 4. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Test cables upon receipt at Project site.
  - 1. Test each pair of twisted pair cable for open and short circuits.
  - 2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
  - 3. Test each coaxial cable for open and short circuits.

**1.9 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

**1.10 COORDINATION**

- A. Coordinate layout and installation of telecommunications pathways with EC/GC and owner IT.
- B. Coordinate telecom equipment room layouts and equipment rack elevations with owner IT.
- C. Coordinate related security installation requirements with security contractor and owner IT.

**PART 2 - PRODUCTS**

**2.1 DRAWING REFERENCE**

- A. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105, for site communications requirements.
- B. Refer to Vol 2 Drawings, for coordination of work within support building equipment rooms:
  - 1. Sheet E301: Concessions Building, Mech/Elec Room 102
  - 2. Sheet E303: Maintenance Building, Mechanical Room M102

**2.2 CABLING PERFORMANCE REQUIREMENTS**

- A. General Performance: Backbone cabling systems shall comply with TIA-568-C.0 and TIA-568-C.1
- B. Electrical Components, Devices, and Accessories: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- D. For all installation applications of Project, provide cabling rated for the environment in which it is installed.
- E. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- F. Grounding: Comply with TIA-607-D.

### **2.3 BACKBONE CABLING DESCRIPTION**

- A. For the project, outside plant backbone fiber cabling system will:
  - 1. Provide interconnection between existing City campus fiber handhole and the project Maintenance Building equipment room.
    - a. Splice new OSP backbone fiber to existing City campus fiber, as coordinated with owner IT. Provide fusion splicing of optical fibers; mechanical splicing not acceptable.

### **2.4 OPTICAL FIBER CABLE**

- A. Optical fiber backbone cabling is part of the optical fiber cabling subsystem within the telecommunications cabling system structure.
- B. Fiber optic cabling subsystem consists of backbone cables, terminations, patch panels, and patch cords or jumpers used for fiber backbone cross-connection. Optical fiber interconnecting units may be referred to as light interface units (LIUs).
- C. Provide optical fiber backbone cabling as indicated on the Drawings and Specifications.
- D. Product source limitations:
  - 1. Obtain fiber optic cabling, connectors, and connecting hardware from a single manufacturer.
- E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Belden
  - 2. CommScope
  - 3. Corning
- F. Standards requirements:
  - 1. Comply with TIA-568-C.3 performance specifications.
  - 2. Comply with TIA-598-D fiber optic cable color coding.
- G. Provide: SMFO armored cabling, outdoor rated, 12-strand OS2 9/125-micrometer, loose tube, yellow.
- H. Jacket: Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
- I. Splicing: Provide fusion splicing of optical fibers; mechanical splicing not acceptable.

### **2.5 OPTICAL FIBER CABLE HARDWARE**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Belden
  - 2. CommScope
  - 3. Corning
- B. Standards requirements:
  - 1. Comply with and match the performance criteria of the provided optical fiber backbone cabling.
  - 2. Comply with TIA-568-C.3 performance specifications.
  - 3. Comply with TIA-598-D fiber optic cable and connector color coding.
- C. Source Limitations: Obtain optical fiber connecting hardware from same manufacturer as optical fiber cable, from single source.

- D. Fiber Patch Panels or LIUs:
  - 1. Modular panels housing multiple-numbered, duplex cable connectors.
  - 2. Rack mount in telecom equipment racks, within Maintenance and Concessions buildings.
  - 3. Provide fiber patch panel in each telecom room, sized to accommodate one duplex connector for each pair of installed fiber strands assigned to field, plus 25 percent spare.
  - 4. Size fiber patch panel to accommodate:
    - a. Outside plant backbone fiber cabling specified within this section.
    - b. Outside plant horizontal fiber cabling specified within section 271500.
  - 5. Provide all required fiber cassettes, adapter panels, and associated components.
  - 6. Provide fusion splicing of optical fibers. Mechanical splicing not acceptable.
- E. Fiber Cable Connecting Hardware:
  - 1. Quick-connect, duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
  - 2. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-C.3.
- F. Fiber Patch Cords:
  - 1. Factory-made, dual fiber cables with duplex connector at each end, matching the supplied fiber connector Type.
  - 2. Comply with and match the performance criteria of the provided optical fiber backbone cabling.
  - 3. Provide two patch cords for each installed fiber optic strand pair: One patch cord for each end.
  - 4. Provide patch cords in the following lengths:
    - a. Provide 50% for each of the following lengths: 3', 5'.
  - 5. Review telecom shop drawings with owner IT prior to procuring patch cords.

## 2.6 CABLING IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Brady Worldwide
  - 2. HellermannTyton
  - 3. Panduit
- B. Comply with TIA-606-C and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## 2.7 SOURCE QUALITY CONTROL

- A. Factory test optical fiber cables according to TIA-568-C.3.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- B. Examine roughing-in for communications device cabling conduit systems to verify actual locations of conduit and back boxes before device installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Comply with TIA/EIA 606-D, "Administration Standard for Commercial Telecommunications Infrastructure."
- B. In meetings with Architect and Owner, present, review and coordinate Project planning documents.
- C. Verify and obtain all necessary licenses and construction permits required to complete the Project scope.

### **3.3 INSTALLATION**

- A. Comply with all state and local ordinances, codes, and regulations.
- B. Coordinate all communications conduit rough-in requirements with EC and GC prior to work.

### **3.4 ENTRANCE FACILITIES**

- A. Contact communications service provider to coordinate and arrange for installation of demarcation points and associated equipment. Coordinate specific requirements with owner IT.

### **3.5 WIRING METHODS**

- A. Routing:
  - 1. Cabling may be installed in accessible ceilings unenclosed, unless otherwise indicated on the Drawings.
  - 2. Install cable and conduit, concealed in accessible ceilings, walls, and floors where possible.
  - 3. Cabling may be installed unenclosed within consoles, cabinets, desks, and counters.
  - 4. In unfinished spaces, install cabling in conduit pathways; concealed in walls for new construction.
  - 5. Where installed within conduit, conduit size shall be minimum 1 inch, maximum conduit fill 40%.
  - 6. Refer to the Drawings for typical device conduit requirements.
  - 7. Telecom copper transmission wiring shall not share conduit with other building wiring systems.
  - 8. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 9. For all installation applications, provide cabling rated for the environment in which it is installed.
    - a. Provide riser rated cabling as required.
    - b. Provide plenum rated cabling as required.
    - c. Provide indoor/outdoor rated cabling as required.
    - d. Provide outside plant (OSP) or direct burial cabling as required.
    - e. Non-rated OSP cabling must be terminated within 50 feet from its point of entry into the building, unless installed within continuous metallic conduit pathway.
- B. Wiring within Enclosures:
  - 1. Bundle, lace, and train cables within enclosures.
  - 2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
  - 3. Provide and use lacing bars and distribution spools.
  - 4. Install conductors parallel with or at right angles to sides and back of enclosure.

### **3.6 INSTALLATION OF PATHWAYS**

- A. Drawings indicate general arrangement and routing of primary cabling pathways.
- B. Comply with the following Sections:
  - 1. 260533 "Raceways and Boxes for Electrical Systems"



- C. Comply with NFPA 70 for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### 3.7 INSTALLATION OF CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-C.1.
  - 2. Comply with BICSI ITSIMM Ch 5 "Cable Installation" and Ch 6 "Cable Termination Practices."
  - 3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
  - 4. Cables may not be spliced.
  - 5. Secure and support cables not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices." Install lacing bars and distribution spools.
  - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  - 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
  - 11. In communications equipment rooms, install and manage a 10 foot service loop for all cables.
- C. Open Cable Installation:
  - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  - 2. J-hook installation: Suspend twisted pair cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart, and at each change in direction. Hook spacing shall allow no more than 6 inches of slack. Size J-hooks to allow a minimum of 25 percent future capacity without exceeding design capacity limits. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
  - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- D. Installation of Cable Routed Exposed under Raised Floors:
  - 1. Install plenum-rated cable only.
  - 2. Install cabling after the flooring system has been installed in raised floor areas.
  - 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.
- E. Twisted Pair Cable Installation:
  - 1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
  - 2. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
- F. Optical Fiber Cable Installation:
  - 1. Comply with TIA-568-C.0, TIA-568-C.1, TIA-568-C.3 and TIA-526-14-B.
  - 2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

- G. Group connecting hardware for cables into separate logical fields.

### **3.8 FIRESTOPPING**

- A. Comply with project Penetration Firestopping specification, for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM "Firestopping Systems" article.

### **3.9 GROUNDING**

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" chapter.
- C. Comply with TIA-607-D and NECA/BICSI-607.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

### **3.10 IDENTIFICATION**

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-C.
- B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications equipment rooms, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- D. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    - a. Individually number and identify each cable extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    - b. Label each unit and field within distribution racks and frames.
  - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware.
- E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-C requirements for the following:
  - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

### **3.11 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Visually inspect cable jacket materials for NRTL certification markings.
  - 2. Inspect twisted pair cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1.
  - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 4. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test telecom copper circuit link after termination.
  - 5. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - 6. Backbone Twisted Pair Cable Tests:
    - a. Test for each circuit according to TIA/EIA-568-C.1 and TIA/EIA-568-C.2.
  - 7. Optical Fiber Cable Tests:
    - a. Link end-to-end performant test include but may not be limited to:
      - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-B, Method B, One Reference Jumper.
      - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-C.1.
      - 3) Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests.
- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI TDMM, or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Where not-compliant with specified criteria, correct terminations and/or remove and replace cabling if required, to remedy deficient installation.
- E. Collect results, assemble, and submit test and inspection reports.

### **3.12 DEMONSTRATION AND TRAINING**

- A. Provide up to four hours of training, if requested by owner. Train owner's IT maintenance personnel in backbone cable-plant management operations, including changing signal pathways for different backbone circuits, rerouting signals in failed cables, and keeping records of backbone cabling assignments when making revisions to the installed backbone cabling system.

END OF SECTION

## **SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Category data cabling.
  - 2. Data cabling connecting hardware.
  - 3. Optical fiber cabling.
  - 4. Optical fiber connecting hardware.
  - 5. Identification products.

#### **1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105.
- C. Refer to Vol 2 Drawings, sheets E301 and E303.
- D. This section is inclusive of all Division 27 sections.
- E. Owner Technology Standards:
  - 1. Refer to owner technology standards, as applicable to the Project.

#### **1.3 DEFINITIONS**

- A. BICSI: Building Industry Consulting Service International.
- B. CATV: Community antenna television.
- C. CEA: Consumer Electronics Association.
- D. EMI: Electromagnetic interference.
- E. FTP: Shielded twisted pair.
- F. F/FTP: Overall foil screened cable with foil screened twisted pair.
- G. F/UTP: Overall foil screened cable with unscreened twisted pair.
- H. IDC: Insulation displacement connector.
- I. Jack: Also termed outlet, or fixed female connector.
- J. LAN: Local area network.
- K. MATV: Master antenna television.
- L. MMFO: Multimode Fiber Optic.

- M. Outlet: Cable connecting device at work area plate.
- N. Plug: Also termed connector, or male connector.
- O. RCDD: Registered Communications Distribution Designer.
- P. RF: Radio frequency.
- Q. Screen: Metallic layer, either a foil or braid, placed around a pair or group of conductors.
- R. Shield: Metallic layer, either a foil or braid, placed around a pair or group of conductors.
- S. S/FTP: Overall braid screened cable with foil screened twisted pair.
- T. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- U. SMFO: Single Mode Fiber Optic.
- V. TDMM: BICSI Telecommunications Distribution Methods Manual.
- W. UTP: Unscreened (unshielded) twisted pair.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product to be used on Project.
- B. Shop Drawings: Reviewed and stamped by RCDD.
  - 1. Telecom structured cabling plan drawings, showing data outlet locations, quantities, and types. Identify and label all data outlet locations on plans.
  - 2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
  - 3. Cabling administration drawings and printouts.
  - 4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
    - a. Telecommunications rooms plans and elevations.
    - b. Telecommunications pathways.
    - c. Telecommunications system access points.
    - d. Telecommunications grounding system.
    - e. Telecommunications conductor drop locations.
    - f. Typical telecommunications details.
- C. Cable testing plan for each cable type provided.
- D. Sustainable Design Submittals, if applicable to Project.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:
  - 1. Certifications for RCDD, installation supervisor, and field inspector.
  - 2. Certification from cabling manufacturer.
- B. Field quality-control reports.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Closeout Documentation: In general, Closeout Documentation includes the following post construction items:
1. As-Built Drawings: Provide all items listed under Shop Drawings submittal. Show all information in the As-Built Drawings in its final installed condition, as was constructed.
  2. Operation and Maintenance Manuals (O&Ms).
  3. Cabling Certification and Test Results.
  4. Warranty Information.
  5. Structured Cabling Solution Manufacturer Warranty Information.

## **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
  2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
  3. Field Inspector: Currently certified by BICSI as an RCDD to supervise on-site inspection.
  4. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
  5. Manufacturer Certification: Installer must be certified by the horizontal structured cabling solution manufacturer to design and install the system and provide the specified manufacturer warranty.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Test cables upon receipt at Project site.
1. Test each pair of twisted pair cable for open and short circuits.
  2. Test each coaxial cable for open and short circuits.
  3. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.

## **1.9 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## **1.10 COORDINATION**

- A. Coordinate layout and installation of telecommunications pathways with EC/GC and owner IT.
- B. Coordinate telecom equipment room layouts and equipment rack elevations with owner IT.
- C. Coordinate related security installation requirements with security contractor and owner IT.

## **PART 2 - PRODUCTS**

### **2.1 DRAWING REFERENCE**

- A. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105, for site communications requirements.
- B. Refer to Vol 2 Drawings, for coordination of work within support building equipment rooms:
1. Sheet E301: Concessions Building, Mech/Elec Room 102

2. Sheet E303: Maintenance Building, Mechanical Room M102

## **2.2 HORIZONTAL CABLING PERFORMANCE REQUIREMENTS**

- A. General Performance: Horizontal cabling systems shall comply with TIA-568-C.0 and TIA-568-C.1
- B. Electrical Components, Devices, and Accessories: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.
- D. For all installation applications of Project, provide cabling rated for the environment in which it is installed.
- E. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- F. Grounding: Comply with TIA-607-D.

## **2.3 HORIZONTAL TWISTED PAIR CABLING DESCRIPTION**

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols. Cable splices are not allowed in the permanent link.
- B. The maximum allowable permanent link twisted pair cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect within equipment room.
- C. Based on field conditions, cable pathway routing, and shop drawings, notify Architect if any twisted pair data circuit length will exceed the 295 foot maximum allowable length.
- D. Provide an end-to-end Category 6a horizontal structured cabling solution for the Project, as indicate on the Drawings and Specifications.
- E. The installed horizontal structured cabling solution shall be certified and warranted by the cable Manufacturer for a minimum of 20 years. Provide Manufacturer warranty information with Close Out Submittals, as identified under Part 1.
- F. Product source limitations:
  1. Obtain all Category data cabling, connectors, and connecting hardware from a single manufacturer.
- G. Cable and outlet colors:
  1. Prior to procuring equipment, confirm all cable, outlet, and connector colors with owner IT.

## **2.4 CATEGORY TWISTED PAIR CABLE**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Belden
  2. CommScope

3. Hubble
4. Panduit
5. Siemen

- B. Conductors: 100-ohm, 23 AWG solid copper.
- C. Standard: Comply with TIA-568-C.2 for Category cables.
- D. Provide Category 6a cabling.
- E. Shielding/Screening: Unshielded twisted pairs (UTP)
- F. Jacket Color: Blue.

## **2.5 TWISTED PAIR CABLE CONNECTING HARDWARE**

- A. Twisted Pair Cable Hardware: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Belden
  2. CommScope
  3. Hubble
  4. Panduit
  5. Siemen
- C. General Requirements for Twisted Pair Cable Hardware:
  1. Comply with and match the performance criteria of the provided Category data cabling.
  2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
- D. Source Limitations: Obtain twisted pair cable connecting hardware from same manufacturer as twisted pair cable, from single source.
- E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
  1. Rack mount in telecom equipment racks, within Maintenance and Concessions buildings.
  2. Features:
    - a. Universal T568A and T568B wiring labels.
    - b. Labeling areas adjacent to conductors.
    - c. Replaceable connectors.
    - d. 48 ports, unless otherwise indicated on Drawings.
  3. Construction: 16-gauge steel and mountable on 19-inchequipment racks.
  4. Number of outlet jacks: One for each four-pair Category cable indicated on Drawings.
- F. Plugs and Plug Assemblies:
  1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
  2. Standard: Comply with TIA-568-C.2.
- G. Jacks and Jack Assemblies:
  1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
  2. Designed to snap-in to a patch panel or cover plate.
  3. Standard: Comply with TIA-568-C.2.



- H. Wall and WAP Faceplates:
  - 1. Where wall data outlets are shown on the drawings, provide 2-port faceplate, populated with two data jacks. Refer to Vol 2 Drawings, sheets E301 and E303.
  - 2. Where ceiling wireless AP (WAP) data outlets are shown on the drawings, provide 2-port faceplate, populated with two data jacks.
  - 3. Provide plastic cover plates, color as coordinated with Architect.
  - 4. For use with snap-in jacks accommodating any combination of twisted pair, coaxial, and optical fiber work area cords.
  - 5. Labels: Machine printed, in the field, using adhesive-tape label. Or snap-in, clear-label covers and machine-printed paper inserts.
  
- I. Security Camera Data Connections:
  - 1. Where security camera data outlets are shown on the drawings, one data cable, terminated with modular plug assembly, for direct connect to camera. Refer to Vol 2 Drawings, sheets E301 and E303.
  - 2. Labels: Machine printed, in the field, using adhesive-tape label. Or snap-in, clear-label covers and machine-printed paper inserts.
  
- J. Patch Cords:
  - 1. Factory-made, four-pair cables, terminated with an eight-position modular plug at each end.
  - 2. Comply with and match the performance criteria of the provided Category data cabling.
  - 3. Provide two patch cords for each installed data circuit: One within telecom room at rack, and one for work area outlet.
  - 4. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
  - 5. Provide blue patch cords in the following lengths:
    - a. For work area outlets provide 50% 10' and 50% 15' in length.
    - b. For telecom room patch cords provide 25% for each of the following lengths: 3', 5', 7' 10'.
  - 6. Review telecom shop drawings with owner IT prior to procuring patch cords.

## 2.6 HORIZONTAL OPTICAL FIBER CABLING DESCRIPTION

- A. For the project, outside plant horizontal fiber cabling system will:
  - 1. Provide interconnections between the Maintenance Building equipment room and the device outlets, ie the site security camera fiber media converters located on light poles. Refer to Vol 1 Drawings, sheets E-121, E122, and ALT-105.
  
- B. Fiber optic cabling subsystem consists of horizontal cables, terminations, patch panels, and patch cords or jumpers used for horizontal-to-horizontal cross-connection. Optical fiber interconnecting units may be referred to as light interface units (LIUs).
  
- C. Provide optical fiber horizontal cabling as indicated on the Drawings and Specifications.
  
- D. Product source limitations:
  - 1. Obtain fiber optic cabling, connectors, and connecting hardware from a single manufacturer.
  
- E. Cable and outlet colors:
  - 1. Optical fiber cable and connector colors shall be per industry standards.

## 2.7 OPTICAL FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Belden
  - 2. CommScope

3. Corning
- B. Standards requirements:
  1. Comply with TIA-568-C.3 performance specifications.
  2. Comply with TIA-598-D fiber optic cable color coding.
- C. Provide: SMFO armored cabling, outdoor rated, 4-strand OS2 9/125-micrometer, loose tube, yellow.
- D. Jacket: Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
- E. Splicing: Provide fusion splicing of optical fibers. Mechanical splicing not acceptable.

## 2.8 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Belden
  2. Corning
- B. Standards requirements:
  1. Comply with and match the performance criteria of the provided optical fiber horizontal cabling.
  2. Comply with TIA-568-C.3 performance specifications.
  3. Comply with TIA-598-D fiber optic cable and connector color coding.
- C. Source Limitations: Obtain optical fiber connecting hardware from same manufacturer as optical fiber cable, from single source.
- D. Fiber Patch Panels or LIUs:
  1. Modular panels housing multiple-numbered, duplex cable connectors.
  2. Rack mount in telecom equipment racks.
  3. Provide fiber patch panel in each telecom room, sized to accommodate one duplex connector for each pair of installed fiber strands assigned to field, plus 25 percent spare.
  4. Size fiber patch panel to accommodate:
    - a. Outside plant horizontal fiber cabling specified within this section.
    - b. Outside plant backbone fiber cabling specified within section 271300.
  5. Provide all required fiber cassettes, adapter panels, and associated components.
  6. Provide fusion splicing of optical fibers; mechanical splicing not acceptable.
- E. Fiber Cable Connecting Hardware:
  1. Quick-connect, duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
  2. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-C.3.
- F. Device Outlet Connections:
  1. Provide duplex LC fiber connections for site security camera media converter within associated outdoor enclosure on site light poles, typically at 15'AFG.
  2. Provide fusion splicing of optical fibers; mechanical splicing not acceptable.
  3. Labels: Machine printed, in the field, using adhesive-tape label. Or snap-in, clear-label covers and machine-printed paper inserts.
- G. Fiber Patch Cords:
  1. Factory-made, dual fiber cables with duplex connector at each end, matching the supplied fiber connector Type.
  2. Comply with and match the performance criteria of the provided optical fiber horizontal cabling.

3. Provide two patch cords for each installed fiber optic strand pair: One patch cord for each end.
4. Provide patch cords in the following lengths:
  - a. Provide 50% for each of the following lengths: 3', 5'.
5. Review telecom shop drawings with owner IT prior to procuring patch cords.

## **2.9 CABLING IDENTIFICATION PRODUCTS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Brady Worldwide
  2. HellermannTyton
  3. Panduit
- B. Comply with TIA-606-C and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## **2.10 SOURCE QUALITY CONTROL**

- A. Factory test twisted pair cables according to TIA-568-C.2.
- B. Factory test optical fiber cables according to TIA-568-C.3.
- C. Cable will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- B. Examine roughing-in for communications device cabling conduit systems to verify actual locations of conduit and back boxes before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Comply with TIA/EIA 606-D, "Administration Standard for Commercial Telecommunications Infrastructure."
- B. In meetings with Architect and Owner, present, review and coordinate Project planning documents.
- C. Verify and obtain all necessary licenses and construction permits required to complete the Project scope.

### **3.3 INSTALLATION**

- A. Comply with all state and local ordinances, codes, and regulations.
- B. Coordinate all communications conduit rough-in requirements with EC and GC prior to work.

### 3.4 WIRING METHODS

- A. Routing:
1. Cabling may be installed in accessible ceilings unenclosed, unless otherwise indicated on the Drawings.
  2. Install cable and conduit, concealed in accessible ceilings, walls, and floors where possible.
  3. Cabling may be installed unenclosed within consoles, cabinets, desks, and counters.
  4. In unfinished spaces, install cabling in conduit pathways; concealed in walls for new construction.
  5. Where installed within conduit, conduit size shall be minimum 1 inch, maximum conduit fill 40%.
  6. Refer to the Drawings for typical device conduit requirements.
  7. Data transmission wiring shall not share conduit with other building wiring systems.
  8. Install plenum cable in environmental air spaces, including plenum ceilings.
  9. For all installation applications, provide cabling rated for the environment in which it is installed.
    - a. Provide riser rated cabling as required.
    - b. Provide plenum rated cabling as required.
    - c. Provide indoor/outdoor rated cabling as required.
    - d. Provide outside plant (OSP) or direct burial cabling as required.
    - e. Non-rated OSP cabling must be terminated within 50 feet from its point of entry into the building, unless installed within continuous metallic conduit pathway.
- B. Wiring within Enclosures:
1. Bundle, lace, and train cables within enclosures.
  2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
  3. Provide and use lacing bars and distribution spools.
  4. Install conductors parallel with or at right angles to sides and back of enclosure.

### 3.5 INSTALLATION OF PATHWAYS

- A. Drawings indicate general arrangement and routing of primary cabling pathways.
- B. Comply with the following Sections:
1. 260533 "Raceways and Boxes for Electrical Systems"
- C. Comply with NFPA 70 for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### 3.6 INSTALLATION OF CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
1. Comply with TIA/EIA-568-C.1.
  2. Comply with BICSI ITSIMM Ch 5 "Cable Installation" and Ch 6 "Cable Termination Practices."
  3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
  4. Cables may not be spliced.
  5. Secure and support cables not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices." Install lacing bars and distribution spools.
  8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
  11. In communications equipment rooms, install and manage a 10 foot service loop for all cables.
- C. Open Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. J-hook installation: Suspend twisted pair cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart, and at each change in direction. Hook spacing shall allow no more than 6 inches of slack. Size J-hooks to allow a minimum of 25 percent future capacity without exceeding design capacity limits. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
  3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- D. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
  2. Install cabling after the flooring system has been installed in raised floor areas.
  3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.
- E. Twisted Pair Cable Installation:
1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
  2. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
- F. Optical Fiber Cable Installation:
1. Comply with TIA-568-C.0, TIA-568-C.1, TIA-568-C.3 and TIA-526-14-B.
  2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- G. Group connecting hardware for cables into separate logical fields.
- H. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-D for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

- c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
- 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

### **3.7 FIRESTOPPING**

- A. Comply with project Penetration Firestopping specification, for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM "Firestopping Systems" article.

### **3.8 GROUNDING**

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" chapter.
- C. Comply with TIA-607-D and NECA/BICSI-607.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

### **3.9 IDENTIFICATION**

- A. In addition to requirements in this article, comply with identification requirements of TIA/EIA 606-C.
- B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications equipment rooms, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- D. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    - a. Individually number and identify each cable extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    - b. Label each unit and field within distribution racks and frames.
  - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware.

- E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-C requirements for the following:
  - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

### 3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Visually inspect cable jacket materials for NRTL certification markings.
  - 2. Inspect twisted pair cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1.
  - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 4. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test data circuit permanent link after termination.
  - 5. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - 6. Twisted pair performance tests include but may not be limited to:
    - a. Test for each data circuit permanent link. Perform the following tests according to TIA/EIA-568-C.1 and TIA/EIA-568-C.2:
      - 1) Wire map.
      - 2) Length (physical vs. electrical, and length requirements).
      - 3) Insertion loss.
      - 4) Near-end crosstalk (NEXT) loss.
      - 5) Power sum near-end crosstalk (PSNEXT) loss.
      - 6) Equal-level far-end crosstalk (ELFEXT).
      - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
      - 8) Return loss.
      - 9) Propagation delay.
      - 10) Delay skew.
  - 7. Optical Fiber Cable Tests:
    - a. Link end-to-end performant test include but may not be limited to:
      - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-B, Method B, One Reference Jumper.
      - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-C.1.
      - 3) Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests.
- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI TDMM, or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Where not-compliant with specified criteria, correct terminations and/or remove and replace cabling if required, to remedy deficient installation.
- E. Collect results, assemble, and submit test and inspection reports.

**3.11 DEMONSTRATION AND TRAINING**

- A. Provide up to four hours of training, if requested by owner. Train owner's IT maintenance personnel in horizontal cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments when making revisions to the installed horizontal cabling system.

END OF SECTION



**SECTION 280413 - COMMON SUBMITTAL REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes supplementary administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, Closeout Documents, and other submittals specific to the work of this Division.

**1.2 RELATED DOUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 01 submittal requirements.
- C. This section is inclusive of all Division 28 sections.

**1.3 DEFINITIONS**

- A. Contractor: Refers to an entity in direct Contract with the Owner to furnish and/or perform any portion of the Work of the Contract, including but not limited to a Construction Manager.
  - 1. Contractor shall review and approve Product Submittals prior to forwarding them to the Architect.
- B. Product Submittals: In general, Product Submittals show characteristics of the proposed construction in the following forms:
  - 1. Shop Drawings.
  - 2. Product Data.
  - 3. Samples.
- C. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- D. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- E. Certification Information: In general, Certification Information includes any requirements for Contractor Certification specific to this Division, as identified within other Division 28 specifications.
- F. Closeout Documentation: In general, Closeout Documentation includes post construction items in the following forms:
  - 1. As-Built Drawings.
  - 2. Operation and Maintenance Manuals (O&Ms).
  - 3. Certification and/or Test Results.
  - 4. Warranty Information.

#### **1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

- A. Requirements specified for submittals are intended to provide efficient handling, while permitting review responsibilities to be carried out.
- B. Avoidable Resubmittals: The first two reviews of each specified submittal will be processed without cost to the Contractor. After the second review, the Owner may charge the Contractor for the cost of such additional processing, unless the processing results from approved Change Orders causing revisions to previously approved submittals.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
  - 2. When a large volume of submittal materials is scheduled, additional review time may be required. Similarly, a particular submittal may require review completion in less than the agreed normal time. Due to variations in submittal volume and processing needs, agreed review time is not intended to apply to extreme conditions.
  - 3. Resubmittal Review: Allow 10 business days for review of each resubmittal.
  - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.
- E. Maintain at the Project Site ready access to the latest reviewed Shop Drawings and Product Data, and one set of samples.

#### **1.5 DELEGATED-DESIGN SERVICES**

- A. Definitions:
  - 1. Delegated Design: A portion or component of the Work identified by the Contract Documents to be designed by the Contractor, or an entity assigned by the Contractor, to satisfy performance and design criteria specified in the Contract Documents for that portion or component.
  - 2. Registered Design Professional: Design professional, assigned by the Contractor, who is responsible for providing the delegated design work, and for certifying that the work is in compliance with the specified performance requirements and design criteria. Design professional shall be legally qualified to practice in jurisdiction where Project is located and shall be experienced in providing delegated design services of the kind indicated. Delegated design services are defined as those performed for installation of the system, assembly or product that are similar in material, design, and extent to those indicated for this Project.
- B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## **PART 2 - PRODUCTS – NOT USED**

## **PART 3 - EXECUTION**

### **3.1 CONTRACTOR'S REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Combine with Submittal Review Sheet before submitting to Architect.
1. Submittal Compliance Form: Allowed in lieu of some product data and sample submittals. See individual specification sections for specific allowable use. By submitting the form, the Contractor certifies that all products specified in the Section are being submitted exactly as indicated, including all options and features indicated, with no substitutions or comparable products. Where a Basis-of-Design manufacturer/product is indicated, along with a list of other manufacturers, the Contractor certifies that only the Basis-of-Design manufacturer/product will be provided and not any other listed manufacturers/products. Where a single manufacturer/product is indicated, even if specified as "available manufacturer" or manufacturer "included but not limited to the following", Contractor certifies that only the indicated single manufacturer/product will be provided.
    - a. Obtain a copy of the Submittal Compliance Form from the Architect, fill in the information required and include as a line item on the Submittal Cover Sheet for each applicable Submittal.
    - b. Upon receipt, the Architect will complete the form in the space below "Architect Action" and indicate the Action on the Submittal Cover Sheet.
- B. Project Closeout and Maintenance Material Submittals:
1. As-Built Drawings.
  2. Operation and Maintenance Manuals (O&Ms).
  3. Certification and/or Test Results.
  4. Warranty Information.
  5. See additional requirements in Division 01.
- C. Be responsible for quantities, weights, and dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes and to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of every trade, supplier, and subcontractor.
- D. Be responsible for each submittal to be in conformance with information given and the design intent expressed in the Contract Documents.
- E. Provide with each submittal specific written notice of any variation from the requirements of the Contract Documents by causing a specific notation to be made on the Submittal Review Sheet and Submittal Transmittal.
- F. Product substitution of any specified "Basis-of-Design manufacturer/product" will not be considered without prior, written Architect pre-approval of the proposed substitution manufacturer/product.

**3.2 ARCHITECT'S AND GENERAL CONTRACTOR'S ACTION**

- A. General: Architect will not review submittals that do not include the Submittal Review Sheet.
- B. Action Submittals: Architect's staff and consultants will review the submittal, and mark the Submittal Review Sheet with an action code. The code meanings are described below.
- C. Additional codes may be provided within comments or as an electronic submittal review stamp and shall be used in help indicating return of partial submittals.
- D. The Final Review Code on the Submittal Review Sheet prevails and governs the action of the overall submittal.
- E. Review Code meanings are as follows:
  - 1. Action Codes Permitting Use:
    - a. When an action code permitting use is assigned to a submittal, it does not authorize work that does not comply with the requirements of the Contract Documents. Acceptance of the Work will depend on compliance.
    - b. Code AP - Approved: The Work covered by the submittal item may proceed, provided it complies with Contract Document requirements.
    - c. Code AN - Approved as Noted: The Work covered by the submittal item may proceed, provided it complies with the Architect's notations and Contract Document requirements.
    - d. Code AN-R - Approved as Noted - Resubmit: Do not deliver or install the related work until the resubmittal has received Code AP or AN. However, fabrication and other off-site work covered by the submittal item may proceed, at the Contractor's risk, provided it complies with the Architect's notations and Contract Document requirements.
  - 2. Action Code Prohibiting Use:
    - a. Action Code REJ - Not Approved: The Work covered by the submittal item, including purchasing, fabrication, delivery, and other activity, shall not proceed. Revise the submittal item or prepare a new item in accordance with the Architect's notations. Resubmit the corrected or new item without delay; do not permit submittal items marked "Not Approved" to be used. Work incorporating such items will be rejected.
  - 3. Action Code for Items Not Required:
    - a. Action Code X - Not Requested by Contract Documents: The submittal item is not called for by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.
- F. Informational Submittals: For Architect's information only. Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
  - 1. Action Code for Information Only:
    - a. Action Code INF - Information Only - Received: The submittal item is not called for a return with a reviewed action code by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.
- G. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- H. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- I. Architect will return without review submittals received from sources other than the Contractor.
- J. Submittals not required by the Contract Documents may be returned by the Architect without action.
  - 1. Do not submit Material Safety Data Sheets. They will be returned without review.

### 3.3 SUBMITTAL TRANSMITTAL REQUIREMENTS

- A. Submittal Transmittal shall be a PDF file in electronic format. It is recommended, to expedite the submittal review, the electronic form be emailed for review to the Architect as early as possible.
  - 1. Submittal Numbering: See below.
  - 2. Contact Information: Full Name, Phone Number and Email Address.
  
- B. Submittal Definition
  - 1. Each submittal consists of items from only ONE Specifications section.
  - 2. Complete Submittal: If ALL the items required by the Specifications section are listed on one Submittal Form (including continuation sheet), it is a complete submittal.
  - 3. Partial Submittals: If it is necessary to divide the required items of a given Specifications section into two or more submittals to meet schedule or handling requirements, the separate submittals are partial submittals. All partial submittals have the same submittal number, and are differentiated by sequential P-numbers (see below).
  - 4. All items in each submittal, whether complete or partial, will be processed together: Individual items will not be 'broken out' for special handling. Arrange submittals accordingly.
  
- C. Submittal Numbering
  - 1. Number submittals as described below to assist tracking.
  - 2. Number each submittal in the format nnnnnn-nn.
    - a. The 6-digit number is the number of the section that requires the submittal. For example, 044200.
    - b. The 2-digit number is based on the numerical sequence of submittals from that section. In other words, for each section, the first submittal is 01, the second is 02, and so on. The 2-digit number does not change for partial or re-submittals, so that the submittal can be tracked.
    - c. P-Number for Partial Submittals: Number each partial submittal in the pee space, beginning with P1, and increasing by one for each partial submittal of that submittal. If the submittal is a complete submittal, leave the P space blank.
    - d. R-Number for Re-submittals: Number each re-submittal in the arr space, beginning with R1, and increasing by one for each re-submittal of that submittal. Do not include an R-Number for the initial submittal.
    - e. Examples:
      - 1) Initial Complete Submittal: 044200-01. First Re-Submittal: 044200-01-R1.
      - 2) Initial Partial Submittal: 044200-01-P1. Second Partial Submittal: 0044200-01-P2. First Re-submittal of Second Partial Submittal: 044200-R1-P2.

### 3.4 SUBMITTAL REVIEW SHEET REQUIREMENTS

- A. Provide Submittal Review Sheet in PDF format. Submit as the page after the Submittal Transmittal.
- B. When attached, the Submittal Review Sheet shall not obscure information contained in the submittal.
- C. Do not edit any of the information contained within the Submittal Review Sheet except as follows:
  - 1. Submittal Number: See Submittal Numbering in Submittal Transmittal Requirements paragraph.
- D. The Contractor shall submit the PDF file in a manner that will allow editing of the Submittal Review Sheet fields by SmithGroup and its consultants.

END OF SECTION

## **SECTION 282300 - VIDEO SURVEILLANCE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes:
  - 1. Recording servers.
  - 2. Security cameras.
  - 3. Midspan PoE devices.
  - 4. Fiber SFP midspan PoE devices.
  - 5. Environmental enclosures.

#### **1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This section is inclusive of all Division 28 sections.
- C. Division 27 Communications specification sections.
- D. Refer to Vol 1 Drawings, sheets E-121, E-122, and ALT-105.
- E. Refer to Vol 2 Drawings, sheets E301 and E303.
- F. Owner Security Standards:
  - 1. Refer to owner technology and security standards, as applicable to the Project.

#### **1.3 DEFINITIONS**

- A. ACAMS: Access control and alarm management system.
- B. API: Application protocol interface.
- C. CPU: Central processing unit.
- D. IP: Internet protocol.
- E. LAN: Local area network.
- F. NDAA: National defense authorization act.
- G. NVR: Network video recorder.
- H. ONVIF: Open network video interface forum.
- I. PTZ: Pan-tilt-zoom.
- J. RAID: Redundant array of independent disks.
- K. TCP/IP: Transmission control protocol / internet protocol.

- L. UPS: Uninterruptible power supply.
- M. VMS: Video management system.
- N. WAN: Wide area network.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product to be used on Project.
- B. Shop Drawings: Include device floor plans, one-line diagrams, block diagrams, and typical device installation details.
- C. Video storage calculations, based on equipment provided for Project.
- D. Sustainable Design Submittals, if applicable to Project.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:
  - 1. Installer certification from access control system manufacturer.
  - 2. Manufacturer certifications for technicians and installation supervisor.
- B. Field quality-control reports.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Closeout Documentation:
  - 1. Completed Readiness Checklist.
  - 2. Final Test Result Report.
  - 3. As-Built Drawings.
  - 4. Operation and Maintenance Manuals (O&Ms).
  - 5. Warranty Information.

#### **1.7 QUALITY ASSURANCE**

- A. Installer/Contractor Qualifications:
  - 1. Installer must be certified by the video surveillance system manufacturer to design and install the provided system.
  - 2. Installer must have certified technicians and project supervisor certified by the video surveillance system manufacturer to install the provided system.
  - 3. Minimum 5 years' experience of satisfactory performance on projects of similar size and scope. Provide owner with references upon request.

#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Cameras, NVRs and CPUs:
  - 1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.
  - 2. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.

## **1.9 PROJECT CONDITIONS**

- A. Environmental Conditions: Do not deliver or install equipment until HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
  - 1. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components installed in temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.

## **1.10 COORDINATION**

- A. Coordinate security conduit pathway requirements with EC and GC prior to rough-in work.
- B. Coordinate telecom data cabling requirements with Division 27 telecommunications cabling contractor.
- C. Coordinate security installation and commissioning requirements with owner security personnel.
- D. Coordinate security equipment networking requirements with owner IT personnel.
  - 1. Equipment and devices will communicate over owner LAN/WAN.
  - 2. Assemble and maintain an IP security device schedule, itemizing data port quantities, locations, and other networking requirements, for coordination with owner IT during installation.

## **1.11 WARRANTY**

- A. Warranty Period: Provide one (1) year warranty from date of Substantial Completion on all parts and installation.
- B. Special Warranty: Provide three (5) year manufacturer warranty on all provided cameras.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Video Surveillance System:
  - 1. Genetec Omnicast Enterprise.
  - 2. Shall be extension of the City's existing enterprise video surveillance system.
- B. Cameras:
  - 1. Basis of Design Products: Axis Communications, no substitutions.

### **2.2 DESCRIPTION**

- A. Video Surveillance:
  - 1. The video surveillance system for the Project will be an extension of existing Genetec VMS.
  - 2. Provide new recording server, security cameras, peripheral components, and associated licensing.
  - 3. IP cameras will communicate with the existing VMS solution, via LAN/WAN connectivity.
  - 4. Provide a complete, operational, turn-key video surveillance system, as indicated on the Drawings and Specifications. Provide all necessary equipment, cabling, installation, software, configuration, programming, and commissioning.
  - 5. The solution shall be managed centrally and provide web-based monitoring and control capabilities.



6. VMS shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.
  7. The system shall be an enterprise-level network video solution, providing flexibility for video monitoring and storage methods, and redundant capabilities. System must be capable of expansion and provide sustainability.
  8. VMS shall be an open architecture platform, be non-proprietary, and be ONVIF compliant.
  9. System must be capable of API integration with industry standard, open architecture third-party solutions and devices.
  10. Graphical user interface software shall manage all IP-based video camera and control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management.
  11. System design shall include all necessary compression software for high-performance, dual-stream, H.264, H.265, and MPEG-4 video.
  12. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.
  13. Cameras shall be high-definition IP PoE type units, ruggedly built and designed for adverse environments where applicable, complying with NEMA Type environmental standards.
  14. Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN.
  15. The system must provide robust cyber security protection, including industry standard certifications, and offer manufacturer cyber security hardening guide.
  16. VMS must be capable of automatic, scheduled, long-term archiving to alternate data storage method, such as cloud-based applications or connected storage hardware.
  17. Camera video shall be recorded for a minimum of 30 days, refer to recording server criteria.
- B. Camera call-up integration:
1. Coordinate security alarm camera call-up ACAMS interface functional requirements with owner during system configuration and programming.

### **2.3 APPLICATION SOFTWARE**

- A. Modify existing video management system software database to incorporate new recording server and security cameras for the Project.
- B. Coordinate software configuration, programming, and system functional requirements with owner IT and security department prior to work.
- C. Workstation Software:
  1. Not required.
  2. Owner shall administer video surveillance system locally from browser-based software, or client software application loaded on owner provided PCs.
  3. VMS shall support mobile device client application.

### **2.4 RECORDING SERVER**

- A. Provide recording server for the Project, sized to record and store video for all cameras indicated on the Drawings.
- B. The video surveillance system will be an extension of the City's existing Genetec Omnicast system.
- C. Recording server will be networked and communicate with the existing centralized, enterprise video surveillance platform via LAN/WAN.
- D. Requirements:
  1. Rack mount server, capable of modular expansion.

2. Locate recording server within wall-mount IT cabinet in Maintenance Building equipment room, as coordinated with owner IT.
3. Recorder will be supported by local UPS unit, supplied by Division 27.
4. Server hardware/software shall meet or exceed minimum requirements as recommended by the manufacturer.
5. Manufacturer Products:
  - a. Genetec Streamvault
    - 1) (1) SV-4040EX-R28-288T-12-416 Archiver
    - 2) (1) SV-2030E-R6S-D480-336 Directory
    - 3) Usable storage 250TB
6. Provide all associated system software and licensing.
7. For each supplied camera, provide Genetec licenses:
  - a. ESS GSC-OM-E-1C Enterprise Camera Connection
  - b. ESS ADV-CAM-E-5Y Genetec Advanced for Omnicast
    - 1) Must be co-termed with existing Elgin manufacturer contract

E. Recording criteria:

1. Record all cameras at full resolution at 15 frames per second, using motion-based recording of average 60% motion. Coordinate specific requirements with owner during configuration.
2. Size recorders such that cameras are recorded and archived for minimum 30-days on the storage device, plus an additional 25% spare storage capacity.
3. As part of shop drawing process, installer shall submit video storage calculations to demonstrate the specified video storage capacity is met with the submitted product.

## 2.5 INDOOR CAMERAS

A. Description:

1. Wall, ceiling, or pendant mount.
2. Minimum 30 frames per second.
3. Wide dynamic range.
4. Day/night mode.
5. Low-light capable.
6. Varifocal lens.
7. PoE power.
8. ONVIF and NDAA compliant.
9. Provide mounting hardware appropriate for the installation application.
10. For accessible ceilings, provide recessed mount kit with tile bridge support bracket.

B. Basis-of-Design Products

1. Fixed camera 2MP
  - a. Axis P3255-LVE, PoE+
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-C4: Ceiling surface mount, hard lid
2. 360-degree fisheye camera 6MP
  - a. Axis M4317-PLVE, PoE
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-C5: Ceiling surface mount, hard lid
    - 2) #C-M5: Ceiling surface mount, hard lid

## 2.6 OUTDOOR CAMERAS - ON BUILDINGS

A. Description:

1. Wall, ceiling soffit, or pendant mount.

2. Minimum 30 frames per second.
3. Wide dynamic range.
4. Day/night mode.
5. Low-light capable.
6. Varifocal lens.
7. PoE power.
8. ONVIF and NDAA compliant.
9. Provide mounting hardware appropriate for the installation application.

B. Basis-of-Design Products

1. Fixed camera 2MP
  - a. Axis P3255-LVE, PoE+
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-C2: Wall surface mount, 9' AFG
2. 360-degree fisheye camera 6MP
  - a. Axis M4317-PLVE, PoE
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-C1: Roof ceiling soffit, surface mount
    - 2) #C-C3: Wall mount, corner bracket arm, 9' AFG
    - 3) #C-C6: Wall mount, corner bracket arm, 9' AFG
    - 4) #C-C8: Wall surface mount, 9' AFG, restroom entry area
    - 5) #C-M1: Wall mount, corner bracket arm, 9' AFG
    - 6) #C-M3: Wall mount, corner bracket arm, 9' AFG
    - 7) #C-M4: Wall mount, corner bracket arm, 9' AFG
3. 360-degree multi-sensor 4x5MP (20MP)
  - a. Axis P3737-PLE, PoE+
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-C7: Roof ceiling soffit, surface mount
4. 360-degree multi-sensor 4x5MP (20MP) with integral PTZ x40 zoom
  - a. Axis Q6010-E w/Q6075-E, High PoE
    - 1) Provide Axis T8134 60W Midspan, locate in IT cabinet
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-M2: Roof ceiling soffit, surface mount

## 2.7 OUTDOOR CAMERAS - ON LIGHT POLES

A. Description:

1. Pole mount.
2. Minimum 30 frames per second.
3. Wide dynamic range.
4. Day/night mode.
5. Low-light capable.
6. Varifocal lens.
7. PoE power.
8. ONVIF and NDAA compliant.
9. Provide pole mount outdoor enclosure, with unified camera mount.
10. Provide mounting hardware appropriate for the pole mount application.

B. Basis-of-Design Products

1. 360-degree multi-sensor 4x5MP (20MP)
  - a. Axis P3737-PLE, PoE+
    - 1) Powered by Axis 60W SFP Midspan

- 2) Midspan located within security enclosure on light pole
- b. No substitution
- c. Scheduled cameras:
  - 1) #C-S1: Pole mount, 15' AFG
  - 2) #C-S3: Pole mount, 15' AFG
  - 3) #C-S4: Pole mount, 12' AFG
  - 4) #C-S10: Pole mount, 15' AFG, Alternate 5 scope, refer to sheet ALT-105
  - 5) #C-S11: Pole mount, 15' AFG, Alternate 5 scope, refer to sheet ALT-105
2. 360-degree multi-sensor 4x5MP (20MP) with integral PTZ x40 zoom
  - a. Axis Q6010-E w/Q6075-E, High PoE
    - 1) Powered by Axis 60W SFP Midspan
    - 2) Midspan located within security enclosure on light pole
  - b. No substitution
  - c. Scheduled cameras:
    - 1) #C-S2: Pole mount, 15' AFG
    - 2) #C-S5: Pole mount, 12' AFG
    - 3) #C-S6: Pole mount, 15' AFG
    - 4) #C-S7: Pole mount, 15' AFG
    - 5) #C-S8: Pole mount, 15' AFG
    - 6) #C-S9: Pole mount, 15' AFG
    - 7) #C-S12: Pole mount, 15' AFG, Alternate 5 scope, refer to sheet ALT-105

## 2.8 OUTDOOR ENCLOSURE - ON LIGHT POLES

- A. Description:
  1. Environmental enclosure, to house camera associated electronics equipment.
  2. Pole mount outdoor enclosure, with unified camera mount.
  3. IP66 and NEMA 4X rated.
  4. Will house SFP high PoE midspan fiber-to-Ethernet converter.
  5. Will house power outlet, provided by EC.
  6. Provide mounting hardware appropriate for the pole mount application.
- B. Basis-of-Design Products
  1. Outdoor enclosure
    - a. Axis T98A18-VE Surveillance Cabinet
    - b. No substitution
    - c. Mount camera to enclosure, at camera height(s) as indicated
  2. SFP 60W high PoE midspan fiber-to-Ethernet converter
    - a. Axis T8154 60W SFP Midspan
    - b. No substitution
  3. For each supplied SFP Midspan, provide two (2) Axis T8611 SFP Module LC.LX:
    - a. (1) at remote Axis SFP Midspan
    - b. (1) at head-end SFP aggregation switch in Maintenance building
      - 1) Refer to section 271100, coordinate with Division 27 supplier
    - c. No substitution

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other pathway elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

- B. Examine roughing-in for security device cabling conduit systems to verify actual locations of conduit and back boxes before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.
- B. Verify and obtain all necessary licenses and construction permits required to complete the Project scope.

### **3.3 INSTALLATION**

- A. Install cameras, video surveillance equipment, and cabling as recommended by manufacturer(s).
- B. Comply with all state and local ordinances, codes, and regulations.
- C. Coordinate all security conduit rough-in requirements with EC and GC prior to work.
- D. Coordinate all security equipment installation and IT LAN requirements with owner.

### **3.4 WIRING METHODS**

- A. Routing:
  - 1. Cabling may be installed in accessible ceilings unenclosed, unless otherwise indicated on the Drawings.
  - 2. Install cable and conduit, concealed in accessible ceilings, walls, and floors where possible.
  - 3. Cabling may be installed unenclosed within consoles, cabinets, desks, and counters.
  - 4. In unfinished spaces, install cabling in conduit pathways; concealed in walls for new construction.
  - 5. Where installed within conduit, data circuit conduit size shall be minimum 1 inch.
  - 6. Refer to the Drawings for typical device conduit requirements.
  - 7. Data transmission wiring shall not share conduit with other building wiring systems.
  - 8. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 9. For all installation applications, provide cabling rated for the environment in which it is installed.
- B. Wiring within Enclosures:
  - 1. Bundle, lace, and train cables within enclosures.
  - 2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
  - 3. Provide and use lacing bars and distribution spools.
  - 4. Install conductors parallel with or at right angles to sides and back of enclosure.
- C. Grounding: Provide independent-signal circuit grounding if recommended by manufacturer.
- D. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

### **3.5 INSTALLATION OF PATHWAYS**

- A. Drawings indicate general arrangement and routing of primary cabling pathways.
- B. Comply with the following Sections:
  - 1. 260533 "Raceways and Boxes for Electrical Systems"

- C. Comply with NFPA 70 for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### **3.6 FIRESTOPPING**

- A. Comply with project Penetration Firestopping specification, for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM "Firestopping Systems" article.

### **3.7 IDENTIFICATION**

- A. Label all security enclosures, cabinets, and cabling.
- B. Identify system components, wiring, and cabling complying with TIA/EIA-606-C.
- C. Comply with requirements of the following Identification Sections:
  - 1. 260553 "Identification for Electrical Systems".
- D. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of termination, where it is accessible within an enclosure.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    - a. Individually number and identify each cable extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
- E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-C requirements for the following:
  - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.
- F. Cable Schedule: Install a cable schedule within each electronic security enclosure. List incoming and outgoing cables and their designations, origins, and destinations. Protect printed schedule with clear plastic cover. Furnish an electronic copy of all final schedules provided for the Project.
- G. All labeling and cable schedules shall be aligned with the submitted closeout security as-built drawings.

### **3.8 PROTECTION**

- A. Maintain strict security during the installation of equipment and software. Rooms housing servers or workstations that have been powered up shall be locked and secured, as coordinated with owner.

### **3.9 STARTUP SERVICE**

- A. Perform system startup and commissioning.
  - 1. Complete installation and startup checks according to approved procedures that were developed in conjunction with owner in "Preparation" Article and based on manufacturer's written instructions.
  - 2. Coordinate system startup schedule and logistical requirements with owner prior to work.

**3.10 CLEANING**

- A. Clean installed items using methods and materials recommended by manufacturer.
- B. Clean video surveillance system camera housings, servers, workstations, and components as needed.

**3.11 DEMONSTRATION**

- A. Perform 100% pre-testing for all system functionality, and complete initial readiness checklist. Correct and resolve all deficiencies. Update and submit completed readiness checklist identifying corrections, and request for approval of Substantial Completion.
- B. Perform final field test in conjunction with owner, demonstrating that all features and functionality are 100% complete and operational.

**3.12 TRAINING**

- A. Provide up to four hours of training, if requested by owner. Training shall cover the following basic aspects of the system:
  - 1. Software configuration and administration.
  - 2. Camera configuration and adjustments.
  - 3. System operation and monitoring.
  - 4. End-user maintenance.

**3.13 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:
  - 1. Check proper operation of cameras and lenses.
  - 2. Verify operation of auto-iris lenses and adjust back-focus as needed.
  - 3. Verify operation of camera call-up based on ACAMS alarm activation.
  - 4. Check video storage usage and capacity versus specified criteria.
  - 5. Recommend changes to cameras, device configuration or programming, to improve Owner's use of the video surveillance system.
  - 6. Provide a written report of adjustments and recommendations.

END OF SECTION

SECTION 321813.10 - S - PLAYGROUND TURF

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Alternate No. 3, Synthetic turf surfacing for the Playground.
- B. Related Requirements:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 2. Section 312000 "Earth Moving."

1.2 SUBMITTALS

- A. Submit the following:
  - 1. Synthetic Turf and Safety Subsurface System - One (1) sample each, approximately (1) square yard, of turf color.
  - 2. Certified copies of independent (third-party) laboratory reports and tests as follows:
    - a. Pile Height, Face Weight and Total Fabric Weight - ASTM D418.
    - b. Primary and Secondary Backing Weights - ASTM D 418.
    - c. Grab Tear Strength - ASTM D 1682.
    - d. Tuft Bind - ASTM D1335.
    - e. Flammability Standard – ASTM D2859
    - f. Determination of Accessibility of Surface Systems Under and Around Playground Equipment – ASTM F1951-99
    - g. Impact Attenuation of Surface Systems Under and Around Playground Equipment – ASTM F1292-04.
    - h. Protection of Electrostatic Discharge Susceptible Items: Footwear/Flooring System – Voltage Measurements in Combination with a Person – ANSI/ESD STM97.2-2016.
    - i. Determination of Polyfluorinated (PFAS) Compounds in Soil by Liquid Chromatography Tandem Mass Spectrometry – ASTM D7968
    - j. Certified safety subsurface system - IPEMA.
  - 3. Maintenance Manuals, which will include all necessary instructions for the proper care and preventative maintenance of the turf system.
  - 4. The manufacturer/installer of the synthetic turf shall inspect the subbase and supply a Certificate of Subbase Acceptance for the purpose of obtaining manufacturer's warranty for the finished synthetic surface.
  - 5. Shop drawings shall be prepared and contain all pertinent information regarding installation.
    - a. Seaming Plan
    - b. Installation details; edge detail; inserts, etc.
  - 6. Product Information
    - a. Product information including carpet, padding and infill materials
  - 7. Field Test Reports From Independent and Certified Test Lab
    - a. Impact Attenuation - Impact attenuation test results shall meet or exceed Consumer Product Safety Commission Guidelines for impact attenuation (G-max and Head Injury Criterion "H.I.C."). Test results must be administered and evaluated under the same test and these results must be shown for three drops at each required temperature: 32o, 72o, 120o; yield less than 200 G's and less than 1000 H.I.C. Only test results from ASTM testing approved laboratories F8 committee will be acceptable.
    - b. Permeability – min 30” per hour.
    - c. Electrostatic Discharge - that it is 1,000 volts below the 2,000-volt limit for commercial applications with a wide variety of footwear.
    - d. Flammability – Pill test



- e. PFAS – within specified limits
- 8. Warranty
  - a. Provide copy of manufacturer's warranty, 15 year period.

### 1.3 QUALITY ASSURANCE

- A. The Turf Contractor and the Turf Manufacturer must be experienced in the manufacture and installation of this specific type of synthetic turf system specific to playground spaces, and provide references of three (3) specific installations within the past five (5) years.
  - 1. The turf contractor must provide competent workmen skilled in the installation of this specific type of synthetic turf. The designated supervisory personnel on the project must be certified in writing by the turf manufacturer as competent in the installation of this material, including joining seams. The manufacturer shall have a representative on site to certify installation and warranty compliance.
  - 2. The turf contractor shall provide evidence directly from the turf manufacturer that the installer is certified by the manufacturer to install this type of synthetic turf installation.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver manufactured materials in original packages with seals unbroken and bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store manufactured materials in a clean, dry location, protected from the weather and deterioration, and complying with manufacturer's written instructions for minimum and Maximum temperature requirements for storage. Store units on flat surfaces.
- C. Protect UV-light sensitive materials from exposure to sunlight.

### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply surface system materials or components over wet, frozen, or excessively damp substrates if prohibited by manufacturer's written instructions or warranty requirements.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system to be performed according to manufacturer's written dimensions of other construction by field measurements.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. All components and their installation method shall be designed and manufactured for use on outdoor playgrounds. The materials as herein after specified should be able to withstand full climatic exposure, be resistant to insect infestation, rot, fungus and mildew, anti-microbial; to ultra-violet light and heat degradation, and shall have the basic characteristic of flow-through drainage allowing free movement of surface run off through the turf where such water may flow to the subbase and subdrainage system.
- B. The product shall include a resilient subsurface padding safety system. They system shall be IPEMA certified and provide fall height protection in compliance with the playground equipment heights.

- C. The playground grass resilient synthetic turf and subsurface padding system layout shall be provided by the contractor and manufacturer to match the approved playground equipment sizes and appropriate fall heights and padding safety system and various thickness.
- D. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use.
- E. Primary blades (Olive Green) are a slit film XP polyethylene with anti-microbial agent AlphaSan® integrated into the primary yarn. An anti-static agent must also be integrated into the construction so as to not allow static charge build-up. Secondary blade (turf green/tan blend) is a heat textured nylon monofilament. Polyethylene blades that are web or honeycomb fibrillated shall not be accepted. Polypropylene or polyethylene thatch layers shall not be accepted.
- F. Weight: face weight will be 48 oz. With backing, the total weight of the product will be 103 oz.
- G. Tufting: The tufting gauge will be 3/8", pile height 1-1/2". Tufting configuration – dual yarn same row setup.
- H. Backing: The backing shall be multi-layered, three-parts. First layer (stabilized primary consisting of polyester, fiberglass and polyurethane, 18 pic construction and 6 ounces. Second layer is a 40-ounce, urethane layer. Third layer is nonwoven, recycled, geotextile fleece.
- I. Seams: Primary seaming system shall be a micromechanical seam, utilizing hook and loop technology. Seams will be sealed with an adhesive.
- J. Infill material: Sand infill.

## 2.2 PLAYGROUND TURF, ACCEPTABLE MANUFACTURERS

- A. Forever Lawn. Playground Grass Ultra, as manufactured by ForeverLawn Inc.
- B. Approved equal.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The installation shall be performed in full compliance with approved shop drawings.
- B. All installation operations shall be performed by personnel directly employed by the manufacturer, fully familiar with the materials and their application, under the full-time direction and supervision of a qualified technical supervisor employed by the manufacturer of the synthetic turf. Installation supervisors shall have a minimum of five (5) years experience.
- C. The surface to receive the playground turf shall be inspected and certified by the manufacturer as ready for the installation of the playground turf system.
- D. Adhesives for bonding synthetic turf appropriately shall be as recommended by the playground turf manufacturer.
- E. Cord for sewing seams of the turf shall be as recommended by the playground turf manufacturer.

### 3.2 BASE STONE CONSTRUCTION

- A. The base stone slope gradation and direction shall match subgrade slope, unless otherwise noted.
  - 1. The geotextile fabric shall be installed under the stone base.
  - 2. The drain system shall be installed as indicated on the drawings.
  - 3. The base stone elevation shall not vary by more than 1" +/- . Any imperfections, divots, etc. in the base stone will be repaired to meet grade tolerance.
  - 4. All capping stone materials shall be provided and laser graded to meet finish grade tolerance and shall not vary more than 1/4" when compared with a 50' taut string line.

### 3.3 PLAYGROUND TURF INSTALLATION

- A. The turf installer shall thoroughly inspect all materials delivered to the site both for quality and quantity to assure that the entire installation shall have sufficient material to maintain proper mixing ratios.
- B. Synthetic turf shall be loose-laid across the area, stretched, and attached to the perimeter edge detail. Turf shall be of sufficient length to permit full cross-area installation. No head or cross seams will be allowed except as needed to accommodate programmed cut-outs.
- C. All seams shall be flat, tight, and permanent with no separation or fraying. Field seams shall be sewn using double-lock stitch with cord recommended by the turf manufacturer. Seaming tape to be constructed of high tenacity polyurethane coated, woven nylon. Inlaid markings shall be adhered to the seaming tape with a two-part, high strength polyurethane adhesive applied per the turf manufacturer's standard procedures for outdoor applications.
- D. Prior to infill installation, Engineer shall conduct a pre-fill inspection.
- E. Infill materials shall be properly applied in numerous lifts using special broadcasting equipment to produce a layered system of the manufacturer's standard infill products. The turf shall be raked and brushed properly as the mixture is applied. The infill material shall be installed to a minimum depth of 1 inch. The infill materials can only be applied when the turf fabric is bone dry.

### 3.4 OWNER'S TRAINING

- A. The Synthetic Turf Provider shall instruct the Owner's maintenance staff on the care and maintenance of the synthetic turf surface at an in-person, on-site meeting.
- B. Provide Five (5) complete maintenance manuals, copies of manufacturer's literature, samples, certifications, and laboratory analytical data for all items submitted as a part of this specification

### 3.5 CLEAN UP

- A. Contractor shall provide the labor, supplies and equipment, as necessary, for final cleaning of surfaces and installed items.
- B. The Owner shall determine if any remnants of new material shall become the property of the Owner. Deliver remnants to location as determined by the Owner.
- C. The Contractor shall keep the area clean throughout the project and clear of debris. Dispose waste materials in accordance with local requirements.

END OF SECTION

















































































