

**THE PORT AUTHORITY OF NY & NJ**

**PROCUREMENT DEPARTMENT  
4 WORLD TRADE CENTER  
150 GREENWICH STREET, 21<sup>ST</sup> FLOOR  
NEW YORK, NEW YORK 10007**

**REQUEST FOR PROPOSALS**

**ISSUE DATE: OCTOBER 16, 2019**

**TITLE: REQUEST FOR PROPOSALS FOR THE PROVISION OF A  
TURNKEY SOLUTION, INCLUDING MAINTENANCE, OF A  
GUNSHOT DETECTION SYSTEM AT NEWARK LIBERTY  
INTERNATIONAL AIRPORT– THREE (3) YEAR CONTRACT**

**RFP NUMBER: 59136**

**SUBMIT PROPOSALS TO THE ABOVE ADDRESS NO LATER THAN THE  
DUE DATE AND TIME INDICATED BELOW**

**SITE INSPECTION DATE: OCTOBER 25, 2019  
(Refer to the document for more information)**

**QUESTIONS DUE DATE: NOVEMBER 6, 2019 TIME: 5:00 PM**

**PROPOSAL DUE DATE: NOVEMBER 15, 2019 TIME: 2:00 PM**

**BUYER: JOHN SANTIAGO  
[john.santiago@panynj.gov](mailto:john.santiago@panynj.gov)  
(212) 435-4613**

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## **1. INFORMATION FOR PROPOSERS ON THIS REQUEST FOR PROPOSALS**

### **A. General Information**

The Port Authority of New York and New Jersey (the “Port Authority” or the “Authority”) is an agency of the States of New York and New Jersey, created and existing by virtue of the Compact of April 30, 1921, made by and between the two States, and thereafter consented to by the Congress of the United States. It is charged with providing transportation, terminal and other facilities of trade and commerce within the Port District. The Port District comprises an area of about 1,500 square miles in both States, centering about New York Harbor. The Port District includes the Cities of New York and Yonkers in New York State, and the cities of Newark, Jersey City, Bayonne, Hoboken and Elizabeth in the State of New Jersey, and over 200 other municipalities, including all or part of seventeen counties, in the two States, see [www.panynj.gov](http://www.panynj.gov). Additionally, the most recent electronic version of the Authority’s Annual Report is available at <http://www.panynj.gov/corporate-information/annual-reports.html>.

This is the second of a two-step procurement process. Based on the Port Authority’s review of submissions to the Request for Pre-Qualifications (RFPQ) #56612, the Port Authority has selected the Guardian Indoor Active Gunshot Detection System (GDS) manufactured by Shooter Detection Systems (SDS).

The Port Authority is hereby seeking proposals from qualified firms to furnish, install, integrate, configure, commission and successfully complete acceptance testing of the GDS, and provide maintenance services and warranty for the commissioned GDS, at Newark Liberty International Airport (EWR) Terminal B, as more fully described herein.

Terminal B recently completed major upgrades including ticket counters, baggage screening, connector expansion and other renovation work on the Meet & Greet area. Proposers and the Contractor should be cognizant of the Port Authority’s desire to maintain the aesthetic appearances of the Terminal, making aesthetics and function extremely important parts of this installation project. Protection and location of the Terminal’s signage, artwork, ceiling baffles, architectural features and other property are factors to be considered in the design and installation work.

### **B. Brief Summary of Scope of Work**

The Contractor shall furnish, install, integrate, configure, commission and successfully complete acceptance testing of the GDS within a two hundred ten (210) day period, and provide maintenance and warranty service for the commissioned and Authority accepted GDS for a period of three (3) years at EWR Terminal B. The primary function of the GDS will be to serve as a tool that can be paired with other processes and systems to facilitate the assessment of reports of gunfire. The GDS shall, at a minimum, be able to: (1) provide notifications to terminal and airport operations personnel and (2)

communicate with emergency response and law enforcement personnel in the event gunfire occurs within the GDS coverage area(s).

The full Scope of Work is set forth in detail in Attachment C – Scope of Work and Engineering Technical Specifications.

### **C. Deadline for Receipt of Proposals**

Refer to the cover page of this RFP for the Proposal Due Date, which is subject to change by Addendum. There will be no public opening and reading of proposals. The RFP closes at 2:00 P.M. Eastern Time on the Proposal Due Date.

**PLEASE READ THE FOLLOWING DELIVERY REQUIREMENTS CAREFULLY. Proposers assume all responsibility for delays or problems in delivery.**

Proposal submissions will be received at:

The Port Authority of NY & NJ  
Attention: Proposal Custodian  
Procurement Department  
4 World Trade Center  
150 Greenwich Street, 21st Floor  
New York, NY 10007

Clearly mark the solicitation number on the outermost package.

At this address, proposals will be accepted via (1) regular mail, (2) express delivery service (e.g. UPS), or (3) hand delivery.

Express carrier deliveries by commercial vehicles can be made via vendors approved by Silverstein Properties, the 4 World Trade Center (4 WTC) Property Manager, through the Vehicle Security Center (VSC). Presently, UPS is the only delivery vendor with approved recurring delivery times.

There is extensive security at the World Trade Center Site. Individuals must present a valid government-issued photo ID to enter 4 WTC. Individuals without valid identification shall be turned away and their packages not accepted. Individuals without packages or carrying small packages or boxes that can be conveyed by hand or on a hand truck may enter through the lobby. All envelopes, packages and boxes may be subject to additional security screening.

There is no parking available at 4 WTC/150 Greenwich Street, and parking in the surrounding area is extremely limited.

The Port Authority assumes no responsibility for delays caused by any delivery service.

#### **D. Vendor Profile**

To ensure maximum opportunities, it is vitally important that Proposers keep their vendor profiles up to date with an appropriate e-mail address, as this will enable their firm to receive timely notice of advertisements, reminders, solicitations and addenda. Proposers may update their vendor profile or register as a Port Authority Vendor by accessing the online registration system at <https://www.paprocare.com>.

#### **E. Submission of Proposals**

One reproducible original (containing original signatures and clearly designated as such) and ten (10) double-sided copies of the proposal must be submitted on or before the due date and time in accordance with the information on the cover page of this RFP and sent or delivered to the RFP Custodian at the address specified on the cover page. Each copy of the proposal as well as the parcel(s) used for shipping must be conspicuously marked with the Proposer's name and address as well as the Proposer's Vendor Number, if available. In addition, the outside of the package must clearly state the title of this RFP, the number of this RFP and the Proposal Due Date. Failure to properly label proposal submissions may cause a delay in identification, misdirection or disqualification of proposal submissions.

Consistent with environmentally preferable procurement practices, the Port Authority requests all documents submitted to be in a form that can be easily recycled (i.e., no plastic covers or binding) and to provide only supporting literature which directly relates to the proposal being submitted. Proposers are encouraged to provide information regarding their environmentally preferable/sustainable business practices as they relate to this contract wherever possible by submitting with proposals a completed Attachment G - Certified Environmentally Preferable Products/Practices form.

#### **F. Communications Regarding this RFP**

All communications concerning this RFP should be directed to the Buyer listed on the cover page. All questions regarding this RFP should be submitted in writing via e-mail to the Buyer at the address listed on the cover page no later than 2:00 p.m. on the Questions Due Date.

The Buyer is authorized only to direct the attention of prospective Proposers to various portions of this RFP so that they may read and interpret such portions themselves.

Neither the Buyer nor any other employee of the Port Authority is authorized to interpret the provisions of this RFP or give additional information as to its

requirements. If interpretation or other information is required, it will be communicated to Proposers by written addenda and such writing shall form a part of this RFP.

### **G. Proposal Acceptance or Rejection**

Acceptance shall be only by mailing to or delivering at the office designated by the Proposer in its proposal, a notice in writing signed by an authorized representative on behalf of the Port Authority specifically stating that the proposal is accepted or by execution of an agreement covering the subject matter of this RFP signed by authorized representatives of the Port Authority and the Proposer. No other act of the Port Authority, its Commissioners, officers, agents, representatives, or employees shall constitute acceptance of a proposal. Rejection of a proposal shall be only by either (a) a notice in writing specifically stating that the proposal is not accepted, signed by an authorized representative of the Port Authority and mailed to or delivered to the Proposer at the office designated in the Proposal, or (b) omission of the Port Authority to accept the proposal within 180 days after the Proposal Due Date. No other act of the Port Authority, its Commissioners, officers, agents, representatives or employees shall constitute rejection of a proposal.

### **H. Union Jurisdiction**

Proposers are advised to ascertain whether any union now represented or not represented at the facility will claim jurisdiction over any aspect of the operations to be performed hereunder and their attention is directed to the Section of this RFP entitled "Harmony" included in the "Standard Contract Terms and Conditions" hereunder.

### **I. City Payroll Tax**

Proposers should be aware of the payroll tax imposed by the:

- a. City of Newark, New Jersey for services performed in Newark, New Jersey;
- b. City of New York, New York for services performed in New York, New York;  
and
- c. City of Yonkers, New York for services performed in Yonkers, New York.

These taxes, if applicable, are the sole responsibility of the Contractor. Proposers should consult their tax advisors as to the effect, if any, of these taxes. The Port authority provides this notice for informational purposes only and is not responsible for either the imposition or administration of such taxes. The Port Authority exemption set forth in the Paragraph entitled "Sales or Compensating Use Taxes", in the "Standard Contract Terms and Conditions" included herein, does not apply to these taxes.



## **J. Pre-Proposal Meeting/Site Inspection**

The Port Authority will host a Pre-Proposal Meeting/Site Inspection as follows:

**Date and Time:** October 25, 2019 from 9:00 AM to 11:00 AM Eastern Time

**Location:** EWR Terminal B, Level 3 Rest and Recharge Area, Newark, NJ.

Attendance is strongly recommended. A site inspection allows Proposers to tour and physically inspect the actual site(s) of Work prior to the submission of proposals. The meeting will begin promptly, and Proposers are advised to arrive at least twenty (20) minutes prior to the meeting time to ensure sufficient time to locate the meeting room and sign in. In order to gain admittance to the meeting, attendees must present a valid, government issued identification and separate identification showing that they are employees of the Proposer. Failure to have proper identification may preclude attendance at the meeting. Proposers interested in attending the meeting must RSVP to Edward Chang at [echang@panynj.gov](mailto:echang@panynj.gov) at least two (2) business days prior to the date of the meeting and must indicate who will be attending. No materials in response to this RFP will be accepted at this meeting.

No questions will be formerly addressed during the site inspection. Any questions concerning this RFP should be submitted in writing prior to the meeting so that the Port Authority may prepare responses via an addendum in advance of the meeting. Additional questions may be submitted up to the time of the Questions Due Date.

## **K. Additional Proposer Information**

Prospective Proposers are advised that additional vendor information, including, but not limited to forms, documents and other information, including MBE/WBE Participation Plan Submission Forms and protest procedures, may be found on the Port Authority website at <http://www.panynj.gov/business-opportunities/become-vendor.html>.

## **L. Personnel Assurance Program and Contractor Staff Background Screening**

The Contractor awarded this Contract may be required to have its staff, and any subcontractor's staff working under this Contract, authorize the Authority or its designee to perform background checks. Such authorization shall be in a form acceptable to the Authority. The Contractor and any subcontractors may also be required to use an organization designated by the Authority to perform the background checks. The cost for said background checks for staff that pass and are granted a credential may be reimbursable to the Contractor and its subcontractors as an out-of-pocket expense. Costs for staff that are rejected for a credential for any reason are not reimbursable.

Such background checks shall be performed through the Authority's personnel assurance program provider. The Secure Worker Access Consortium ("S.W.A.C.") is the only Port Authority approved provider to be used to conduct background screening,

except as otherwise required by federal law and/or regulation. Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers can be found at <http://www.secureworker.com>, or S.W.A.C. may be contacted directly at (877) 522-7922.

## **M. Automated Clearing House Enrollment**

The Port Authority has transitioned to an electronic method of paying its vendors, contractors and consultants via an Automated Clearing House (“ACH”) funds transfer. It is the Port Authority’s expectation that all vendors, contractors and consultants will be paid via an ACH funds transfer. To avoid delays in payment, vendors, contractors, and consultants should enroll in ACH and complete the Port Authority’s “Authorization Agreement For Direct Deposits And Direct Payments (ACH Credits)” form, which is available at <https://www.panynj.gov/business-opportunities/pdf/Vendor-ACH-auth-form.pdf>. The Authorization Agreement shall remain in full force and effect until the Port Authority has received written notification from the vendor, contractor or consultant of its termination in such time and in such manner as to afford the Port Authority and the depository financial institution(s) a reasonable opportunity to act on it. Any questions on this process may be directed to the Comptroller’s Department ACH Enrollments contact line at (201) 216-6002 or emailed to [ACHENROLLMENT@PANYNJ.GOV](mailto:ACHENROLLMENT@PANYNJ.GOV).

## **2. PROPOSER PREREQUISITES**

Only Proposers who can demonstrate that they comply with all of the following prerequisites should submit proposals, along with supporting documentation, as only proposals from such Proposers will be considered. As of the Proposal Due Date, Proposers shall meet the following prerequisites:

- A. The Proposer shall have had at least five (5) years of continuous experience immediately prior to the date of the submission of its proposal in the management and operation of a business that installs, integrates and maintains security-related electronic/electrical systems and was actually engaged in providing these services to commercial and industrial accounts under contract. The Proposer may fulfill this prerequisite if it can demonstrate that the persons or entities owning and controlling the Proposer have had a cumulative total of at least the same number of years and type of direct continuous experience immediately prior to the submission of this proposal as is required of the Proposer, or has owned and controlled other entities which meet the requirement.
- B. During the time period stated in (A) above, the Proposer shall demonstrate satisfactory performance of at least two (2) contract(s) for similar services of similar size and scope to those required by this RFP.

- C. The Proposer shall be certified by SDS as a certified dealer of its GDS prior to the date of the submission of its proposal. The Proposer shall demonstrate, by submission with its proposal, proof of agreement with SDS that the Proposer is a certified dealer, and the following:
  - a. Proof of experience with:
    - i. Verint Nextiva Video Systems Inc. (Closed Circuit Camera Control, Display, Video Analytics, and Digital Video Recording System).
    - ii. Everbridge, Emergency Messaging System.
- D. Retain professional services of SDS to assist in pre and post installation surveys, design reviews, meetings, testing, commissioning, and training.
  - a. All System equipment installation, inspection, and testing shall be performed under the direct supervision of personnel certified by the manufacturer of the approved equipment.
- E. The Proposer shall demonstrate that it has earned gross revenues of at least One Million Dollars (\$1,000,000) in the last fiscal or calendar year immediately prior to the date of submission of its proposal from the type of services or products described in this RFP.
- F. In the event a proposal is submitted by a joint venture, the foregoing prerequisites will be considered with respect to such Proposal as follows:
  - i. With respect to subparagraphs A, B and C above, the prerequisite will be considered satisfied if the joint venture itself, or any of its participants individually, can meet the requirements. With respect to subparagraph E above, the gross income of the joint venture itself may meet the prerequisites or the gross income of the participants in the joint venture may be considered cumulatively to meet the prerequisite.
  - ii. If the proposal is submitted by a common law joint venture, a joint venture that has not been established as a distinct legal entity, each participant of the joint venture shall be held jointly and severally liable and must individually execute and perform all acts required by this proposal. Documents signed by a common law joint venture, in connection with this proposal, shall include the names of all participants of the joint venture followed by the words “acting jointly and severally”. All joint venture proposers must provide documentation of their legal status.

All Proposers must include documentation that they meet the above prerequisites. By furnishing this solicitation document to Proposers, the Port Authority has not made a determination that the Proposers have met the prerequisites or have otherwise been deemed qualified to perform the services. In addition, a determination that a Proposer has met the prerequisites is no assurance that they will be deemed qualified in connection with other proposal requirements included herein.

### **3. FINANCIAL INFORMATION**

The Proposer will be required to demonstrate that it is financially capable of performing the contract resulting from this RFP (“Contract”). The determination of the Proposer’s financial qualifications and ability to perform this Contract will be in the sole discretion of the Port Authority. The Proposer shall submit, with its proposal, the following:

#### **A. Financials:**

1. Certified financial statements, including applicable notes, reflecting the Proposer’s assets, liabilities, net worth, revenues, expenses, profit or loss and cash flow for the most recent year or the Proposer’s most recent fiscal year.
2. Where the certified financial statements in subparagraph 1 above are not available, then reviewed statements from an independent accountant setting forth the aforementioned information shall be provided.

Where the statements submitted pursuant to subparagraphs 1 and 2 aforementioned do not cover a period which includes a date not more than forty-five (45) days prior to the Proposal Due Date, then the Proposer shall also submit a statement in writing, signed by an executive officer or his/her designee, that the present financial condition of the Proposer is at least as good as that shown on the statements submitted.

- B. A statement of work which the Proposer has on hand, including any work on which a bid and/or proposal has been submitted, containing a description of the work, the annual dollar value, the location by City and State, the current percentage of completion, the expected date for completion, and the name of an individual most familiar with the Proposer’s work on these jobs.
- C. The name and address of the Proposer’s banking institution, chief banking representative handling the Proposer’s account, the Proposer’s Federal Employer Identification Number (i.e., the number assigned to firms by the Federal Government for tax purposes), the Proposer’s Dun and Bradstreet number, if any, the name of any credit service to which the Proposer furnished information and the number, if any, assigned by such service to the Proposer’s account.

### **4. EVALUATION CRITERIA AND RANKING**

All proposals will be reviewed by the Port Authority to determine if they adhere to the format required in this RFP, if they contain all required submissions and if the Proposer meets the prerequisites required for submission of a Proposal. For Proposals meeting such requirements, the following criteria, set forth in order of importance, will be utilized in the evaluation of proposals:

A. Technical Expertise, Experience of Proposer, and Proposer's Capability to Meet the Requirements of this RFP

1. The extent to which the Proposer and the managerial and supervisory personnel proposed for this project have experience in implementing and managing similar services in a similar environment using staff comparable in size to that necessary for the services to be provided hereunder.
2. Proposer's organization chart that identifies key personnel in fields related to those applicable to the RFP requirements, such as but not limited to engineering and electrical, that will be assigned to this project from initiation to completion. The organization chart should include, at a minimum, the personnel's name and title. If the personnel will be assigned to the work under this RFP, the Proposer must indicate so, including the personnel's role under this project and percentage of time commitment to the project.
3. Experience of Proposer's senior management team in managing employees and conducting employee management programs, including, but not limited to:
  - a. Security training
  - b. OSHA safety training
  - c. Quality assurance and control programs
4. Certifications
  - a. Evidence that the Proposer is certified by SDS to furnish, install, test, integrate and maintain the selected GDS.
  - b. Evidence, if any, that the Proposer has achieved U.S. Department of Homeland Security, Security and Technology Directorate, Office of SAFETY Act Designation and/or Certification.
5. Facilities/project references
  - a. Contact information of clients for whom the selected GDS has been successfully installed and commissioned by the Proposer.
  - b. Project descriptions and contact information for three (3) projects (may be other technology installations) of similar size, scope, and complexity to EWR Terminal B where installations are to be conducted without disruption to high volume customer and airport operational activity.
6. Basis of Design for the GDS
  - a. Specific project requirements and the concepts the Proposer will utilize to address the project requirements.
  - b. Most cost-effective methods to provide a fully functional and effective GDS for the coverage areas required by the Authority.

- c. Proposer's interpretations and understanding of the functional requirements and of the operational intent of the GDS as conveyed by the Authority.

## B. Cost Proposal

The Total Estimated Contract Price as submitted on the Cost Proposal Form.

## C. Management Approach

The clarity and feasibility of the Proposal, which shall include the Proposer's management philosophy, principles and programs to be utilized in performing the service, and which shall include consideration of the following:

- a. Proposer's proposed labor and supervisory staffing
- b. On-site management plans and work plan for this Contract
- c. Proposed quality assurance/quality control program, including customer care, safe work environments, and wages compliance.

## 6. MBE/WBE SUBCONTRACTING PROVISIONS

The Port Authority has a long-standing practice of making its business opportunities available to Minority Business Enterprises (MBEs) and Women-owned Business Enterprises (WBEs) and has taken affirmative steps to encourage such firms to seek business opportunities with the Port Authority. The successful Proposer ("Contractor") will use good faith efforts to provide for meaningful participation by Port Authority certified MBE/WBEs as defined in this document.

MBE/WBE Good Faith Participation – The Contractor shall use every good faith effort to provide for meaningful participation by Port Authority certified Minority Business Enterprises (MBEs) and Port Authority certified Women-owned Business Enterprises (WBEs) in all purchasing and subcontracting opportunities associated with this Contract, including the purchase of equipment, supplies and labor services, in accordance with the section of the Standard Terms and Conditions entitled "MBE/WBE Good Faith Participation."

The Proposer shall use good faith efforts to achieve participation equivalent to twenty percent (20%) of the total Contract price for Port Authority certified MBEs and ten percent (10%) of the total Contract price for Port Authority certified WBEs.

Good faith efforts to include and facilitate participation by MBE/WBEs shall include, but not be limited to the following:

- a. Dividing the services and materials to be procured into smaller portions, where feasible.

- b. Giving reasonable advance notice of specific contracting, subcontracting and purchasing opportunities to such MBE/WBEs as may be appropriate.
- c. Soliciting services and materials from Port Authority certified MBE/WBE firms. To access the Port Authority's Directory of MBE/WBE certified firms, go to <http://www.panynj.gov/business-opportunities/sd-mwsdbe-profile.html>
- d. Ensuring that provision is made to provide progress payments to MBE/WBEs in accordance with the prompt payment provision below.
- e. Observance of reasonable commercial standards of fair dealing in the respective trade or business.

Proposers are directed to use form PA3760C as the recording mechanism for the MBE/WBE Participation Plan, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>.

Proposers shall include their MBE/WBE Participation Plans with their Proposals, to be reviewed and approved by the Authority's Office of Business Diversity and Civil Rights (OBDCR).

The Proposer must submit an MBE/WBE Participation Plan for each MBE/WBE subcontractor. Each Participation Plan shall contain, at a minimum, the following:

- Identification of the MBE/WBE: Provide the name and address of the MBE/WBE. If no MBE/WBEs are identified, describe the process for selecting participant firms in order to achieve the good faith goals under this Contract.
- Level of Participation: Indicate the dollar value and percentage of MBE/WBE participation expected to be achieved.
- Scope of Work: Describe the specific scope of work the MBE/WBEs will perform.

The MBE/WBE subcontractor listed on each of the MBE/WBE Participation Plans must be certified by the Port Authority in order for the Contractor to receive credit toward the MBE/WBE goals set forth in this Contract. Please go to <http://www.panynj.gov/business-opportunities/sd-mwsdbe-profile.html> to search for MBE/WBEs by a particular commodity or service. The Port Authority makes no representation as to the financial responsibility of these firms or their ability to perform work under this Contract.

Subsequent to Contract award, all changes to any of the MBE/WBE Participation Plans must be submitted via a Modified MBE/WBE Participation Plan to the Manager for review and approval by the Authority's Office of Business Diversity and Civil Rights. For submittal of modifications to the MBE/WBE Plan, Contractors are directed to use form PA3760D, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>. The Contractor shall not make changes to any of its approved MBE/WBE Participation Plans or substitute MBE/WBE subcontractors or suppliers for those named in their approved plans without the Manager's prior written approval. Unauthorized changes or substitutions, including performing the work designated for a subcontractor with the Contractor's own forces, shall be a violation of this

section. Progress toward attainment of MBE/WBE participation goals set forth herein will be monitored throughout the duration of this Contract.

The Contractor shall also submit to the Manager, along with invoices, the Statement of Subcontractor Payments, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>. The Statement must include the name and business address of each MBE/WBE subcontractor and supplier actually involved in the Contract, a description of the work performed and/or product or service supplied by each such subcontractor or supplier, the date and amount of each expenditure, and such other information that may assist the Manager in determining the Contractor's compliance with the foregoing provisions.

### **Prompt Payment/Retainage**

The Contractor agrees to pay each subcontractor under this Contract, for satisfactory performance of its subcontract, no later than ten (10) days from the receipt of each payment the Contractor receives from the Authority. The Contractor agrees further to return retainage payments, if any to each subcontractor within ten (10) days after the subcontractors' work is satisfactorily completed. Any delay or postponement of payment from the above referenced timeframe may occur only for good cause following written approval of the Authority.

### **MBE/WBE Conditions of Participation**

MBE/WBE participation will be counted toward meeting the MBE/WBE contract goal, subject to all of the following conditions:

- A. **Commercially Useful Function.** An MBE/WBE is considered to perform a commercially useful function when it is responsible for the execution of a distinct element of work on a contract and carries out its responsibilities by actually performing, managing, and supervising the work involved in accordance with normal industry practice. Regardless of whether an arrangement between the Contractor and the MBE/WBE represent standard industry practice, if the arrangement erodes the ownership, control or independence of the MBE/WBE or in any other way does not meet the commercially useful function requirement, that firm shall not be included in determining whether the MBE/WBE goal is met and shall not be included in MBE/WBE reports. If this occurs with respect to a firm identified as an MBE/WBE, the Contractor shall receive no credit toward the MBE/WBE goal and may be required to backfill the participation. An MBE/WBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction or contract through which funds are passed in order to obtain the appearance of MBE/WBE participation. An MBE/WBE may rebut a determination by the Authority that the MBE/WBE is not performing a commercially useful function to the Authority.
- B. **Work Force.** The MBE/WBE must employ a work force (including administrative and clerical staff) separate and apart from that employed by the Contractor, other



Subcontractors on the contract, or their Affiliates. This does not preclude the employment by the MBE/WBE of an individual that has been previously employed by another firm involved in the Contract, provided that the individual was independently recruited by the MBE/WBE in accordance with customary industry practice. The routine transfer of work crews from another employer to the MBE/WBE shall not be allowed.

- C. Supervision. All Work performed by the MBE/WBE must be controlled and supervised by the MBE/WBE without duplication of supervisory personnel from the Contractor, other Subcontractors on the contract, or their Affiliates. This does not preclude routine communication between the supervisory personnel of the MBE/WBE and other supervisors necessary to coordinate the Work.
- D. Equipment: MBE/WBE subcontractors may supplement their equipment by renting or leasing additional equipment in accordance with customary industry practice. If the MBE/WBE obtains equipment from the Contractor, their affiliates and other subcontractors performing Work on the Contract, the MBE/WBE shall provide documentation to the Authority demonstrating that similar equipment and terms could not be obtained at a lower cost from other customary sources of equipment. The required documentation shall include copies of the rental or leasing agreements, and the names, addresses and terms quoted by other sources of equipment.

### **Counting MBE/WBE Participation**

The value of the Work performed by an MBE/WBE, with its own equipment, with its own forces, and under its own supervision will be counted toward the goal, provided the utilization is a commercially useful function. An MBE/WBE prime contractor shall still provide opportunities for participation by other MBE/WBEs. Work performed by MBE/WBEs will be counted as set forth below. If the Authority determines that some or all of the MBE/WBEs work does not constitute a commercially useful function, only the portion of the work considered to be a commercially useful function will be credited toward the goal.

- A. Subcontractors. One hundred percent (100%) of the value of the Work to be performed by an MBE/WBE subcontractor will be counted toward the MBE/WBE goal. The value of such Work includes the cost of materials and supplies purchased by the MBE/WBE, except the cost of supplies or equipment leased from the Contractor, other Subcontractors or their affiliates will not be counted. When an MBE/WBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward MBE/WBE goals only if the MBE/WBE subcontractor is itself an MBE/WBE. Work that an MBE/WBE subcontracts to a non-MBE/WBE firm does not count toward MBE/WBE goals.
- B. Manufacturers/Fabricators. One hundred percent (100%) of the expenditure to an MBE/WBE manufacturer or fabricator will be counted towards the MBE/WBE goal.

- C. Material Suppliers. Sixty percent (60%) of the expenditure to an MBE/WBE material supplier will be counted toward the MBE/WBE goal. Packagers, brokers, manufacturer's representatives, or other persons who arrange or expedite transactions are not material suppliers within the meaning of this paragraph.
- D. Broker's/Manufacturer's Representatives. One hundred percent (100%) of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees for transportation charges for the delivery of materials or supplies provided by an MBE/WBE broker/manufacturer's representative will be counted toward the MBE/WBE goal, provided they are determined by the Authority to be reasonable and not excessive as compared with fees customarily allowed for similar services. The cost of the materials and supplies themselves will not be counted.
- E. Services. One hundred percent (100%) of fees or commissions charged by an MBE/WBE for providing a bona fide service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of the Work will be counted toward the MBE/WBE goal, provided the fee is reasonable and not excessive as compared with fees customarily allowed for similar services.
- F. Trucking Operations. If using an MBE/WBE firm for trucking operations, the MBE/WBE trucking firm of record is the firm that is listed on the MBE/WBE Participation Plan. The MBE/WBE trucking firm shall own and operate at least one registered, insured, and fully operational truck used for the performance of the Work and shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the MBE/WBE goal. The MBE/WBE trucking firm of record shall control the day-to-day MBE/WBE trucking operations for performance of the Work, and shall be responsible for (1) negotiating and executing rental/leasing agreements; (2) hiring and terminating the work force; (3) coordinating the daily trucking needs with the Contractor; and (4) scheduling and dispatching trucks.
  - 1. MBE/WBE Owned/Leased Trucks. One hundred percent (100%) of the value of the trucking operations the MBE/WBE provides for the performance of the Work using trucks it owns or leases on a long-term basis that are registered, insured, and operated by the MBE/WBE using drivers it employs, will be counted toward the MBE/WBE goal.
  - 2. MBE/WBE Short-Term Leased Trucks. The MBE/WBE may lease trucks on a short-term basis from another MBE/WBE, including an owner/operator who is Port Authority certified as an MBE/WBE. 100% of the value of the trucking operations that the lessee MBE/WBE provides will be counted toward the MBE/WBE goal.
  - 3. Non-MBE/WBE Trucks. The MBE/WBE may lease trucks on a short-term basis from a non-MBE/WBE, including an owner-operator. One hundred

percent (100%) of the fee or commission the MBE/WBE receives as a result of the lease arrangement will be counted toward the MBE/WBE goal. The value of the trucking operations provided by the lessee will not be counted toward the MBE/WBE goal.

- G. Joint ventures between MBE/WBEs and non-MBE/WBEs may be counted toward the MBE/WBE goal in proportion to the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the MBE/WBE performs with its own forces. Please contact the Office of Business Diversity and Civil Rights at (201) 395-3958 for more information about requirements for such joint ventures.

## **7. CERTIFICATION OF RECYCLED MATERIALS PROVISION**

Proposers shall submit, with their proposal, Attachment G - Certified Environmentally Preferable Products / Practices form attesting that the products or items offered by the Proposer contain the minimum percentage of post-consumer recovered material in accordance with the most recent guidelines issued by the United States Environmental Protection Agency (EPA), or, for commodities not so covered, the minimum percentage of post-consumer recovered materials established by other applicable regulatory agencies.

### **Recycling Definitions:**

For purposes of this solicitation, the following definitions shall apply:

- a. "Recovered Material" shall be defined as any waste material or by-product that has been recovered or diverted from solid waste, excluding those materials and by-products generated from, and commonly reused within, an original manufacturing process.
- b. "Post-consumer Material" shall be defined as any material or finished product that has served its intended use and has been discarded for disposal or recovery having completed its life as a consumer item. "Post-consumer material" is included in the broader category of "Recovered Material".
- c. "Pre-consumer Material" shall be defined as any material or by-product generated after the manufacture of a product but before the product reaches the consumer, such as damaged or obsolete products. Pre-consumer Material does not include mill and manufacturing trim, scrap, or broken material that is generated at a manufacturing site and commonly reused on-site in the same or another manufacturing process.
- d. "Recycled Product" shall be defined as a product that contains the highest amount of post-consumer material practicable, or when post-consumer material is impracticable for a specific type of product, contains substantial amounts of Pre-consumer Material.

- e. "Recyclable Product" shall be defined as the ability of a product and its packaging to be reused, reconditioned for use, or recycled through existing recycling collection programs.
- f. "Waste Reducing Product" shall be defined as any product that will result in less waste generated due to its use rather than another product designed to serve the same function with a greater waste generation rate. This shall include, but not be limited to, those products that can be reused, refilled or have a longer life expectancy and contain a lesser amount of toxic constituents.

## **8. PROPOSAL SUBMISSION REQUIREMENTS**

In order to expedite the evaluation of proposals, the Proposer's response to this RFP shall follow the format and order of items, using the same paragraph identifiers, as set forth below.

### **A. Letter of Transmittal**

The Proposer shall submit a letter on its letterhead, signed by an authorized representative, stating its experience and qualifications in meeting the requirements of this RFP. This letter shall include a statement on whether the Proposer is submitting a proposal as a single entity, a joint venture, or is partnering with another firm in a prime/subcontracting relationship. In all cases, information required for a single entity is required for each participant in a joint venture.

The Letter of Transmittal shall contain:

1. Name and address of the Proposer and an original signature on the Letter of Transmittal by an authorized representative on behalf of the Proposer;
2. Name(s), title(s) and telephone number(s) of the individual(s) who are authorized to negotiate and execute the Contract;
3. Name, title and telephone number of a contact person to which the Port Authority can address questions or issues related to this RFP;
4. Name and address of proposed subcontractors, if any;
5. If a corporation: (a) a statement of the names and residences of its officers, and (b) a copy of its Certificate of Incorporation, with a written declaration signed by the secretary of the corporation, with the corporate seal affixed thereto, that the copy furnished is a true copy of the Certificate of Incorporation as of the date of the opening of the Proposals;
6. If a partnership: a statement of the names and residences of its principal officers, indicating which are general and which are special partners;

7. If an individual: a statement of residence;
8. If a joint venture: information on each of the parties consistent with the information requested above; if the Contract is awarded to a common law joint venture (a partnership of business entities) each member will be jointly and severally liable under the Contract.

## **B. Executive Summary**

The Proposer shall submit a summary presenting the major features of its proposal and how the proposal satisfies the requirements contained in this RFP, as well as the special competencies and expertise of the Proposer to meet the requirements of this RFP.

## **C. Agreement on Terms of Discussion**

The Proposer shall submit a copy of Attachment A - Agreement on Terms of Discussion signed by an authorized representative of the Proposer. Attachment A shall be submitted by the Proposer without any alterations or deviations. Any Proposer who fails to sign the Port Authority's Agreement on Terms of Discussion will not have its proposal reviewed. If the Proposer is a joint venture, an authorized representative of each party must sign the Agreement on Terms of Discussion.

## **D. Certifications With Respect to the Contractor's Integrity Provisions**

The Proposer, by signing the Letter of Transmittal, makes the certifications in the "Contractor's Integrity Provisions," the terms and conditions of which are found in Port Authority Form PA 3764A, applicable to this RFP. A copy of the form can be obtained from <http://www.panynj.gov/business-opportunities/become-vendor.html>.

If the Proposer cannot make any such certifications, it shall enclose an explanation of that inability.

## **E. Code of Ethics for Port Authority Vendors**

Proposer's attention is directed to the Port Authority's "Code of Ethics for Port Authority Vendors" (the "Code"). The Code can be found on the Port Authority's website at <https://www.panynj.gov/business-opportunities/become-vendor.html>.

## **F. Documentation of Proposer Prerequisites**

The Proposer shall submit documentation to demonstrate that it meets all prerequisites included herein.

## **G. Proposal**

The Proposer must submit a proposal that details and clearly describes its experience and capability to perform the services described in this RFP, its approach to such work and the cost of such work to the Port Authority. Anything proposed and accepted by the Authority shall become Contract requirements. At a minimum, the proposal shall address the following items in their order and reference the same paragraph identifiers:

1. Technical Experience, Experience of Proposer, and the Proposer's Capability to Meet the Requirements of this RFP

- A. Manufacturer certifications

Evidence, in the form of a letter from SDS, that the Proposer is certified by SDS to furnish, install, test, integrate and maintain the selected GDS for this contract.

- B. Project Schedule

The Proposer shall submit a project schedule showing how it plans to execute the scope of work to meet the Milestones set forth in Attachment B - Contract Specific Terms and Conditions and Attachment C - Scope of Work and Engineering Technical Specifications. The schedule shall indicate the total duration for project implementation, including submission and subsequent approval of construction documents and time for construction.

- C. The Proposer shall submit a listing of all system installation and integration contracts that were performed by, or are currently being performed by, the Proposer within the two (2) years immediately preceding the RFP Due Date. For each contract listed, include:

- i. The name and address of the contracting party
    - ii. The locations where the work was performed
    - iii. Duration of the contract
    - iv. The approximate dollar amount of the contract
    - v. The annual staff hours of full and part time labor expended in the performance of the contract
    - vi. A summary of the types of work performed and
    - vii. The names, addresses and telephone numbers of the owners
    - viii. Representatives familiar with the work that the Port Authority may contact.

- D. The Proposer shall submit a detailed explanation of its technical expertise and experience in the following areas:

- i. Utilization of technological advances and resulting benefits

- ii. Management of system and associated integrations in buildings and facilities of similar size.

#### E. System Service Requirements

The Proposer should submit proposed service requirements including warranty and maintenance standards (and the appropriate measurements thereof), concepts or procedures that will further its objective to provide the highest possible level of service at EWR, and those elements of the System Service Requirements (warranty and maintenance service plan) that are accepted by the Port Authority shall become requirements under the Contract.

- F. The Proposer must submit in its proposal a detailed narrative that includes, but is not limited to, the following:
  - i. Proposer's strategy to providing a turnkey solution
  - ii. Proposer's acceptance of the Authority's requirements and GDS function and application
  - iii. Any suggested changes, enhancements or other variations to the Port Authority's requirements and expectations.

The Authority requires proposers to utilize their experience with these systems, experience with warranty services and experience with service agreements to develop viable and cost-effective solutions to ensure continued operations and maintenance of the GDS is accomplished. At a minimum, system service shall include but not be limited to biannual testing of all sensors, software and firmware patches/updates to keep system up to date with the system's latest versions, response and remediation times addressing sensor issues (warning state or offline, single or multiple), GDS system offline, situational awareness client offline, integrations with Verint and Everbridge offline. The Authority is not interested in as-needed, time and materials, or similar arrangements at this time.

#### G. Basis of Design

Proposers shall submit to the Authority a Basis of Design for the GDS capturing the specific project requirements and the concepts the Proposer will utilize to address the project requirements. The Basis of Design should also capture the most cost-effective methods to provide a fully functional and effective GDS for the coverage areas required by the Authority. Further, the Basis of Design should address the Proposer's interpretations and understanding of the functional requirements and of the operational intent of the GDS as conveyed by the Authority.

At a minimum, the Basis of Design shall outline the following items:

- i. Identify the entity serving as the Contractor's Engineer of Record (EOR)

- ii. Identify the entity installing the equipment
- iii. Identify the entity as the SDS Guardian Certified Dealer
- iv. Functional requirements to be met in the eventual design;
- v. Narrative with an operational description of the proposed system, including the expected personnel and procedures which will be utilized to operate the technology;
- vi. Narrative with a description of how the Contractor shall provide for centralized monitoring capabilities for the GDS in the Port Authority Police Building at EWR, which includes all necessary integrations and measures for the Alarm Communications and Display system to effectively display an alarm (the Authority intends that the alarms display on a facility floor plan/map) and facilitate response activities as needed to support Authority active shooter response protocols.

Elements of the Basis of Design that are accepted by the Port Authority shall become requirements under the Contract.

## 2. Cost Proposal

The Proposer shall submit Attachment D - Cost Proposal form indicating the compensation that it expects to receive. The Cost Proposal shall be complete and inclusive of all work required by this RFP and shall include, but not be limited to, material and labor costs, travel costs, any salaries, health benefits and other benefits, overhead and profits.

The Proposer shall be aware of the following working conditions during the performance of the work in preparing their cost proposal:

- a. Working Hours
  - i. Public areas (see coverage plans in Attachment H) from 7am to 3pm, Monday to Friday.
  - ii. Secured areas (see coverage plans in Attachment H) from 1am to 5am, Monday to Friday.
- b. Security and Safety Requirements
  - i. SIDA and SWAC
- c. Availability of Parking
  - i. None.
- d. Loading and Unloading of Materials
  - i. During work hours, coordinate with the Resident Engineer.
- e. Availability of Storage for Tools and Equipment
  - i. Not guaranteed, subject to availability.

The Cost Proposal shall be firm-fixed cost and must account for all costs for the term of this Contract. Billing for the project implementation shall be based on the payment milestone schedule as set forth in Attachment B – Contract Specific Terms and Conditions. The Port Authority may require the Proposer to provide a cost breakdown of its Lump Sum amounts in the Cost Proposal.



### 3. Management Approach

- A. The Proposer should indicate the total number of full-time (minimum thirty (30) hours/week) employees currently employed by the firm and the number employed in each of the preceding three (3) years.
- B. The Proposer shall show the number of full-time and part-time employees to be utilized in providing these services, including supervisory staff. The Proposer shall submit a plan to minimize employee turnover. It is the Port Authority's preference to have the Proposers submit a staffing plan that maximizes the use of full-time employees.
- C. The Proposer should provide a complete description of how it intends to implement and manage the required services hereunder, including any information that it believes would be helpful to the Port Authority in assessing its ability to provide the services described in the RFP.
- D. The Proposal must include the Proposer's plan to ensure compliance with the requirements of this Contract, including, but not limited to:
  - i. Evidence of insurance requirements
  - ii. the Proposer's MBE/WBE Participation Plan, in accordance with the MBE/WBE Subcontracting Provisions hereunder.
  - iii. The Proposer's Certified Environmentally Preferable Products/Practices Form ensuring compliance with all applicable federal, state and local standards in their business practices, in accordance with the Certified Environmentally Preferable Products/Practices Provision.
- E. The Proposer shall submit a statement indicating the qualifications and experience of managerial and supervisory personnel employed by the firm who are assigned to the Contract including:
  - i. Their length of service with the firm
  - ii. The anticipated function of each person on the Contract
  - iii. A summary of the relevant experience of each person listed

The resumes of the individuals who are being recommended for these positions should be included in the Proposal.
- F. The Proposer shall submit a complete description of all employee management programs (covering both supervisory and non-supervisory personnel) that it currently utilizes including, but not limited to:
  - i. Security training
  - ii. OSHA safety training
  - iii. Quality Assurance/Quality Control programs

#### 4. Contractor Identity Check/Background Screening Plan

The Proposer shall submit a Contractor Identity Check/Background Screening Plan, which demonstrates how the Proposer will ensure that only employees who were successfully prescreened and properly credentialed perform the services herein. This Plan shall be applicable to all years of the Contract and shall include, but not be limited to, the following:

The length of time researched for the identity check/background screening on new hires, which shall be at a minimum of 10 years of employment history or verification of what an employee documented they have done in the last 10 years preceding the date of the investigation, resources utilized to perform this, and the frequency at which it is performed on current employees.

#### 5. Background Qualification Questionnaire (to be submitted directly to the Office of the Inspector General)

The Proposer shall submit a completed Background Qualifications Questionnaire (BQQ), required for itself and all consultants, contractors, subcontractors, subconsultants and vendors providing services at the World Trade Center Site, known to the Proposer at the time of proposal submission. This document and instructions for submitting the completed BQQ to the Authority's Office of Inspector General can be obtained at the Authority's website through the following link:

[http://www.panynj.gov/wtcprogress/pdf/ANYNJ\\_OIG\\_WTC\\_BQQP.zip](http://www.panynj.gov/wtcprogress/pdf/ANYNJ_OIG_WTC_BQQP.zip)

### **H. Acknowledgment of Addenda**

If any Addenda are published or sent as part of this RFP, the Proposer shall complete, sign and include with its Proposal each Addenda. In the event any Proposer fails to conform to these instructions, its proposal will nevertheless be construed as though the Addenda had been acknowledged.

If the Proposer downloaded this RFP document, it is the responsibility of the Proposer to periodically check the Port Authority website at <http://www.panynj.gov/business-opportunities/bid-proposal-advertisements.html> and download any Addenda that might have been issued in connection with this solicitation.

### **I. Acceptance of General Contract Provisions**

The Port Authority has attached to this RFP as Attachment J – General Contract Provisions governing the Contract. The Proposer is expected to agree with these General Contract Provisions. However, if the Proposer has any specific exceptions, such exceptions should be set forth in a separate letter included with its response to this RFP. After the proposal due date, the Proposer will be precluded from raising any exceptions unless such exceptions are justified by and directly related to

substantive changes in the business or technical requirements and are agreed to by the Proposer and the Port Authority.

#### **J. MBE/WBE Participation Plan**

The Proposer shall submit an MBE/WBE Participation Plan in accordance with the MBE/WBE Subcontracting Provisions hereunder.

### **9. CONDITIONS FOR THE SUBMISSION OF A PROPOSAL**

In addition to all other requirements of this RFP, the Proposer agrees to the following conditions for the submission of its proposal:

#### **A. Changes to this RFP**

At any time, in its sole discretion, the Port Authority may by written addenda, modify, correct, amend, cancel and/or reissue this RFP. If an addendum is issued prior to the date proposals are due, it will be provided to all parties in the medium in which the parties obtained the RFP. If an addendum is issued after proposals have been received, the addendum will be provided only to those whose proposals remain under consideration at such time.

#### **B. Proposal Preparation Costs**

The Port Authority shall not be liable for any costs incurred by the Proposer in the preparation, submittal, presentation, or revision of its proposal, or in any other aspect of the Proposer's pre-contract activity. No Proposer is entitled to any compensation except under an agreement for performance of services signed by an authorized representative of the Port Authority and the Proposer.

#### **C. Disclosure of Proposal Contents / Use of Ideas and Materials**

Proposal information is not generally considered confidential or proprietary. All information contained in the proposal is subject to the "Agreement on Terms of Discussion" attached hereto as Attachment A.

#### **D. Ownership of Submitted Materials**

All materials submitted in response to or in connection with this RFP shall become the property of the Port Authority. Selection or rejection of a Proposal shall not affect this right.

## **E. Subcontractors**

If a Proposer intends to use subcontractor(s) the Proposer must identify in its proposal the names of the subcontractor(s) and the portions of the work the subcontractor(s) will perform.

## **F. Conflict of Interest**

If the Proposer or any employee, agent or subcontractor of the Proposer may have a possible conflict of interest, or may give the appearance of a possible conflict of interest, the Proposer shall include in its proposal a statement indicating the nature of the conflict. The Port Authority reserves the right to disqualify the Proposer if, in its sole discretion, any interest disclosed from any source could create a conflict of interest or give the appearance of a conflict of interest. The Port Authority's determination regarding any questions of conflict of interest shall be final.

## **G. Authorized Signature**

Proposals must be signed by an authorized corporate officer (e.g., President or Vice President), General Partner, or such other individual authorized to bind the Proposer to the provisions of its proposal and this RFP.

## **H. References**

The Port Authority may consult any reference familiar with the Proposer regarding its current or prior operations and projects, financial resources, reputation, performance, or other matters. Submission of a proposal shall constitute permission by the Proposer for the Port Authority to make such inquiries and authorization to third parties to respond thereto.

## **I. Evaluation Procedures and Negotiation**

Only Proposers which meet the prerequisites may have their proposals evaluated based on the evaluation criteria set forth in this RFP. The Port Authority may use such procedures that it deems appropriate to evaluate such proposals. The Port Authority may elect to initiate contract negotiations with one or more Proposers including negotiation of costs/price(s) and any other term or condition, including modifying any requirement of this RFP. The option of whether or not to initiate contract negotiations rests solely with the Port Authority.

## **J. Taxes and Costs**

Purchases of services and tangible personal property by the Port Authority in the States of New York and New Jersey are generally exempt from state and local sales and compensating use taxes, and from most federal excises (Taxes). All costs

associated with the Contract must reflect this exemption and be stated in U.S. currency.

#### **K. Most Advantageous Proposal/No Obligation to Award**

The Port Authority reserves the right to award the Contract to other than the Proposer proposing the lowest price. The Contract will be awarded to the Proposer whose proposal the Port Authority believes, in its sole discretion, will be the most advantageous to the Port Authority. Neither the release of this RFP nor the acceptance of any response thereto shall compel the Port Authority to accept any proposal. The Port Authority shall not be obligated in any manner whatsoever to any Proposer until a proposal is accepted by the Port Authority in the manner provided in the Section of this RFP entitled "Proposal Acceptance or Rejection."

#### **L. Multiple Contract Awards**

The Port Authority reserves the right to award multiple Contracts for the products, work and/or services that are the subject matter of this RFP and Proposers are hereby given notice that they may not be the Port Authority's only contractor for such products, work and/or services.

#### **M. Rights of the Port Authority**

1. The Port Authority reserves all its rights at law and equity with respect to this RFP including, but not limited to, the unqualified right, at any time and in its sole discretion, to change or modify this RFP, to reject any and all proposals, to waive defects or irregularities in proposals received, to seek clarification of proposals, to request additional information, to request any or all Proposers to make a presentation, to undertake discussions and modifications with one or more Proposers, or to negotiate an agreement with any Proposer or third person who, at any time, subsequent to the deadline for submissions to this RFP, may express an interest in the subject matter hereof, to terminate further participation in the proposal process by a Proposer or to proceed with any proposal or modified proposal, which in its judgment will, under all circumstances, best serve the Port Authority's interest. The Port Authority may, but shall not be obliged to, consider incomplete proposals or to request or accept additional material or information. The holding of any discussions with any Proposer shall not constitute acceptance of a proposal, and a proposal may be accepted with or without discussions.
2. No Proposer shall have any rights against the Port Authority arising from the contents of this RFP, the receipt of proposals, or the incorporation in or rejection of information contained in any proposal or in any other document. The Port Authority makes no representations, warranties, or guarantees that the information contained herein, or in any addenda hereto, is accurate, complete, or timely or that such information accurately represents the

conditions that would be encountered during the performance of the contract. The furnishing of such information by the Port Authority shall not create or be deemed to create any obligation or liability upon it for any reason whatsoever and each Proposer, by submitting its proposal, expressly agrees that it has not relied upon the foregoing information, and that it shall not hold the Port Authority liable or responsible therefor in any manner whatsoever.

Accordingly, nothing contained herein and no representation, statement or promise, of the Port Authority, its directors, officers, agents, representatives, or employees, oral or in writing, shall impair or limit the effect of the warranties of the Proposer required by this RFP or Contract and the Proposer agrees that it shall not hold the Port Authority liable or responsible therefor in any manner whatsoever.

3. At any time and from time to time after the opening of the proposals, the Port Authority may give oral or written notice to one or more Proposers to furnish additional information relating to its proposal and/or qualifications to perform the services contained in this RFP, or to meet with designated representatives of the Port Authority. The giving of such notice shall not be construed as an acceptance of a proposal. Information shall be submitted within three (3) calendar days after the Port Authority's request unless a shorter or longer time is specified therein.

#### **N. No Personal Liability**

Neither the Commissioners of the Port Authority, nor any of them, nor any officer, agent or employee thereof shall be charged personally with any liability by a Proposer or another or held liable to a Proposer or another under any term or provision of this RFP or any statements made herein or because of the submission or attempted submission of a proposal or other response hereto or otherwise.

## **ATTACHMENT A – AGREEMENT ON TERMS OF DISCUSSION**

### **(REQUEST FOR PROPOSALS FOR A TURNKEY SOLUTION OF A GUNSHOT DETECTION SYSTEM AT NEWARK LIBERTY INTERNATIONAL AIRPORT)**

The Port Authority's receipt or discussion of any information (including information contained in any proposal, vendor qualification(s), ideas, models, drawings, or other material communicated or exhibited by us or on our behalf) shall not impose any obligations whatsoever on the Port Authority or entitle us to any compensation therefor (except to the extent specifically provided in such written agreement, if any, as may be entered into between the Port Authority and us). Any such information given to the Port Authority before, with or after this Agreement on Terms of Discussion ("Agreement"), either orally or in writing, is not given in confidence. Such information may be used, or disclosed to others, for any purpose at any time without obligation or compensation and without liability of any kind whatsoever. Any statement which is inconsistent with this Agreement, whether made as part of or in connection with this Agreement, shall be void and of no effect. This Agreement is not intended, however, to grant to the Port Authority rights to any matter, which is the subject of valid existing or potential letters patent.

Any information (including information contained in any proposal, vendor qualification(s), ideas, models, drawings, or other material communicated or exhibited by us or on our behalf) provided in connection with this procurement is subject to the provisions of the Port Authority Public Records Access Policy adopted by the Port Authority's Board of Commissioners, which may be found on the Port Authority website at: <http://corpinfo.panynj.gov/documents/Access-to-Port-Authority-Public-Records/>. The foregoing applies to any information, whether or not given at the invitation of the Authority.

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(Company)

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(Signature)

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(Title)

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(Date)

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DO NOT RETYPE.**

Rev. 01/27/17

## **ATTACHMENT B – CONTRACT SPECIFIC TERMS AND CONDITIONS**

### **1. General Agreement**

Subject to all of the terms and conditions of this Contract, the undersigned (the “Contractor”) hereby offers and agrees to provide all the necessary supervision, personnel, equipment, materials and all other things necessary to perform the Work required by this Contract at the Facilities set forth in the Contract, and to do all other things necessary or proper therefor or incidental thereto, all in strict accordance with the provisions of the documents comprising the Contract and any future changes therein; and the Contractor further agrees to assume and perform all other duties and obligations imposed upon it by this Contract. In addition, all things not expressly mentioned in the Contract but involved in the carrying out of its intent and in the complete and proper execution of the matters referred to in and required by this Contract are required, and the Contractor shall perform the same as though they were specifically delineated, described and mentioned therein.

### **2. Duration**

The term of this Contract will be for a maximum of three (3) years and seven (7) months (the “Term”). The Term shall be divided into two parts. First, the Contractor shall have two hundred and ten (210) calendar days to furnish, install, integrate, configure, commission, and successfully complete acceptance testing of the GDS (the “Initial Setup Term”). Following completion of the Initial Setup Term and successful commissioning and acceptance, the Contractor shall provide maintenance and warranty service for the GDS for a period of three (3) years (the “Service Term”). The Initial Setup Term shall begin on the date that the Contractor receives notice to proceed from the Port Authority.

### **3. Billing and Payment**

Subject to the provisions of this Contract, the Port Authority agrees to pay, and the Contractor agrees to accept from the Port Authority, as full and complete compensation for the performance of its obligations under this Contract amounts equal to the prices inserted by the Proposer in its Cost Proposal. All prices shall be fixed and firm for the term of Contract. All computations made by the Contractor and all billing and billing procedures shall be done in accordance with the following:

- a. Payment will be made in accordance with the costs for the applicable items of work as they appear in the Cost Proposal, minus any deductions for services not performed and/or any liquidated damages to which the invoice may be subject. All Work must be completed within the time frames specified or as designated by the Port Authority.
- b. Payment Term shall be Net 30, and payments are not made until the Port Authority’s verification of invoices.
- c. Payment for work related to the Initial Setup Term will be made in accordance with the Installation Milestone Payment Schedule below:



<b>Installation Milestone Payment Schedule</b>			
<b>Milestone</b>	<b>Description</b>	<b>Milestone Percentage</b>	<b>Cumulative Percentage</b>
A	Mobilization	5%	5%
B	Construction Drawings (50% Design)	5%	10%
C	Approved Construction Drawings (100% Design)	10%	20%
D	Passed Pre-installation Acceptance Testing	15%	35%
E	1 <sup>st</sup> Floor Installation/Performance Verification Testing/Acceptance	10%	45%
F	2 <sup>nd</sup> Floor Installation/Performance Verification Testing/Acceptance	10%	55%
G	3 <sup>rd</sup> Floor Installation/Performance Verification Testing/Acceptance	10%	65%
H	Passed 30-day Operational Acceptance Test	20%	85%
I	Closeout/Occupancy Submittals	10%	95%
J	3-Year Warranty	5%	100%

- d. Payment for work related to system maintenance services will be made on a monthly basis. The Contractor shall submit to the Authority, by the fifth day of each month of the Service Term that the Contract is in effect, an invoice at one-thirty-sixth (1/36) of the “Maintenance Program” cost in the Cost Proposal accepted by the Authority.

#### **4. Liquidated Damages**

- a) The Contractor’s obligations for the performance and completion of the Work within the time or times provided for in this Contract are of the essence of this Contract. In the event that the Contractor fails to satisfactorily perform all or any part of the Work required hereunder in accordance with the requirements set forth in this RFP and the Specifications (as the same may be modified in accordance with provisions set forth elsewhere herein) then damages for breach by the Contractor may be liquidated, but only at an amount which is reasonable in the light of the anticipated or actual harm caused by the breach, the difficulties of proof of loss, and the inconvenience or nonfeasibility of otherwise obtaining an adequate remedy, as follows:
- i. If the Contractor fails to respond to a service problem within the required response time, as agreed upon in the Port Authority accepted service maintenance schedule submitted by the Contractor in accordance with the

Scope of Work subsection entitled “System Service Requirements”, the compensation payable to the Contractor by the Port Authority will be reduced by one thousand dollars (\$1,000) per day, or for any partial day on a pro-rata basis, for each day, or partial day thereafter until the Contractor responds to the service problem.

- ii. If the Contractor fails to remediate a service problem within the remediation time as agreed upon in the Port Authority accepted service maintenance schedule submitted by the Contractor in accordance with the Scope of Work subsection entitled “System Service Requirements”, the compensation payable to the Contractor by the Port Authority will be reduced by one thousand dollars (\$1,000) per day, or for any partial day on a pro-rata basis, for each day, or partial day thereafter until the Contractor remediates the service problem.
- b) The Manager shall determine whether the Contractor has met the service requirements under this Contract, and the Manager’s determination shall be final, binding and conclusive upon the Contractor.
- c) Failure of the Manager or the Port Authority to impose liquidated damages shall not be deemed Port Authority acceptance of a failure to perform on the part of the Contractor or a waiver of its remedies hereunder.

## **5. Increase and Decrease in Areas or Frequencies**

The Manager shall have the right, at any time and from time to time in their sole discretion, to increase or decrease the frequencies of all or any part of the services required hereunder and/or to add areas not described herein in the Specifications or to remove areas or parts of areas which are hereunder so described. In the event the Manager decides to change any frequencies or areas such change shall be by written notice given to the Contractor not less than twenty-four (24) hours prior to the effective date of said changes, said changes to be effective upon the date specified in said notice.

In the event of an increase or decrease in areas or frequencies, the Contractor’s compensation will be adjusted to reflect such change in areas or frequencies utilizing the applicable unit prices for such services as set forth in the Cost Proposal. Where no specific unit price has been quoted for the type of services to be increased or decreased, the Manager shall have the right to negotiate the compensation to reflect such change, whether an increase or decrease in areas or frequencies, which, in the opinion of the Manager, are necessary to complete the work, by multiplying the increased or decreased amount by the negotiated rate.

In the event of a decrease, the Contractor shall not be entitled to compensation for Work not performed.

No such change in areas or frequency will be implemented which results in a total increase or decrease in compensation that is greater than fifty percent (50%) of the total estimated contract price for the Base Term or, if changes are to be implemented during an Option Period (if applicable and executed), fifty percent (50%) for that Option Period.

Any increases in frequencies or areas shall not constitute Extra Work and, as such, shall not be limited by the Extra Work provisions of this Contract.

## **6. Extra Work**

The Contractor is required to provide separate materials, supplies, equipment and personnel for Extra Work when such is deemed necessary by the Manager. "Extra Work" as used herein shall be defined as work which differs from that expressly or impliedly required by the Specifications in their present form. Total Extra Work performed by the Contractor shall not exceed six percent (6%) of the Total Estimated Contract Price of this Contract for the entire Term of this Contract including extensions thereof, or six percent (6%) of the Total Estimated Contract Price of each Section if this Contract is awarded by separate Sections.

An increase in area or frequency does not constitute Extra Work, but shall be compensable based on the prices in the Cost Proposal and the paragraph herein titled "Increase or Decrease in Areas or Frequencies".

The Contractor is required to perform Extra Work pursuant to a written order of the Manager expressly recognizing such work as Extra Work. If Lump Sum or Unit Price compensation cannot be agreed upon by the parties in writing prior to the start of Extra Work, the Contractor shall perform such Extra Work and the Contractor's compensation shall be increased by the sum of the following amounts and such amounts only: (1) the actual net cost, in money, of the labor, and material, required for such Extra Work; (2) five percent (5%) of the amount under (1) above; (3) such rental as the Manager deems reasonable for plant and equipment (other than small tools) required for such Extra Work; (4) if the Extra Work is performed by a subcontractor, an additional five percent (5%) of the sum of the amounts under (1) through (3) above.

As used in this numbered clause (and in this clause only):

“Labor” means laborers, mechanics, and other employees below the rank of supervisor, directly employed at the Site of the Work subject to the Manager or their designee’s authority to determine what employees of any category are “required for Extra Work” and as to the portion of their time allotted to Extra Work; and “cost of labor” means the wages actually paid to and received by such employees plus a proper proportion of (a) vacation allowances and union dues and assessments which the employer actually pays pursuant to contractual obligation upon the basis of such wages, and (b) taxes actually paid by the employer pursuant to law upon the basis of such wages and workers’ compensation premiums paid pursuant to law. “Employees” as used above means only the employees of one employer.

“Net Cost” means the Contractor’s actual cost after deducting all permitted cash and trade discounts, rebates, allowances, credits, sales taxes, commissions, and refunds (whether or not any or all of the same shall have been taken by the Contractor) of all parts and materials purchased by the Contractor solely for the use in performing its obligation hereunder provided, where such purchase has received the prior written approval of the Manager as required herein. The Contractor shall promptly furnish to the Manager such bills of sale and other instruments as the Manager may require, executed, acknowledged and delivered, assuring to the Manager title to such materials, supplies, equipment, parts, and tools free of encumbrances.

“Materials” means temporarily-installed and consumable materials as well as permanently-installed materials; and “cost of materials” means the price (including taxes actually paid by the Contractor pursuant to law upon the basis of such materials) for which such materials are sold for cash by the manufacturers or producers thereof, or by regular dealers therein, whether or not such materials are purchased directly from the manufacturer, producer or dealer (or if the Contractor is the manufacturer or producer thereof, the reasonable cost to the Contractor of the manufacture and production), plus the reasonable cost of delivering such materials to the Site of the Work in the event that the price paid to the manufacturer, producer or dealer does not include delivery and in case of temporarily-installed materials, less their salvage value, if any.

The Manager shall have the authority to decide all questions in connection with Extra Work. The exercise by the Manager of the powers and authorities vested in him/her by this section shall be binding and final upon the Port Authority and the Contractor.

The Contractor shall submit all reports, records and receipts as are requested by the Manager so as to enable him/her to ascertain the time expended in the performance of the Extra Work, the quantity of labor and materials used therein and the cost of said labor and materials to the Contractor.

The provisions of this Contract relating generally to Work and its performance shall apply without exception to any Extra Work required and to the performance thereof. Moreover, the provisions of the Specifications relating generally to the Work and its performance shall also apply to any Extra Work required and to the performance thereof, except to the extent that a

written order in connection with any particular item of Extra Work may expressly provide otherwise.

If the Contractor deems work to be Extra Work, the Contractor shall give written notice to the Manager within twenty-four (24) hours of performing the work that it so considers as Extra Work, and failure of the Contractor to provide said notice shall constitute a waiver of any claim to an increase in compensation for such work and a conclusive and binding determination that it is not Extra Work.

The Contractor shall supply the amount of materials, supplies, equipment and personnel required by the Manager within four (4) hours following the receipt of written or verbal notice from the Manager, or in the case of an emergency as determined by the Manager, within four (4) hours following the receipt by the Contractor of the Manager's written or oral notification. Where oral notification is provided hereunder, the Manager will thereafter confirm the same in writing.

All Extra Work shall be billed to the Port Authority on a separate invoice on a monthly basis.

## **7. Insurance Procured by the Contractor**

The Contractor and its subcontractor(s) shall take out, maintain, and pay the premiums on Commercial General Liability Insurance, for the life of the Contract and such Insurance and shall be written on an ISO occurrence form CG 00 01 0413 or its equivalent covering the obligations assumed by the Contractor under this Contract including but not limited to premise-operations, products and completed operations, and independent contractors coverage, with contractual liability language covering the obligations assumed by the Contractor under this Contract and, if vehicles are to be used to carry out the performance of this Contract, then the Contractor shall also take out, maintain, and pay the premiums on Automobile Liability Insurance covering any autos in the following minimum limits:

Commercial General Liability Insurance - \$ 25 million combined single limit per occurrence for bodily injury and property damage liability.

Automobile Liability Insurance - \$ 5 million combined single limit per accident for bodily injury and property damage liability. (\$25 million per accident for unescorted airside)

Technology Errors & Omissions liability (or Technology Professional liability coverage) insurance - the Contractor shall maintain Technology Errors & Omissions insurance, covering liability for all professional products and services performed, including liabilities arising from acts, errors or omissions in rendering computer or information technology services including (1) systems analysis (2) systems programming (3) data processing (4) systems integration (5) outsourcing development and design (6) systems design, consulting, development and modification (7) training services relating to

computer software or hardware (8) management, repair and maintenance of computer products, networks and systems (9) marketing, selling, servicing, distributing, installing and maintaining computer hardware or software (10) data entry, modification, verification, maintenance, storage, retrieval or preparation of data output with a limit not less than \$ 35 million dollars per occurrence. This insurance shall provide coverage for software copyright liability, contractual liability and liability for loss of revenues and business interruption. If such policy is a “claims made” policy, all renewals thereof during the life of this Agreement shall include “prior acts coverage” covering at all times all claims made with respect to Contractor’s performance under this Agreement, including any subsequent supplements thereto or modifications thereof for the entire duration thereof.

Privacy and Network Security (Cyber Liability) insurance – the Contractor shall maintain Privacy and Network (Cyber Liability) insurance covering liability arising from (1) hostile action, or a threat of hostile action, with the intent to affect, alter, copy, corrupt, destroy, disrupt, damage, or provide unauthorized access/unauthorized use of a computer system including exposing or publicizing confidential electronic data or causing electronic data to be inaccessible (2) computer viruses, Trojan horses, disabling codes, trap doors, back doors, time bombs drop-dead devices, worms and any other type of malicious or damaging code (3) dishonest, fraudulent, malicious, or criminal use of a computer system by a person, whether identified or not, and whether acting alone or in collusion with other persons, to affect, alter, copy, corrupt, delete, disrupt, or destroy a computer system or obtain financial benefit for any party or to steal or take electronic data (4) denial of service for which the Insured is responsible that results in the degradation of or loss of access to internet or network activities or normal use of a computer system (5) loss of service for which the Insured is responsible that results in the inability of a third- party, who is authorized to do so, to gain access to a computer system and conduct normal internet or network activities (6) access to a computer system or computer system resources by an unauthorized person or persons or an authorized person in an unauthorized manner with a limit not less than \$ 35 million dollars per occurrence. This insurance shall provide coverage for personal injury (including emotional distress and mental anguish), and a separate limit of not less than \$1 million for credit monitoring services.

Professional Liability Insurance - The Contractor and/or its sub-contractor(s) shall procure and maintain for the life of the agreement professional liability coverage against liability, including acts, errors, mistakes and omissions arising from professional services or work performed by the Contractor or any person employed by the Contractor. A \$ 10 million. single limit per claim shall be afforded by this coverage. All endorsements and exclusions shall be evidenced on the certificate of insurance. The coverage shall be maintained during the term of the Agreement, and for at least five years following the completion of this agreement. The policy shall have a retroactive date that proceeds any design work. The coverage shall be written on an occurrence form or may be written on a claims-made basis with a five-year reporting/discovery period.

The insurance shall be written on an occurrence basis, as distinguished from a “claims made” basis, and shall not include any exclusions for “action over claims” (insured vs. insured) and minimally arranged to provide and encompass at least the following coverages:

- Contractual Liability to cover liability assumed under the Contract;
- Independent Contractor's Coverage;
- Premise-Operations, Products and Completed Operations Liability Insurance;
- Coverage for Explosion, Collapse and Underground Property Damage (XCU)
- The insurance coverage (including primary, excess and/or umbrella) hereinafter afforded by the Contractor and all subcontractor(s) shall be primary insurance and non-contributory with respect to the additional insureds;
- Excess/umbrella policies shall "follow form" to the underlying policy;
- Excess/umbrella policies shall have a liberalization clause with drop down provision;
- To the extent any coverage the Contractor and subcontractor(s) obtains and/or maintains under this Contract contains "Other Insurance" language or provisions, such language or provisions shall not be applicable to the additional insureds or to any insurance coverage maintained by the additional insureds;
- All insurance policies shall include a waiver of subrogation, as allowed by law, in favor of the additional insureds;
- Defense costs must be outside of policy limits. Eroding limits policies are not permitted;
- In the event the Contractor and/or its subcontractors obtains and/or maintains insurance in an amount greater than the minimum limits required under this Contract, then the full limits of that insurance coverage will be available to respond to any claim asserted against the additional insureds that arises out of or is in any way connected with this Contract;
- Additional insureds coverage shall not be restricted to vicarious liability unless required by controlling law.

In addition, the liability policy (ies) shall be written on a form at least as broad as ISO Form CG 20 10 10 01 (for ongoing operations work) together with ISO Form CG 20 37 10 01 (for completed operations work) or their equivalent and endorsed to and name "The Port Authority of New York and New Jersey and its related entities, their Commissioners, Directors, Superintendents, officers, partners, employees, agents, their affiliates, successors or assigns" as Insured (as defined in the policy or in an additional insured endorsement amending the policy's "Who is An Insured" language as the particular policy may provide). The "Insured" shall be afforded coverage and defense as broad as if they are the first named insured and regardless of whether they are otherwise identified as additional insureds under the liability policies, including but not limited to premise-operations, products-completed operations on the Commercial General Liability Policy. Such additional insureds status shall be provided regardless of privity of contract between the parties. The liability policy (ies) and certificates of insurance shall contain separation of insured and severability of interests clauses for all policies so that coverage will respond as if separate policies were in force for each insured. An act or omission of one of the insureds shall not reduce or void coverage to the other insureds. The Contractor is responsible for all deductibles and losses not covered by commercially procured insurance. Any portion of the coverage to be provided under a Self-Insured Retention (SIR) of the Contractor is subject to the review and approval of the General Manager, Risk Finance. If any part of the insurance is self-insured, though shall treat us as though commercial insurance is in place. Furthermore, any insurance or self-insurance maintained by the above additional insureds shall not contribute to any loss or claim.

If any of the Work is to be done on or at Port Authority facilities by subcontractors and, if the Contractor requires its subcontractors to procure and maintain such insurance in the name of the Contractor, then such insurance as is required herein shall include and cover the additional insureds and it must have insurance limits not lower than those set forth by the Port Authority herein, along with all the insurance requirements in this section known as “Insurance Procured by the Contractor”.

All insurance coverage shall be provided by the Contractor and/or by or for any of its subcontractors at no additional expense to the Port Authority and its related entities. A copy of this section titled “Insurance Procured by the Contractor” shall be given to your insurance agent and subcontractors and shall form a part of the covered contract or subcontract for insurance purposes in furtherance of the insurance requirements under this Contract.

Further, it is the Contractor’s responsibility to maintain, enforce and ensure that the type of coverages and all limits maintained by it and any of all subcontractors are accurate, adequate and in compliance with the Port Authority requirements; and the Contractor is to retain a copy of its subcontractors’ certificates of insurance. All certificates of insurance shall be turned over to the Port Authority prior to the start of work, including subcontractors’ work, and upon completion of the Contract.

***The contractor, its subcontractors and its insurers shall not, without obtaining the express advance written permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the Tribunal over the person of the Port Authority, the immunity of the Port Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority, or the provisions of any statutes respecting suits against the Port Authority.***

The Contractor and its subcontractor(s) shall also take out, maintain, and pay premiums on Workers’ Compensation Insurance in accordance with the requirements of law in the state(s) where work will take place, and Employer’s Liability Insurance with limits of not less than \$1 million per each accident.

Each policy above shall contain an endorsement that the policy may not be canceled, terminated, or modified without thirty (30) days’ prior written notice to the Port Authority, Attn: Facility Contract Administrator, at the location where the work will take place with a copy to the General Manager, Risk Finance.

The Port Authority may, at any time during the term of this Contract, change or modify the limits and coverages of insurance.

Within five (5) days after the award of this Contract and prior to the start of work, the Contractor must submit an original certificate of insurance to the Port Authority Facility Contract Administrator, at the location where the work will take place. This certificate of insurance MUST show evidence of the above insurance policy (ies), including, but not limited to, the cancellation notice endorsement and stating the contract number prior to the start of work. The Contractor is also responsible for maintaining and conforming to all insurance requirements from the additional insureds and their successors or assigns. The General Manager, Risk Finance must approve the certificate(s) of insurance before any



work can begin. Upon request by the Port Authority, the Contractor shall furnish to the General Manager, Risk Finance, a certified copy of each policy, including the premiums.

If at any time the above liability insurance should be canceled, terminated, or modified so that the insurance is not in effect as above required, then the Contractor and all subcontractors shall suspend performance of the Contract at the premises until a satisfactory insurance policy (ies) and certificate of insurance is provided to and approved by Risk Finance, unless the Facility or Project Manager directs the Contractor, in writing, to continue to performing work under the Contract. If the Contract is so suspended, no extension of time shall be due on account thereof.

Renewal certificates of insurance or policies shall be emailed to [certificates-portauthority@riskworks.com](mailto:certificates-portauthority@riskworks.com) and delivered to the Port Authority Facility Contractor Administrator, and upon request from the additional insureds, their successors or assigns at least fifteen (15) days prior to the expiration date of each expiring policy. The General Manager, Risk Management must approve the renewal certificate(s) of insurance before work can resume on the facility. If at any time any of the certificates or policies shall become unsatisfactory to the Port Authority, the Contractor shall promptly obtain a new and satisfactory certificate and policy and provide same to the Port Authority.

Failure by the Contractor to meet any of the insurance requirements, including the requirement that the Port Authority be afforded the full extent of the insurance obtained under this Contract without limitation, shall be deemed a material breach of contract and may be a basis for termination of this Contract by the Port Authority.

The requirements for insurance procured by the Contractor and subcontractor(s) shall not in any way be construed as a limitation on the nature or extent of the contractual obligations assumed by the Contractor under this Contract. The insurance requirements are not a representation by the Port Authority as to the adequacy of the insurance necessary to protect the Contractor against the obligations imposed on it by law or by this or any other contract.

Reference: **CITS #6171N**

## **ATTACHMENT C – SCOPE OF WORK AND ENGINEERING TECHNICAL SPECIFICATIONS**

### **1. Scope of Work**

The Contractor shall deliver a fully-functional GDS that integrates with the Authority’s existing video management, access control, and mass notification systems. These Specifications provides all engineering, technical, and custom specifications that serve as an integral part of this Contract as it relates to the compliance of all materials used for, and application and installation of, the GDS Solution.

The Contractor will be compensated in accordance with the section entitled “Billing and Payment” in Attachment B. All costs of compliance with these Specifications and the design and implementation of its turnkey solution are the responsibility of the Contractor. Any changes, suggested enhancements (not required for effective operations), or other variations to the GDS and turnkey solution must first be presented to the Authority in writing for the Authority to make a determination on a mutually agreed upon change order and adjudicated prior to any work being completed on the change, variation, or suggested enhancement. The Contractor will not be compensated for any additional work completed prior to adjudication and/or approval by the Authority that is not deemed to be within the approved scope.

#### **A. Project Schedule**

The Port Authority anticipates that the Initial Setup Term of the GDS will be completed by the Contractor and accepted by the Authority within two hundred ten (210) calendar days of the date that the Port Authority provides notice to proceed. It is anticipated that design and some phases of construction/installation may be accomplished concurrently. The Contractor is responsible for submission of a detailed schedule showing the completion of the milestones listed below and all work necessary to provide a working GDS within the 210 calendar days:

<b>Milestone</b>	
A	Mobilization
B	Construction Drawings (50% Design)
C	Approved Construction Drawings (100% Design)
D	Passed Pre-installation Acceptance Testing
E	1 <sup>st</sup> Floor Installation/Performance Verification Testing/Acceptance
F	2 <sup>nd</sup> Floor Installation/Performance Verification Testing/Acceptance
G	3 <sup>rd</sup> Floor Installation/Performance Verification Testing/Acceptance
H	Passed 30-day Operational Acceptance Test
I	Closeout/Occupancy Submittals

## **B. System Design Requirements, Review, and Acceptance**

The Contractor will be responsible for developing design drawings and documentation for the GDS. It will be incumbent upon the Contractor to work with the Port Authority to ensure that all required elements as defined in this RFP and the operational intent of the Authority are met by the design provided. The design process is expected to include, at a minimum, the following stages:

### **1. Conceptual Design (Schematic Design):**

The Contractor will be required to provide a Conceptual Design for the GDS that will further the work of the Authority accepted Basis of Design.

It is expected, at this stage, that the Contractor will work closely with SDS, as required, and the Authority to conduct initial site surveys, take field measurements and document the expected design concepts.

As part of the Conceptual Design, the Contractor shall deliver, at a minimum, the following items:

- i. A complete description of the GDS's sub-components and their interaction with the system as a whole;
- ii. Initial floor plans indicating system layout and elevations in Port Authority standard CADD format <http://www.panynj.gov/business-opportunities/pdf/engineering-consultants-ead-cadstandard.pdf>;
- iii. System block diagrams indicating the systems, sub-systems, and requirements for connectivity.

### **2. Construction Documents:**

The Contractor will be required to provide a complete 100% design package, signed and sealed by the Contractor's Engineer of Record (EOR) licensed in the state of New Jersey, which includes, but may not be limited to the following items:

- i. Construction specifications.
- ii. Design drawings that at a minimum include the following:
  - a) staging plans for all disciplines
  - b) Electronic files of all drawings indicated above in DWG, DWF, and PDF format posted to the project website as directed by the Authority.
  - c) Original signed and sealed Permalife® paper copy of standard size (22" x 34") engineering drawings showing all information and details. Permalife® originals shall be prepared in such a manner as to produce clearly legible drawings after reduction. Scales shall be graphical rather than numerical.
- iii. Calculations, as required, signed and sealed by the Professional Engineer.

For ease of management and review of the design process, the Authority will require two (2) design review periods throughout the development of the construction documents.

These review periods, along with estimated percentages of completion are included below:

- i. Construction Document Development to 50% Design
- ii. Construction Document Development to 100% Design

At a minimum, the Construction Documents provided shall contain specifications, in Construction Specifications Institute (CSI) format or equivalent, for all necessary system components and sub-components. The specifications as part of the construction documents should include capacity, capability, expandability, performance and operational parameters, environmental parameters, installation details, interface details, and appearance and finish requirements.

Concerning design drawings, the Contractor shall provide all necessary documents to illustrate the design to the Authority and to be used for the installation. The expected drawing list to be provided by the Contractor includes, but may not be limited to, plans, elevations, details, riser diagrams, and hardware schedules. All drawings are to be produced in CADD format and the Contractor will be required to provide “as built” drawings to the Authority upon completion and acceptance of the project.

A phased approach to construction approvals may be coordinated with the Authority to facilitate the completion of the project within the identified timeline.

### **C. System Installation**

The installation of this system must comply with all applicable codes and relevant regulations for the Facility, jurisdiction(s) and industry. The following list of resources and codes is intended to provide guidance to the Contractor during the initial phases of project consideration:

- 1. NEC – National Electrical Code
- 2. NFPA – National Fire Protection Association
- 3. UL – Underwriters Laboratories, Inc.
- 4. FCC Federal Communications Commission
- 5. NEMA – National Electrical Manufacturer’s Association
- 6. PARAS – Program for Applied Research in Airport Security

The above list is not all inclusive, and it is incumbent upon the Contractor to ensure that all applicable codes and relevant regulations related to the project and the work to be performed are addressed.

It is incumbent upon the Contractor to work closely with the Port Authority during the design and installation of the GDS to avoid and/or mitigate installation requirements which may not be aesthetically pleasing. Existing architectural finishes disturbed during the installation shall be replaced in kind, matching existing finishes. Any required wiring, conduit or other appurtenances as part of this installation shall be concealed, matching current installations at Terminal B. All of Terminal’s signage, artwork, architectural features and other property shall be protected and maintained in place during the installation. The Contractor bears all costs associated with maintaining the aesthetics of the work locations. The Contractor shall address

with the Port Authority and areas of concern before final sensor placement in design and/or installation.

#### **D. Insurance**

The Contractor shall take out, maintain, and pay the premiums on the insurance coverages specified under the section entitled “Insurance Procured by the Contractor” in Attachment B - Contract Specific Terms and Conditions, and shall comply with all requirements of the insurance provisions.

#### **E. Expected Working Conditions**

The Contractor shall adhere to the following working conditions during the performance of the work:

1. Working Hours
  - a. Public areas (coverage plans in Attachment H) from 7am to 3pm, Monday to Friday.
  - b. Secured areas (coverage plans in Attachment H) from 1am to 5am, Monday to Friday.
2. Security and Safety Requirements
  - a. SIDA and SWAC
3. Availability of Parking
  - a. None.
4. Loading and Unloading of Materials
  - a. Coordinate with the Resident Engineer.
5. Availability of Storage for Tools and Equipment
  - a. Not guaranteed, subject to availability.

#### **F. Contractor Supplied Materials and Services**

The Contractor is responsible for ensuring that all components required to meet the performance and functional specifications, including but not limited to tools, materials, delivery and labor, are included in the overall system design and installation. It is incumbent upon the Contractor to provide a GDS that meets all the requirements set forth in this RFP.

#### **G. Shop Drawings, Catalog Cuts and Samples**

The Contractor shall specifically prepare for this Contract all shop drawings which may be required in addition to the Approved Construction Drawings (100% Design) or in addition to any other drawings which the EOR may issue in supplementing the Approved Construction Drawings (100% Design).

The specific requirements elsewhere set forth in the Specifications for furnishing Shop Drawings, Catalog Cuts and samples for any particular portion of the Contract shall not limit the obligation of the Contractor to furnish Shop Drawings, Catalog Cuts and samples for any other portion when so required by the EOR.

The Contractor shall submit a general "Submittal Schedule" for the EOR's review and approval listing the planned transmittal date and estimated number in each specification section category of Shop Drawings, Catalog Cuts, pages of calculations and samples within 15 days after receipt by the Contractor of the acceptance of his Bid.

After checking and verifying all field measurements and after complying with applicable procedures specified hereunder, the Contractor shall submit to the EOR for review and approval, or for other action if so indicated by the EOR, six copies, unless otherwise requested, of all shop drawings. In addition, the Contractor shall submit six copies of all shop drawings to the Authority. Each copy shall bear a specific written indication that the Contractor has reviewed the submission for conformance to the requirements of the Approved Construction Drawings (100% Design) and specifications.

All submissions shall contain specific reference to the contract number, Approved Construction Drawings (100% Design) and technical specification section to which they apply, as indicated below or as otherwise identified, as the EOR may require. In general, submissions shall specifically reference the contract number(s) and Approved Construction Drawings (100% Design) numbers or specification section numbers to which the item pertains. The data shown on the shop drawings shall be complete with respect to quantities, dimensions, conformance to the specified performance and design criteria, materials, test results and similar information to enable the EOR to review the submittal as required.

The Contractor shall also submit six copies to the EOR for review and approval pursuant to the approved submittal schedule, of all catalog cuts and samples demonstrating conformance to the requirements of the Approved Construction Drawings (100% Design) and specifications. In addition, the Contractor shall submit six copies of all catalog cuts to the Authority. Each catalog cut and sample shall have been reviewed by the Contractor and shall be accompanied by a specific written indication that the Contractor has reviewed the submittal for conformance with the Approved Construction Drawings (100% Design) and specifications and shall be identified clearly as to material, supplier, manufacturer's procedures and pertinent data such as catalog numbers and the use for which intended.

Before submission of each shop drawing, catalog cut and sample, the Contractor shall have determined and verified all quantities, dimensions, conformance to the specified performance and design criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and shall have reviewed and coordinated each shop drawing or catalog cut with other shop drawings and catalog cuts and with other requirements.

At the time of each submission, the Contractor shall give the EOR specific written notice of each deviation in any shop drawing, catalog cut or sample from the requirements of the Approved Construction Drawings (100% Design) or specifications and, in addition, shall cause a specific notation of each such deviation to be made on each submittal to the EOR, for review and approval of each such deviation.

The EOR's review and approval of shop drawings, catalog cuts or samples shall not relieve the Contractor from responsibility for any deviation from the requirements of the Approved Construction Drawings (100% Design) or specifications unless the Contractor has in writing called the EOR's attention to each such deviation at the time of submission as required

hereunder and the EOR has given written approval of each by an express specific written notation thereof incorporated in or accompanying the shop drawing, catalog cut or sample approval. Approval of shop drawings, catalog cuts and samples which are inconsistent with the requirements of the Approved Construction Drawings (100% Design) and specifications shall not be deemed to waive or change such requirements or to relieve the Contractor of his obligation to perform such requirements unless the EOR shall expressly and specifically state that he is waiving or changing such requirements, as stated above.

Where a shop drawing, catalog cut or sample is required no related work shall be performed prior to the EOR's review and approval of the submission.

The format for shop drawings prepared by the Contractor shall be as follows: Standard "D" size drawings with outside cut line dimensions of 22 inches by 34 inches and showing in detail all dimensions and description of materials. Two borders shall be drawn. The first shall be drawn one-half inch from the outside edges (top, bottom, left and right). The second shall be drawn inward to the drawing, one-half inch from the top, bottom and right border lines and one and one-half inch from the left border line. The inside borders on these drawings shall be 20 inches by 31 inches. A title block shall be shown on the right side of the drawing adjacent to the inside border identifying the Contractor's name, contract title, contract number, Approved Construction Drawings (100% Design) number, specification reference number and related paragraph and applicable signatures. These drawings shall be arranged in systematic order and numbered consecutively.

Upon receipt of the submittal, the EOR will review the shop drawing, catalog cut or sample for conformance to the design information and materials shown on the Approved Construction Drawings (100% Design) and contained in the Specifications.

1. Approval by the EOR shall not constitute a complete review or approval of the means, methods, techniques, sequences or procedures of construction, except where a specific means, method, technique, sequence or procedure of construction is specifically delineated in or required by the Approved Construction Drawings (100% Design) or specifications, and the approval shall not constitute a review or approval in regard to safety precautions or programs incident thereto. The review and approval of a separate item will not in itself indicate approval of the assembly in which the item functions.
2. Any design shown on the shop drawings and prepared by the Contractor, his subcontractors, their detailers, or their licensed professional engineers is the complete responsibility of the Contractor.
3. Submittals for portions of the work for which professional services for the practice of engineering or architecture are either (1) specifically required by the Approved Construction Drawings (100% Design) and specifications (i.e., delegated design elements, such as temporary structures) or (2) necessarily required by the Contractor in carrying out his obligation for the construction means, methods, techniques, sequences or procedures of construction will be reviewed by the EOR for conformance to the Authority's design information, for completeness of design and for materials, all as shown on the Approved Construction Drawings (100% Design)

and as specified in the Specifications, and will be marked by the EOR either "Reviewed" or "Reviewed - Resubmit".

After receipt of the shop drawings, the EOR will review and indicate the submittal review status (as provided elsewhere in this section) of each shop drawing. When a shop drawing is not approved or is reviewed requiring resubmittal, or if additions or corrections are required, the EOR will return one of the six printed copies submitted and the Contractor shall make the revisions, corrections or additions shown thereon to be made. The Contractor shall resubmit six prints showing the drawing corrected as required, with an additional six submitted to the Authority. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the EOR on the previous submittal. Each drawing shall be corrected as required until the approval of the EOR is obtained.

The EOR's review and evaluation of Shop Drawings, Catalog Cuts and/or samples shall be as follows:

SUBMITTAL REVIEW STATUS	
Approved	Approved as submitted, without any notations or observations; construction may proceed.
Approved as Corrected	Approved with corrections; construction, incorporating the corrections, may proceed.
Not Approved - Resubmit	Not approved; construction may not proceed.
Reviewed	Reviewed with comments or with no comments; construction may proceed.
Reviewed - Resubmit	Reviewed with comments; construction may not proceed.
For Record Only	Submittals for record only.

After approval has been given or after review has been performed on any shop drawing or catalog cut no change will be permitted thereon unless approved in writing by the EOR. Upon approval, the EOR shall submit six copies to the Authority.

As a condition precedent to final payment by the Authority to the Contractor of any amounts to be included pursuant to the section entitled "Billing and Payment" in Attachment B, the Contractor shall mark up and submit to the EOR any previously approved, approved as corrected and reviewed with no resubmittal Shop Drawings that require revision as a result of field changes. The Contractor shall direct specific attention to revisions reflecting the permanent construction as actually made. In accordance with the requirements specified in this numbered Section, the Contractor shall submit one original print of each revised Shop Drawing, marked "FINAL SHOP DRAWING – NOT FOR REVIEW", dated and signed by the Contractor to the EOR for verification. The Contractor's signature shall constitute his verification that the drawing reflects the as-constructed condition.



All drawings, data, calculations and other papers of any type whatsoever, whether in the form of writing, figures or delineations, which are prepared in connection with this Contract and submitted to the Port Authority shall become the property of the Port Authority. The Port Authority shall have a perpetual and non-exclusive right to use or permit the use of all such drawings, data and other papers and of any ideas or methods represented thereby for any purpose and at any time without additional compensation. No such papers shall be deemed to have been given in confidence. Any statement or legend to the contrary in connection with such drawings, data or other papers and in conflict with the provisions of this paragraph shall be void and of no effect.

## **H. Construction Inspection and Acceptance**

The Resident Engineer's Office (REO) provides oversight of construction activities throughout the project. After award of Contract, the REO will be the Port Authority's main point of contact for the Initial Setup Term. The REO performs inspections throughout the construction process and is responsible for monitoring of the Contractor's activities. Throughout the construction phase, the REO is in close contact with the Facility and Project Manager and provides regular updates on project milestones, scheduled activities and any problems or field changes that arise on the project. Specific activities of the REO include, but are not limited to:

1. Scheduling and holding a Pre-Construction Meeting. The agenda for the Pre-Construction Meeting is to review the rules and requirements for construction, the scope of the planned activities, the construction schedule and any staging plans. Any questions the Contractor's team may have will also be answered. The REO will identify applicable submittal, security, safety, M/WBE and other requirements and procedures. Required attendees include the EOR, Contractor and key sub-contractors. Information that the Contractor must provide at the Pre-Construction meeting includes:
  - i. Name and 24-hour emergency number of the Contractor.
  - ii. List of all subcontractors with any applicable licenses, e.g., mechanical, fire protection, and electrical
  - iii. A detailed construction schedule outlining start and completion dates, anticipated dates of Special Inspections, partial or final inspections, or other key milestones
  - iv. Hours of work
  - v. A review of all proposed construction staging areas.
  - vi. Health and Safety Plan, including subcontract compliance
  - vii. Information security requirements
2. Verifying appropriate insurance and contractors' licenses are in place and valid during construction and coordinating with Risk Finance on any questions or issues.
3. Verifying the M/WBE Participation Plan is approved and in place (as applicable).
4. Coordinating facility IDs.
5. Coordinating life safety system tie-ins or shutdowns with the Facility Manager, if necessary.
6. Coordinating all other associated operational issues with the Facility Manager.
7. Auditing and monitoring Contractor and its EOR activities with regard to:
  - i. Construction quality control and assurance and safety.
  - ii. Conformance with the approved plans, specifications, permits and applicable codes.
  - iii. Re-submission and re-approval of field changes (as may be required).

- iv. Special inspections as required to conform to applicable code.
  - v. Material certification.
  - vi. Issuing all Port Authority construction permits (cutting and burning permits, hot work permits, etc.)
8. Ensuring the Contractor constructs work in accordance with Local Building Code and Authority approved plans and specifications.
9. Collecting any additional Construction Phase submittals and forwarding to the appropriate Authority staff group.
10. Coordinating, scheduling, and attending partial and final inspections and issuing Non-Conformance Reports (NCR).
11. Verifying that all NCRs are resolved by the EOR.
12. Coordinating project close-out through receipt of appropriate certifications and records.
13. Processing the Authority paperwork necessary for issue of Certificate of Authorization to Occupy or Use upon satisfactory completion of inspections.
14. Preliminary Inspections and Special Inspections by the EOR. Preliminary Inspections are verifications that all construction is in compliance with Authority approved documents. The EOR should perform preliminary inspections throughout the course of construction.
15. Special Inspections, if applicable, are independent inspections of construction. Special Inspections must be performed by people qualified for the specific task in accordance with applicable codes which adds safety and quality to construction. The EOR shall review and sign to accept all Special Inspection reports. The EOR must submit copies of signed and sealed reports to the REO as they are performed under cover letter indicating acceptance.
16. Port Authority Non-Conformance Report. Following the Partial Inspection, the REO will issue comments in a Non-Conformance Report. The Contractor performs all of the required work to close out the Non-Conformances. The EOR verifies all work has been completed and submits a formal Non-Conformance Report Response to the REO requesting a re-inspection. The process repeats until the all Non-Conformances are resolved and the Partial Inspection is complete.
17. Certification and Request for a Partial Inspection (for Occupancy) or Final Inspection. Once construction is complete, and the EOR has performed all preliminary inspections and Special Inspections, the project can advance to the Close-out & Occupancy. At this time, the EOR will make a request for a Partial Inspection (for Occupancy) or a Final Inspection. The Contractor and the EOR must ensure that the appropriate EOR and Contractor personnel are available and present to conduct the required Final Inspection testing. The Final Certificate of Authorization to Occupy or Use will be issued when all areas of a project are complete, and all Non-Conformance Report items have been satisfactorily resolved. Based upon the recommendation of the REO and concurrence of other members of the Final Inspection team, the REO will request a Final Permit to Occupy or Use from the Port Authority Chief Engineer.
18. Close-Out and Occupancy Submittal Requirements. Prior to scheduling a Partial Inspection for Occupancy or Final Inspection, the EOR must submit the following documents under cover letter to the REO:
  - i. Special Inspection Documents – The EOR must submit copies of signed and sealed reports for all required Special Inspections, if applicable.
  - ii. Record Documents – The EOR shall compile and deliver to the REO, a set of Record Documents conforming to information furnished to the EOR by construction contractors. This set of documents shall consist of record specifications and record drawings showing the reported location of work.

## **I. System Commissioning**

Upon completion of the project and acceptance of the Non Conformance Reports remediation by the Authority, the Contractor will implement and certify the commissioning of the system. The commissioning should address all manufacturer directed requirements for system functionality, system specifications including materials in this RFP, and operational requirements identified in the Approved Construction Drawings (100% Design).

## **J. System Service Requirements**

The Contractor shall adhere to the Authority accepted System Service Requirements. submit a complete system service requirements plan to the Authority including a schedule for maintenance of sensors, systems, software updates, etc. for the full duration of the warranty period provided.

Contractor should be aware that the minimal expected operational life of the GDS, without significant renovation, sensor replacement, or other failure is a period of at least three (3) years. The Authority understands that achieving this operational life will require a continual maintenance and testing program to be implemented. The Contractor's accepted Maintenance Program will facilitate the performance and operational life cycle of the GDS meeting and/or exceeding the operational life cycle requirement specified above. The Contractor will be compensated for maintenance services in accordance with the section entitled "Billing and Payment" in Attachment B.

## **K. Warranty Period**

The Authority requires that the warranty period for the GDS be at least three (3) years. The warranty period shall begin on the date that the Authority accepts the GDS after completion of the Initial Setup Term.

## **L. Airport Operations Areas**

In addition, personnel that are designated to perform work within the Airport Operations (AO) areas of the airport must be issued a Port Authority Airport Identification Card (i.e. SIDA Badge). All applicants must contact their company Issuing Officer/Signatory Authority prior to completing or submitting an Airport Security ID Card application. Issuing Officers are familiar with the requirements to obtain an Airport Security ID Card and should be the applicant's primary point of contact for all Airport Security ID Card needs.

Although the application process may differ slightly among Port Authority airports, all airports share the same compliance requirements.

An applicant is required to complete the following prior to Airport Security ID Card issuance:

1. Complete a PA3253 Airport ID Card Application (New Applicant) and submit it to your company Issuing Officer

2. New SIDA Application Guide - PA3253A
3. Provide identification credentials for verification in accordance with the PA 3253 Application
4. Provide a company check or money order if fingerprinting is required. See fees here.
5. Successfully pass a Criminal History Records Check (CHRC)
6. Successfully pass the airport approved Security Identification Display Area (SIDA) training class
7. Successfully pass a Security Threat Assessment (STA)

#### **M. Prevailing Wages**

The Contractor shall provide (and shall cause all sub-contractors to pay or provide) to its Electricians (who are employed by it to work on an hourly or daily basis at any trade or occupation at or about the Facility) at least the prevailing rate of wage and supplements for others engaged in the same trade or occupation in the locality in which the services are being performed at the time the Work is being performed and notwithstanding that such rate may be higher than the rate in effect on the Proposal Due Date.

For the purposes of this Contract, for work being performed in the State of New Jersey, Contractors and Subcontractors are directed to utilize the State of New Jersey, Department of Labor and Workforce Development prevailing wage levels established pursuant to the New Jersey Prevailing Wage Act (N.J.S.A. 34:11-56.25 et seq.) for workers engaged in public works projects in the Counties of Essex and Union. The applicable prevailing wage rates shall be those that are in effect for the locality and for the period of time in which the work is to be performed. Current prevailing wage rates may be downloaded at:

[http://lwd.state.nj.us/labor/wagehour/wagerate/prevailing\\_wage\\_determinations.html](http://lwd.state.nj.us/labor/wagehour/wagerate/prevailing_wage_determinations.html)

The provisions of this clause are inserted in this Contract for the benefit of such Electricians, as well as for the benefit of the Port Authority; and if the Contractor or any subcontractor shall pay or provide any Work persons, Laborers, Electricians, Mechanics and Helpers less than the rates of wages and supplements above described, such Work persons, Laborers, Electricians, Mechanics and Helpers shall have a direct right of action against the Contractor or such subcontractor for the difference between the wages and supplements actually paid or provided and those to which they are entitled under this clause. If such Work persons, Laborers, Electricians, Mechanics and Helpers are employed by any subcontractor whose subcontract does not contain a provision substantially similar to the provisions of this clause (requiring the payment or provision of a least the above minimum, and providing for a cause of action in the event of the subcontractor's failure to pay or provide such wages and supplements) such Work persons, Laborers, Electricians, Mechanics and Helpers shall have a direct right of action against the Contractor. The Port Authority shall not be a necessary party to any action brought by any Work persons, Laborers, Electricians, Mechanics and Helpers to obtain a money judgment against the Contractor or any subcontractor pursuant to this clause.

Nothing herein contained shall be construed to prevent the Contractor or any subcontractor from paying higher rates or providing higher supplements than the minimum hereinbefore described; and nothing herein contained shall be construed to constitute a representation or guarantee by the Port Authority that the Contractor or any subcontractor can obtain Work persons, Laborers, Electricians, Mechanics and Helpers for the minimum hereinbefore described.

The Contractor's or Subcontractor's failure to comply with any provision of this numbered clause may be deemed as a substantial breach of this Contract.

## 2. Engineering Technical Specifications

<b>Specification Division No.</b>	<b>Specification Title</b>
C 28 50 00	INDOOR GUNSHOT DETECTION SYSTEM
C 28 23 05	FIBER OPTIC CABLING
C 28 23 10	CONTROL/SIGNAL TRANSMISSION
024114	CUTTING, PATCHING & REMOVAL
040700	MASONRY GROUT
055000	MISCELLANEOUS STEEL
057600	STAINLESS STEEL FINISH
061000	ROUGH CARPENTRY
078413	PENETRATION FIRESTOPPING
079200	ARCHITECTURAL SEALANTS
099100	PAINTING
260000	ELECTRICAL GENERAL REQUIREMENTS
260519	WIRES, CABLES, SPLICES, TERMINATIONS (600 VOLTS OR LESS)
260526	GROUNDING
260527	ELECTRICAL BONDING
260529	SUPPORTING DEVICES
260533	RACEWAYS
260534	BOXES AND FITTINGS
260543	UNDERGROUND CONDUIT SYSTEMS
262716	CONTROL PANELS, ENCLOSURES/CABINETS, AND TERMINAL BOXES
262726	WIRING DEVICES
262800	OVERCURRENT PROTECTIVE DEVICES (600 VOLTS OR LESS)

## **DIVISION 28**

### **SECTION 28 50 00**

#### **INDOOR GUNSHOT DETECTION SYSTEM**

##### **PART 1. GENERAL**

###### **1.01 SUMMARY**

- A. This Section specifies requirements for:
1. Indoor Gunshot Detection System (IGDS) Sensor Specifications
  2. Gateway Server Application
  3. Situational Awareness (SA) Application
  4. Configuration Testing and Tools

###### **1.02 RELATED SECTIONS**

- A. Port Authority Specification Sections:
1. 260000 Electrical General Requirements
  2. 260533 Raceways
  3. 260534 Boxes and Fittings
  4. 260529 Supporting Devices
  5. 260526 Grounding
  6. 260527 Electrical Bonding

###### **1.03 REFERENCES**

The following is a listing of the publications referenced in this Section:

**Building Industry Consulting Service International (BICSI)**

BISCSI 005      Electronic Safety and Security System Design and Implementation Best Practices

TDDM            Telecommunications Distribution Methods Manual

ITSIMM          Information Technology Systems Installation Methods Manual

**Federal Communication Commission (FCC)**

FCC              FCC Part 15 Class A

**International Electrotechnical Commission (IEC)**

IEC                IEC 60950-1 Information Technology Equipment- Safety

	<u>National Fire Protection Association</u>
NFPA 70	National Electrical Code
	<u>Restriction of Hazardous Substances (RoHS)</u>
RoHS	RoHS Compliant

#### 1.04 COORDINATION

- A. Coordinate work of this Section with work of other sections of this Contract.

#### 1.05 PRE-INSTALLATION MEETINGS

- A. The Contractor shall meet with the Port Authority a a minimum of once a week for four (4) weeks prior to commencing work set forth in this section.

#### 1.06 SUBMITTALS

- A. Product Data: Submit catalog data showing electrical characteristics and connection requirements
- B. Shop Drawings: Indicate system wiring diagrams showing each device and wiring connection; indicate annunciator layout and sequence of operation.
- C. Manufacturer Instructions: Submit detailed instruction on installation requirements, including storage and handling procedures.
- D. Field Quality-Control Submittals: Indicate results of contractor-furnished tests and inspections.
- E. Manufacturer Reports:
  - 1. Certify that the installation of the IGDS has been completed in accordance with manufacturer's certification and installation requirements.
  - 2. The Contractor shall coordinate with the manufacturer to develop necessary reporting to indicate activities on site, adverse findings, and recommendations. Any findings, conditions, or performance issues must be noted and addressed before the Authority will accept the system. Any items potentially impacting the system's SAFETY Act protections must be evaluated by the manufacturer.
  - 3. Provide a punch-list of identifiable shortcomings and develop and implement appropriate remediation plans to provide a fully functional system which meets the operational and functional intent of the IGDS. Punch list activities must be coordinated with the systems manufacturer.

#### 1.07 CLOSEOUT SUBMITTALS

- A. Project Record Documents
  - 1. Drawings of record showing actual locations of gunshot detection system equipment and components, including but not limited to:
    - a. Enclosures

- b. Updated panel schedules
  - c. Conduit and cabling as-built drawings
  - d. Network connectivity
2. System Operation and Maintenance manuals.

#### 1.08 MAINTENANCE

- A. Owner's Manual/Maintenance Instructions – Maintenance for the Gunshot Detection System shall be provided in accordance with the maintenance requirements for the overall project.
- B. Equipment Overage and Storage Requirements:
  - 1. The Contractor will be expected to maintain a five-percent (5%) overage of sensors during the warranty period. This is intended to support the rapid replacement of sensors, as needed, without concerns for production times, schedules, shipments, etc.
  - 2. The Contractor will be responsible for coordinating storage of the overage with the Authority. It is preferred that the Proposer store and maintain the overage on its premises and maintain responsibility for the overall upkeep and availability of the sensors. The selected Proposer may rotate sensors as needed to facilitate the ability to maintain warranty on replacement sensors installed at the Authority facility.

#### 1.09 QUALIFICATIONS

- A. Manufacturer: Shooter Detection Systems, Guardian Indoor Active Shooter Detection System no substitutions.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. Inspection: Accept materials on site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions and recommendations.

#### 1.11 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
- B. Indicate field measurements on shop drawings. The Contractor shall replicate the design and sensor layout provided by the manufacturer as accurately as practical. Any changes to the sensor layout or coverage are to be verified with the manufacturer to ensure continued system effectiveness in accordance with the design intent.



## 1.12 WARRANTY

- A. Furnish three (3) year manufacturer's warranty and/or extended warranty for all sensors, system components, infrastructure and installation. The warranty period shall begin with Authority acceptance of the system after completion of all testing, commissioning, and training requirements have been accomplished.

## 1.13 EMPLOYEE TRAINING

- A. Employees responsible for the operations and maintenance of the system must be provided with training covering all functionality and system capabilities along with operational and maintenance program implementation. See section "3.04 TRAINING" for additional information.

# PART 2. PRODUCTS

## 2.01 SYSTEM DESCRIPTION

- A. The Indoor Gunshot Detection system (IGDS) is an IP based acoustic and infrared gunshot detection system. This combination provides for effective indoor gunshot detection when the system is installed in accordance with manufacturer guidance provided through the certification process. The system utilizes two complimentary technologies including acoustic sensing and infrared (IR) sensing. The system requires dual activation of the complementary technologies prior to initiating an alarm. This configuration is designed to reduce the potential likelihood of nuisance alarms (environmentally generated) and false alarms (system generated) while providing a probability of detection in excess of ninety five percent (95%), or greater.
- B. The system requires multiple sensors to provide full coverage of the protected space. The sensors are powered via a standard Power over Ethernet (PoE) Local-Area-Network (LAN) switch that also provides connectivity to the Gateway software. The Gateway software supplies the applications needed to provide system monitoring, maintenance, and gunshot alert information to the end user.
- C. The IGDS to be provided by the Contractor is comprised of the following system components:
  - 1. Shooter Detection Systems Guardian Sensor GRDN-2001, No Substitutions
  - 2. SDS Gateway (GW) Server Application - GRDN-SW-GGW-Tx
  - 3. SDS Situational Awareness (SA) Application
  - 4. Guardian AOL: GRDN-AOL-Tx
  - 5. Everbridge Integration: GRDN-SWINT-EVERBRIDGE
  - 6. Verint VMS Integration: GRDN-SWINT-VERINT-VMS
  - 7. Configuration and testing tools - GRDN-TSTR-2000

## 2.02 PRODUCTS TO BE PROVIDED BY THE CONTRACTOR

### A. Gunshot Detection Dual Technology Sensor

1. Manufacturer:
  - a. Shooter Detection Systems Guardian Sensor GRDN-2001, No Substitutions
2. Sensor Capabilities
  - a. A single sensor has a coverage range which spans 180 degrees from the front plate of the sensor and extends 35 feet.
    - (1) If multiple sensors are covering a room or hallway then the coverage arc may be expanded to 40 feet. The coverage area can be expanded as one sensor should have a clear look at the firearm.
  - b. Detection range is based on a low caliber handgun which is fully blocked by the shooter body (i.e. firearm facing away from the sensor).
  - c. A single sensor has a coverage area of approximately 2500 square feet.
  - d. Shot detection shall be declared when the acoustic signature meets the criteria specified by the algorithms and is also verified by an appropriate Infrared (IR) signal.
    - (1) A shot detection shall not be declared based solely on an acoustic signal. The sensor shall be capable of detecting both handguns and high-power rifles.
    - (2) The sensor shall not require the projectile pass nearby the sensor or that the projectile be supersonic.
    - (3) The sensor shall detect blank fire.
    - (4) The sensor shall be capable of detecting acoustically suppressed firearms.
    - (5) The sensor shall be capable of detecting flash suppressed firearms.
  - e. Sensors shall function independently of each other.
    - (1) Each sensor shall produce its own detection without knowledge of any other sensor within the system.
  - f. The sensor shall draw power over category 6 cable.
    - (1) The category 6 cable shall be armored type cable when not installed in conduit.
    - (2) The network switch shall be Power over Ethernet (PoE) 802.3af compliant
    - (3) The sensor must use not more than 1 watt of power and be terminated with Category 6 RJ45 male connector. The sensor shall be a 10/100Mbps device that is also 802.3 complaint and will require a single static IP address.
    - (4) The MAC address shall be located on the top rear corner of the sensor and be the same as the serial number.
    - (5) The RJ45 connector shall be located in the rear of the sensor.
    - (6) Each sensor shall require no more than .5Kbps of bandwidth.

- (a.) It shall also send at least one “heartbeat” message indicating the active working status every <30 seconds. The unit must also require no calibration.
- 3. The sensor shall have a tamper system that alerts when the sensor is moved or removed. It must be capable of being both recess and surface mounted.
- 4. The operating temperature range shall be 0 degrees Celsius to 40 degrees Celsius for standard indoor applications.
- 5. The sensor shall detect and report a unique test (non-shot) signature to support validation of the sensor operation and system configuration / programming.
  - a. This “Test Mode” shall be controlled at a system level enable/disable using the Gateway Application
  - b. The “Test Mode” shall include functionality to automatically reset to normal (non-Test Mode) operation after a period of time.
  - c. The test signature must be easily applied to a single sensor using a physical test device.
- 6. The sensor shall include built in self-test (BIST) features.
- 7. The sensor includes onboard acoustic and IR sources to provide feedback test signals.
- 8. The sensor shall be capable of monitoring other key onboard resources.
- 9. The sensor shall be capable of monitoring ambient IR and acoustic levels to determine if the sensor may have degraded performance.
- 10. The sensor shall have external test capabilities.
- 11. The sensor may be commanded to run built-in self-test using the gateway application. The results of the tested sensor shall be sent to the technician over SMS and include pass/fail results as well as location information for the sensor.
- B. Gateway Application
  - 1. Manufacturer:
    - a. Shooter Detection Systems Guardian SDS Gateway Application GRDN-SW-GGW-Tx (Software), No Substitutions
    - b. Contractor shall ensure that the latest version of the Guardian SDS Gateway Application, which is commercially available, is utilized.
  - 2. Each sensor shall be in constant communication with the Gateway Application.
    - a. The Sensor must maintain 2 communication paths with the Gateway (TCP Ports). One shall be for monitoring (gunshot detection, heartbeat etc.) and the other for command (testing, sensor firmware upgrades etc.).
    - b. Each sensor will require a dedicated IP address to be programmed with the Gateway application.
    - c. All network addresses shall be IPv4.
  - 3. The application shall be VM capable on any Windows based machine.
  - 4. The application shall also be the primary aggregator for the Guardian Situational Awareness Application and third-party integrations.

- a. The software development kit (SDK) interface must contain all information required to report on the health/status/tamper and gunshot detections within the system gunshot detections must be reported on the interface within 1 second of occurring. The application shall allow hardwired dry contract integration through third party Sea-level Systems analog I/O solution, and through the Guardian ROI interface.
- 5. The Application shall be installed on the Authority VM servers. This will be coordinated with the Authority.
- 6. The application shall be integrated into the Verint video management and Everbridge mass notification systems, simultaneously through the software development kits (SDKs). This integration shall provide the PANYNJ with the technical capacity required to operationalize the system, support the assessment of alarm conditions, and provide timely information in the support of response to alarms.
- C. Situational Awareness (SA) Application
  - 1. Manufacturer: Shooter Detection Systems Guardian SDS Situational Awareness (SA) Application, no substitutions
- D. Explorer Configuration Tool
  - 1. Manufacturer: Shooter Detection Systems Guardian SDS Explorer, no substitutions
  - 2. The explorer IP configuration tool shall provide the following functions:
    - a. Configuration of IGDS sensors
    - b. Importing of the node.csv configuration file (for ease of configuration)
    - c. View firmware version on sensors.
    - d. Provide a means of inputting a sensors' static IP address, subnet mask, and default router address.
- E. Configuration and Testing Tools
  - 1. Manufacturer: Shooter Detection Systems. No Substitutions
- F. Network switches and servers shall be provided by Authority.

## **PART 3. EXECUTION**

### **3.01 EXAMINATION**

- A. Inspect all System equipment and accessories prior to installation. Replace any damaged items.
- B. Ensure that the spaces where any electronic equipment is to be stored and/or installed is completely free from any foreign substances, such as concrete dust, water, or any other material that may otherwise be harmful to electronic equipment and connections. No allowances shall be made to the Contractor for equipment damage or delays due to environmental/security damage.

### 3.02 PREPARATION

- A. The Contractor shall be responsible for field verification of dimensions and coordination of conduit entry and all other mounting conditions with the entity manufacturing the equipment and the Facility.
- B. The Contractor shall, before any changes are made to existing Airport systems, coordinate with EWR to allow them to make a full backup of the existing VMS configuration and database. The Contractor shall also create a roll-back strategy prior to any changes made and present the recovery plan to the Engineer for approval.
- C. The entity manufacturing the equipment shall provide on-site technical supervision and assistance during installation and interconnection of the system equipment installed by the Contractor. Said supervision is to ensure proper installation and operation of the system equipment, prior to the installed system beginning the 30-day operational test.
- D. After the system equipment has been delivered, the Engineer will make an on-site inspection. If any equipment has been damaged or for any reason does not comply with the requirements of this Section, the Contractor will be notified in writing, and shall be required to replace the equipment at his own expense, even though the equipment has been previously inspected, tested, and approved for shipment. After such satisfactory replacement, the system shall be installed by the Contractor.

### 3.03 INSTALLATION

- A. Install all System equipment in accordance with the manufacturer's written instructions in the locations shown on the Approved Construction Drawings (100% Design)
- B. All sensors installed under this package shall be connected to and powered from Power over Ethernet (PoE) switches.
- C. All sensors installed under this package are to have statically assigned IP address. Each IP address is to be coordinated with the Authority.
- D. All wiring shall be clearly labeled with function and wire identification number corresponding to the manufacturer's wiring diagrams and/or approved Shop Drawings.
- E. Naming and numbering methodology must be approved by the Authority prior to any system programming.
- F. The Contractor shall refer to the manufacturer mounting hardware guide before installation is started.

### 3.04 TRAINING

- A. The Contractor will be required to provide training to the Port Authority that will facilitate the successful operation of the GDS system. This training should include the following Authority personnel and requirements, at a minimum:
  - 1. Port Authority Police Desk Officers and Supervisors (maximum 60 personnel):
    - a. The officers responsible for monitoring the system should be trained on the systems operations including, but not limited to:
      - (1) alarm recognition and acknowledgement;

- (2) adjudicating any of the system's business rules to achieve a positive outcome;
  - (3) operator level troubleshooting and fault detection.
2. Port Authority Police, Security Operations and Programs Department, and/or Port Authority Technology Department will have approximately thirty (30) personnel that should be included in the training – Personnel responsible for the technological aspects of the GDS should be trained on all the topics listed above, for Port Authority Police personnel. Additionally, these personnel should be trained in the following elements:
- a. proper method for any regular updates of systems which host the GDS system;
  - b. coordination requirements with the Contractor, should the Authority upgrade, change, or otherwise alter interfaced systems;
  - c. process for requesting maintenance and/or testing of systems;
  - d. coordination requirements for expected system outages (Authority internal operations planning);
  - e. Operator Level service activities and/or equivalent troubleshooting and/or support of the GDS to enable the Authority to efficiently address outages or issues internally or provide the best possible system performance while awaiting offeror support and/or maintenance.

### 3.05 SYSTEM ACCEPTANCE TESTING REQUIREMENTS

- A. The Contractor shall develop and submit for approval all tests procedures a minimum of six weeks prior to commencing testing. Coordinate and schedule with the Resident Engineer.
- B. The systems acceptance and testing requirements for this project will be conducted through a multiple stage, phased, approach. Each of the required phases of testing are identified below:
  - 1. Preinstallation Acceptance Testing: Prior to installation onsite, the Contractor will be required to establish a preinstallation acceptance testing regimen. This testing program shall include the following elements:
    - a. The Contractor will coordinate with Shooter Detection Systems to conduct a system functionality test at the manufacturer's location prior to shipping. The Contractor should advise PANYNJ of the testing dates and times and coordinate attendance of select personnel. PANYNJ will pay its own travel costs for this attendance. Upon successful completion of the pre-installation testing, the Contractor will provide PANYNJ with a letter indicating that this testing was completed, and the system was functioning in accordance with manufacturer specifications.

- b. Upon acceptance of the above testing, PANYNJ and the Contractor will coordinate with Shooter Detection Systems to conduct live fire testing of the system at the PAPD Firing Range at the Port Authority Technical Center (PATC) in Jersey City. All individual sensors to be installed, including the required 5% spare, at Newark Airport Terminal B must successfully detect gun fire during this testing.
  - c. Upon completion of the preinstallation acceptance testing of the system, including on-site testing at PATC, the Contractor shall provide a written report to the Authority which details how the above testing requirements were met. Further, the results of the testing, including number of tests, accuracy of detections and ANY false positive or nuisance alarms which occurred during the testing of the system, shall be certified by the Contractor prior to movement of system components and installation within EWR.
- 2. Performance Verification Testing (PVT):
  - a. After installation at the Facility, the equipment shall be tested to show compliance with this Specification Section 3.
  - b. Test Scheduling:
    - (1) The Contractor shall submit the proposed testing procedure to the Authority for review prior to proposed start of test.
    - (2) The Authority shall be notified of the test two weeks prior to its commencement. PVT test must be witnessed by an Authority representative.
    - (3) Testing cannot begin unless the following criteria has been met:
      - (a.) All systems have been installed and individually and jointly tested in accordance with the manufacturer's requirements to ensure they are operating properly.
      - (b.) Written permission from the Authority.
  - c. Verification:
    - (1) All system components shall be tested to demonstrate system features.
    - (2) IGDS system shall be tested using a Guardian Gateway application in test mode, and the Guardian handheld tester. Once in test mode the sensors will look for a pre-defined IR/audio test pattern from the tester. The tester shall not generate a gunshot sound or a muzzle flash and may be used in an occupied building. Once the sensor detects the test pattern the following information shall be displayed via a SMS message, email and the gateway application admin GUI. Report date/time, facility address, location, floor, device name, sensor IP address, sensor MAC address, and cause (Pass/Fail) shall be displayed in the test report.
    - (3) Testing shall continue until the results of the tests are satisfactory to the Authority or its authorized representative. Any repairs, construction, or modifications as required to comply with this Section shall be performed by the Contractor without additional cost to the Authority.

- (4) All integrations must be verified using SDS Trainer application. All associated alarms, events, email messages, SMS alerts, VMS interface must be verified to operate as specified when trainer shots are sent from the Guardian system.
- d. Reporting
  - (1) Describe the operational test performed and the equipment used to perform the test. List all personnel present at the performance of the test.
  - (2) Record in a tabular format all test results, deficiencies, and corrective actions taken.
- e. Testing Termination: PVT shall be terminated when the Contractor has been notified by the Authority or its designated representative when:
  - (1) Individual components, subsystems fail to perform as specified.
  - (2) It is determined that systems are missing components, or the installation is not complete.
  - (3) Upon termination of the PVT, corrective work shall be performed, and the test shall be rescheduled with the Authority.

Retesting shall be performed by the Contractor at no additional expense.

The Contractor shall continue to perform corrective actions and retest until the system passes all test to the satisfaction of the Authority.
3. Operational Acceptance Testing
  - a. Testing may begin once the system has successfully completed Performance Verification Testing, completed specified training, correction of system deficiencies has been completed, and the receipt of written start notification from the Authority has been received.
  - b. The Authority shall have the ability to monitor system operations 24 hours per day, 7 days a week to ensure that the system is operating as specified.
  - c. The Contractor will have personnel available to troubleshoot system operational performance issues throughout the testing period.
  - d. Reporting: Data collected during the operational acceptance test shall be recorded on approved forms with the intent to provide a continuous log of system performance. Weekly entries of the performance data shall be prepared by the Contractor and reviewed by the Authority to observe monitoring of the system. Items to be reported include, but not limited to:
    - (1) Date and Time for all entries.
    - (2) Name of the individual making the entries.
    - (3) Environmental conditions,
    - (4) Authority activities in process at the time of the event.
    - (5) Description of all alarm annunciations, responses, corrective actions, classification of, and cause of the alarm.
    - (6) Description of all equipment failures, including software errors.
    - (7) Daily and weekly tabulations of issues.



- (8) If a nuisance alarm occurs, an investigation should be conducted to determine the specific environmental, technological, or operational element(s) that resulted in the nuisance or false alarm.

This information should be analyzed, and a root cause should be provided to the Authority.

- e. Testing Termination or extension of testing period: The Authority may terminate testing at any time or determine if an extension to the testing period is required.
- f. At the end of the above testing and any Authority directed extensions, based on system performance, the Contractor shall provide a written report to the Authority which details the results of the testing and summarizes system performance.
- g. When the system fails to perform as specified, upon termination of testing the Contractor shall assess the test failure, perform corrective actions, and reschedule testing with The Authority.
- h. Test Duration: Operational Acceptance Testing shall be 30 calendar days.
- i. Adjustments, Corrections and Maintenance
  - (1) During operational acceptance testing, the Contractor is required to perform maintenance on the system including but not limited to the provision of replacement parts and software patching.

4. Final Inspection and Acceptance:

- (1) The Contractor shall review the tabulated record with the Authority upon successful completion of the operational acceptance test.
- (2) Failure Exceptions: The Contractor shall not be responsible for failures caused by:
  - (a.) Power Outages in excess of the backup power capability.
  - (b.) Failure of any Authority furnished power, communications, and control circuits provided failure was not due to the contractors furnished equipment, installation, or software.
  - (c.) Failure of existing Authority equipment provided failure was not due to the Contractor's furnished equipment, installation or software.
- (3) The Contractor shall submit a test report detailing compliance with the requirements of each test identified above for the Authority's review and acceptance of the system.

END OF SECTION

## **SECTION 28 50 00**

### **INDOOR GUNSHOT DETECTION**

#### **APPENDIX "A"**

##### **SUBMITTALS**

- A. Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:
1. Catalog Cuts
    - a. Catalog cuts for sensors, cable and connectors with verification of coordination with existing and Authority-furnished equipment.
  2. Certificates
    - a. Cable certificates, acknowledged by the communication system manufacturers, certifying that the cables are suitable for the connected equipment as described in Section 1.04 "Quality Assurance".
    - b. SDS Sensors certificates, acknowledged by SDS manufacturers certifying that the sensors are in compliance with the specifications
  3. Manufacturer Test Reports
    - a. One (1) foot sample of each type of cable for approval.
    - b. Certified shop test reports for cable.
    - c. One (1) sensor sample
  4. Qualifications
    - a. Qualification data for manufacturers as per Section "Quality Assurance" stating their capabilities and experience. Include list of completed projects and other information specified.
  5. Information
    - a. Field test reports indicating and interpreting test results.
    - b. Maintenance requirements for cables.
    - c. Test plan.
  6. Record Documents:
    - a. One reproducible set and four sets of prints of the Shop Drawings that reflect the actual as built condition of the Gunshot detection system.
    - b. Cable Schedule: A listing of all installed cables runs including but not limited to the following cable run number, cable origin point and cable destination point
    - c. Final Test Report for all installed cable and Sensors

END OF APPENDIX "A"

## **DIVISION 28**

### **SECTION 28 23 05**

#### **FIBER OPTIC CABLING**

##### **PART 1. GENERAL**

###### **1.01 SUMMARY**

- A. This Section specifies the requirements for the following type of Control and Signal transmission media:

1. Single mode Optical fiber cabling.

###### **1.02 DESIGN AND PERFORMANCE REQUIREMENTS**

- A. General Performance: Horizontal cabling systems shall comply with transmission standards in TIA/EIA-568, when tested according to test procedures of this standard.
- B. All cable installation, including all components of the optical fiber cable system shall be manufactured and installed in accordance to the requirements of NFPA 70.
- C. Site Conditions
1. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and system is operating and maintaining conditions as defined in 1.02.C.2.
  2. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability.
    - a. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 30 to 90 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
    - b. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 degrees F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
    - c. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 degrees F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 4X enclosures.

###### **1.03 REFERENCES**

- A. The following is a listing of the publications referenced in this section:
1. Building Industry Consulting Service International (BICSI)
    - a. Telecommunications Design Methods Manual (TDMM)
  2. Insulated Cable Engineering Association (ICEA)
    - a. ICEA STD T-33-655 Guide for Low Smoke, Halogen-Free (LSHF) Polymeric Cable Jackets

3. International Telecommunications Union (ITU)
  - a. ITU T G.651-Characteristics of a 50/125um multimode graded index optical fiber cable
  - b. ITU T G.652-Characteristics of a single-mode optical fiber and cable
  - c. ITU T G.653-Characteristics of a dispersion-shifted single-mode optical fiber and cable
  - d. ITU T G.654-Characteristics of a cut-off shifted-mode optical fiber and cable
  - e. ITU T G.655-Characteristics of a non-zero dispersion-shifted single-mode optical fiber and cable
  - f. ITU T G.656-Characteristics of a fiber and cable with non-zero dispersion for wideband transport
  - g. ICEA T-33-655-Guide for Low Smoke, Halogen-Free (LSHF) Polymeric Cable Jackets
4. National Fire Protection Association (NFPA)
  - a. NFPA 70 National Electrical Code
  - b. NFPA 130 National Electrical Code
  - c. NFPA 502-Standard for Road Tunnels, Bridges, and Other Limited Access Highways  
RFP 59136 - 66
  - d. Naval Engineering Standards
  - e. NES 713 Determination of Toxicity Index of Products of Combustion From Small Specimens of Materials
5. International Electrical Testing Association (NETA)
  - a. NETA Acceptance Testing Specifications, Section 7.25
6. Telecommunications Industry Association (TIA) / Electronics Industries Alliance (EIA)
  - a. TIA/EIA 455-25C-FOTP-25 Impact Testing of Optical Fiber Cables
  - b. TIA/EIA 455-26A-FOTP-26 Crush Resistance of Fiber Optic Interconnecting Devices
  - c. TIA/EIA 455-33A-FOTP-33 Fiber Optic Cable Tensile Loading and Bending Test
  - d. TIA/EIA 455-41A-FOTP-41 Compressive Loading Resistance of Fiber Optic Cables
  - e. TIA/EIA 455-82B-FOTP-82 Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable
  - f. TIA/EIA 455-98A-FOTP-98 Fiber Optic Cable External Freezing Test
  - g. TIA/EIA 455-104-FOTP-104 Fiber Optic Cable Cyclic Flexing Test
  - h. TIA/EIA 526-14A-OFSTP-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
  - i. TIA/EIA 526-7-OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  - j. TIA/EIA 568-C.3-Optical Fiber Cabling Components Standard
  - k. TIA/EIA 598-C-Optical Fiber Cable Color Coding
  - l. TIA/EIA 604-Fiber Optic Cabling Intermateability Standard (FOCIS)
  - m. TIA/EIA 606-A-Administration Standard for Commercial Telecommunications Infrastructure

- n. TIA/EIA 607-A-Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- 7. Underwriters Laboratories Inc.
  - a. UL 910 Test for Flame - Propagation and Smoke - Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
  - b. UL 1651-Standard for Safety for Optical Fiber Cable
  - c. UL 1666 Test for Flame Propagation Height of Electrical and Optical – Fiber Cables Installed Vertically in Shafts
  - d. UL 1685 Standards for Safety Vertical Tray Fire Propagation and Smoke Release Test for Electrical and Optical Fiber Cable.
  - e. UL 2024-Optical Fiber Cable Raceway
- 8. National Electrical Manufacturers Association
  - a. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
- 9. Military Specifications
  - a. MIL-C-24643 Low Smoke Shipboard Cable

#### 1.04 QUALITY ASSURANCE

- A. Cable Manufacturer Qualifications:
  - 1. The cable manufacturer shall be a company specializing in the manufacture of fiber optic cables and shall be ISO 9001/Q9001 certified for a Quality System for Fiber Optic Cables.
  - 2. Cable manufacturers shall be regularly engaged in manufacturing optical fiber cables of the types, sizes, and characteristics specified in this Section and on the Contract Drawings. Cable manufacturer's products shall have been in satisfactory use in similar service for not less than 3 years.
  - 3. All optical fiber materials for which there are established UL standards shall bear the UL label.
  - 4. Wires and cables which have been manufactured more than two years prior to installation shall not be used in the Work of this Section.
  - 5. Where cables specified in this Section are used to provide signal paths for systems specified in other Sections of the Specifications, or for systems shown on the Contract Drawings, review the cable characteristics provided by this Section for compatibility and use with the system equipment to be connected to the fiber optic cables.
  - 6. All optical fiber cable installations, splices and terminations shall be performed by qualified workers with prior experience in installing optical fiber cables and working on optical fiber systems. Work experience shall include the successful installation of at least three other optical fiber systems of similar complexity to the work of this Section. Installer qualifications shall include successful completion of training classes covering optical fiber cable installation, termination, splicing and connectorizing.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to the construction site cable properly packaged in factory-fabricated type or wound on NEMA specified type cable reels.
- B. Store cable in clean dry space in original containers, protected from weather, theft, vandalism, damaging fumes, construction debris and traffic.

- C. Handle cable to avoid abrading, puncturing and tearing cable insulation and sheathing. Ensure that dielectric resistance and characteristic impedance integrity of transmission media are maintained.
- D. Test cables upon receipt at construction site.
  - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use an Optical Test Set or Optical Time Domain Reflectometer (OTDR).
  - 2. Test optical fiber cable on reels, where applicable. Use an OTDR to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
  - 3. Compare results from on-site pre-installation test to manufacturer's pre-shipping test results. Any cables which have different results shall be rejected and not installed.

#### 1.06 SUBMITTALS

- A. See Appendix A for submittal requirements.

## **PART 2. PRODUCTS**

### 2.01 CABLE – GENERAL

- A. Locations, types, sizes and numbers of cables shall be as shown on the Contract Drawings.
- B. Cables that will be installed in riser areas shall pass the flame propagation and smoke release criteria according to the test method of UL 1666.
- C. Cables that will be installed in plenum areas shall pass the flame propagation and smoke release criteria according to the test method of UL 910.
- D. Comply with the following performance characteristics for cables which will be installed in subway areas, substations, or tunnels, where flame retardency, low smoke, low toxicity, zero halogen and good circuit integrity is maintained during a fire.
  - 1. Cables shall pass the flame propagation and smoke release criteria according to the test method of UL 1685.
  - 2. The halogen content of the cable shall not exceed 0.2 percent according to the test method of MIL-C-24643. The Authority classifies 0.2 percent or less halogen content as "non-halogen".
  - 3. The cable shall comply with ICEA T-33-655 for smoke generation.
  - 4. The toxicity index of the cable shall not exceed 2.0 according to the test method of NES 713.
  - 5. The acid gas content of the cable shall not exceed a maximum of 2.0 percent according to the test method of MIL-C-24643.
  - 6. All cables, splices and terminations, for which there are established UL standards shall bear the UL label.
  - 7. Contractor to submit manufacturer's evidence of compliance 2.01 D.7a and 2.01 D.7b surface burning characteristic.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.

### 2.02 OPTICAL FIBER CABLE

- A. General Requirements

1. Optical fiber cables shall be factory-fabricated, single channel, low-loss, glass, graded index type. The number of fibers and optical requirements shall be as shown on the Contract Drawings.
  2. The optical fibers shall be incorporated in the cable construction using either the loose buffer tube or tight buffer tube method. The optical fibers shall be individually clad, jacketed, and identified within the buffer tubes.
  3. Each fiber shall be distinguishable by means of a continuous color code, continuous numbering, continuous lettering, or a combination of methods. Color coding of optical fiber cables shall be in compliance with EIA/TIA-598.
  4. Optical fiber cables shall conform to EIA FOTP-25 standard for impact resistance.
  5. Optical fiber cables shall conform to EIA FOTP-33 standard for maximum pulling load.
  6. Optical fiber cables shall conform to EIA FOTP-41 standard for crush resistance.
  7. Optical fiber cables shall conform to EIA FOTP-104 standard for flexibility.
  8. Optical fiber cables with PVC jackets are acceptable in indoor, general purpose and riser areas. Optical fiber cables with PVC jackets are not acceptable in indoor plenum areas.
  9. Optical fiber cable for outdoor use shall be able to sustain the traffic-induced vibrations at all sites without damage to the physical and optical characteristics of the optical fiber.
  10. Optical fiber cable for outdoor use shall be moisture resistant as per EIA FOTP-82 standards.
  11. Patch Cords: Factory-made, dual-fiber cables conforming to types as called out on Contract Drawings and as specified herein while maintaining a minimum 48-inch length.
  12. Fiber Optic Innerduct:
    - a. Furnish and install fiber optic innerduct of the type, characteristics and size and at the locations indicated on the Contract Drawings. The innerduct shall be plenum-rated, low smoke, zero halogen type, corrosion resistant and, unless otherwise indicated on the Contract Drawings, shall be constructed of flexible polyethylene.
  13. All materials used in the optical fiber cable shall be suitable for use under the following climatic conditions:
    - a. Temperatures of -40°F to +167°F (-40°C to +70°C)
    - b. Relative humidity of 5% to 100% condensing
  14. Optical fiber cable for outdoor use shall be resistant to the following chemicals:
    - a. Petroleum products (gasoline, diesel fuel, lubricants).
    - b. Atmospheric nitric acid.
    - c. Carbon dioxide.
    - d. Carbon monoxide.
    - e. Nitrous oxides.
    - f. Atmospheric sulfuric acid.
- B. Optical Fiber Cable Technical Requirements:
1. Single mode Fiber Optic Cable

- a. Description: Single mode, 8-10 micrometer core diameter, 125 micrometer cladding diameter, fiber strand count as shown on the Contract Drawings, nonconductive, optical fiber cable.
  - (1) Comply with ICEA S-83-596 for mechanical properties.
  - (2) Comply with TIA/EIA-568-B.3 for performance specifications.
  - (3) Comply with TIA- 492CAAB.
  - (4) Listed and labeled by a nationally recognized testing laboratory (NRTL) acceptable to the Authority as complying with UL 444, UL 1651, and NFPA 70 for the following types:
- b. General Purpose, Nonconductive: Type OFN or OFNG
- c. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- d. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
- b. Jacket:
  - (1) Jacket Color: Yellow for 8-10/125-micrometer cable.
  - (2) Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
  - (3) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

## 2.03 OPTICAL FIBER CABLE HARDWARE

- A. Cable Connecting Hardware: Meet the Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
  - 1. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
  - 2. Coordinate fiber optic cable connector type with existing port type and with Authority-furnished equipment port type, if any.
  - 3. All cables under this Contract shall be factory-terminated, pre-manufactured fiber cables except where the length of the cable run exceeds those of the cable manufacturer's length restrictions. Such runs shall be field-terminated and may only be made with prior approval of the Engineer.

## 2.04 IDENTIFICATION PRODUCTS

- A. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Prepare and submit a labeling plan and format to Engineer for approval prior to optical fiber cable work.

## 2.05 FACTORY TESTING

- A. Conduct factory tests as described as follows for cables furnished and installed under this Section.
  - 1. Factory Inspection
    - a. The Engineer shall have the right to inspect the manufacturer's quality control, manufacturing, and testing facilities at any time during the Contract. Inspection by the Engineer will include visual examination of the cables, and all related documentation to ensure that the cables are being fabricated in accordance with the Specifications.



2. Factory Test Plan
  - a. The Contractor shall submit a test plan for each type of cable shown on the Contract Drawings. The test plan shall be approved prior to the start of the factory test. The test plan shall include test schedule, lists of test to be conducted, test equipment to be used, expected test results and test documents produced, and copies of any certified test data to be used in lieu of testing.
3. Factory Test
  - a. For those tests that are not conducted during factory tests, the Contractor shall submit certification by a recognized independent testing laboratory, showing the complete test results. The Contractor shall notify the Engineer 14 days in advance of the scheduling of such factory tests. The Engineer may require additional testing, or may waive factory inspection or witnessing of tests. Perform any Engineer-required additional factory testing at no additional cost to the Authority.
  - b. If additional factory tests are required by the Engineer, the cables shall not be shipped until after the factory tests have been satisfactorily completed and the cables are approved by the Engineer.
  - c. Factory tests for optical fiber cable shall include, at a minimum, the following:
    - (1) Attenuation of each fiber.
    - (2) Bandwidth of each fiber.
    - (3) OTDR (Optical Time Domain Reflectometer) image of each fiber.
    - (4) Factory test optical fiber cables on reels according to TIA/EIA-568-B.1.
    - (5) Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
  - d. Cable will be considered defective if it does not pass tests and inspections.
  - e. Prepare test and inspection reports.
4. Test Results
  - a. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
  - b. End-to-end cabling will be considered defective if it does not pass tests and inspections.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION OF PATHWAYS**

- A. Cable Trays:
  1. Comply with NEMA VE 2 and TIA-569-B.
  2. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
  3. Comply with requirements in Division 16 Section 260533 "Raceways" for installation of conduits and wireways.
  4. Install manufactured conduit sweeps and long-radius elbows whenever possible.

#### **3.02 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements in Division 16 Section 16190 "Supporting Devices" for installation of supports for pathways, conductors and cables.

### 3.03 INSTALLATION OF CABLES

#### A. General Requirements for Cabling Installation:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all cable strands; no cable shall contain unterminated elements. Make terminations only at indicated outlets and cross-connect and patch panels.
4. 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, unused cable.
5. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
6. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

#### B. Pulling Requirements

1. Install cable as indicated in accordance with NFPA 70 requirements and cable manufacturer's written instructions.
2. Install transmission media without damaging conductors, shield, or jacket.
3. Do not bend cable, in handling or installation, to smaller radii than minimum recommended by manufacturer.
4. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
5. Pull cables simultaneously where more than one is being installed in same raceway.
6. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
7. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage media or raceway.

#### C. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

#### D. Splicing of Cable

1. Splicing of optical fiber is not permitted. Splicing is only allowed at Connector panel cassettes.

#### E. Cable in Raceways and Enclosures;

1. Install cable in conduit. Conceal conduit except in unfinished spaces and as indicated on Contract Drawings. Minimum conduit size shall be 1". Control and data transmission wiring shall not share conduit with other building wiring systems.

### 3.04 TESTING

#### A. Conduct tests as described as follows for cables furnished and installed under this Section.

#### B. Field Test:

1. Tests and Inspections:
  - a. Visually inspect all cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B as applicable.

- b. Perform the following tests:
        - (1) Test all existing facility fibers that are impacted by the Work of this Contract prior to modification to establish baseline performance.
        - (2) Test all fibers installed under this Contract after installation, connection, and/or splicing.
        - (3) Test each fiber link, to include new and existing fibers, end-to-end, used by this Contract.
    - 2. Test Instruments:
      - a. Instruments shall meet or exceed applicable requirements specified in TIA/EIA-568-B. Perform tests with a tester that complies with performance and accuracy requirements specified in TIA/EIA-568-B. Use only test cords and adapters that are qualified by test equipment manufacturer.
    - 3. Test Parameters
      - a. Optical Fiber Cable Tests:
        - (1) Test Settings:
          - (a.) Single mode Link Measurements: Test at 1310 and 1550 nm in 1 direction according to TIA-526.
        - (2) Attenuation of each fiber:
          - (a.) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to the equation specified in TIA/EIA-568-B.1.
        - (3) Bandwidth of each fiber.
        - (4) OTDR (Optical Time Domain Reflectometer) image of each fiber.
        - (5) Factory test optical fiber cables on reels according to TIA/EIA-568-B.1.
        - (6) Link End-to-End Attenuation Tests.
    - 4. Test Results
      - a. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
      - b. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- 3.05 FIRESTOPPING
- A. Comply with TIA-569-B, "Fire-stopping" Annex A.
  - B. Comply with BICSI TDMM, "Fire-stopping Systems" article.

END OF SECTION

**SECTION 282305**  
**FIBER OPTIC CABLING**  
**APPENDIX "A"**  
**SUBMITTALS**

- A. Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:
1. Catalog Cuts
    - a. Catalog cuts for cable and connectors with verification of coordination with existing and Authority-furnished equipment ports.
  2. Certificates
    - a. Cable certificates, acknowledged by the communication system manufacturers, certifying that the cables are suitable for the connected equipment as described in Section 1.04 "Quality Assurance".
  3. Manufacturer Test Reports
    - a. One (1) foot sample of each type of cable for approval.
    - b. Certified shop test reports for cable.
  4. Qualifications
    - a. Qualification data for manufacturers as per Section "Quality Assurance" stating their capabilities and experience. Include list of completed projects and other information specified.
  5. Information
    - a. Field test reports indicating and interpreting test results.
    - b. Maintenance requirements for cables.
    - c. Test plan.
  6. Record Documents:
    - a. One reproducible set and four sets of prints of the Shop Drawings that reflect the actual as built condition of the entire cable system.
    - b. Cable Schedule: A listing of all installed cables runs including but not limited to the following cable run number, cable origin point and cable destination point
    - c. Final Test Report for all installed cable.

END OF APPENDIX "A"

**DIVISION 28****SECTION 282310****CONTROL/SIGNAL TRANSMISSION MEDIA****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for the following cable types:

- A. Unshielded Twisted Pair (UTP) cabling;
- B. Shielded Twisted Pair (STP) cabling;
- C. Control cabling;
- D. Coaxial cable.

**1.02 RELATED SECTIONS**

260000	Electrical General Requirements
260533	Raceways
260534	Boxes and Fittings
260529	Supporting Devices
260526	Grounding
260527	Electrical Bonding

**1.03 REFERENCES**

- A. The following is a listing of the publications referenced in this Section:
  - 1. American Society for Testing and Materials (ASTM):
    - a. B 3 – Soft or Annealed Copper Wire;
    - b. B 8 – Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft;
    - c. B 33 – Tinned Soft or Annealed Copper Wire for Electrical Purposes;
  - 2. Building Industry Consulting Service International (BICSI):
    - a. Telecommunications Design Methods Manual.
    - b. Telecommunications Disposal Methods Manual.
  - 3. Military Standards (MIL):
    - a. C-17 – Standards for Radio Frequency Coaxial Cables.
  - 4. National Fire Protection Association (NFPA):
    - a. 70 – National Electrical Code.
  - 5. Underwriters Laboratories Inc. (UL):
    - a. 1685 – Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables;

- b. 486A – Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors.
- 6. International Electrical Testing Association (NETA):
  - a. Acceptance Testing Specifications, Section 7.25.
- 7. Telecommunications Industry Association / Electronics Industries Alliance (TIA/EIA):
  - a. 569-B – Commercial Building Standard for Telecommunications Pathways and Spaces
  - b. 607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

#### 1.04 QUALITY ASSURANCE

- A. Wires and cables that have been manufactured more than two (2) years prior to installation shall not be used in the Work of this Contract.
- B. Where cables specified in this Section are used to provide signal paths for systems specified in other Sections of these Specifications, or for systems shown on Contract Drawings, the Contractor shall obtain review of the cable characteristics and certification for use with the connected system equipment by the connected equipment manufacturer.
- C. Cable manufacturers shall be regularly engaged in manufacturing control/signal transmission media products of the types, sizes, and characteristics specified in this Section and shown on the Contract Drawings. Cable manufacturers' products shall have been in satisfactory use in similar service for not less than 3 years.
- D. The Contractor shall comply with NFPA 70 "National Electric Code" for components and installation.
- E. All cable of each kind shall be the product of a single manufacturer.
- F. Testing Agency Qualifications:
  - 1. Shall be a National Recognized Testing Laboratory (NRTL).
  - 2. The Testing Agency's Inspector shall be currently certified by BICSI as a Registered Communications Distribution Designer (RCDD) to supervise on-site testing.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Equipment Calibration
  - 1. The Contractor shall assure that all measuring and testing equipment is of the proper range type. The equipment shall have some indication attesting to the current calibration status, showing by whom last calibrated, and the date (or other basis) on which inspection or re-calibration is next required. This equipment shall be made available for use by the Engineer. The Contractor shall make personnel available for operation of the equipment, where requested by the Engineer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to the construction site cable properly packaged in factory-fabricated type or wound on NEMA specified type cable reels.
- B. Store cable in clean dry space in original containers, protected from weather, damaging fumes, construction debris and traffic.

- C. Handle cable to avoid bruising, puncturing and tearing cable insulation and sheathing. Ensure that dielectric resistance and characteristic impedance integrity of transmission media are maintained.
- D. Test cables upon receipt at construction site.
  - 1. Test each pair of UTP cable for open and short circuits.

#### 1.06 SUBMITTALS

- A. See Appendix “A” for submittal requirements.

## **PART 2. PRODUCTS**

#### 2.01 GENERAL

- A. Locations, types, sizes and numbers of wires and cables shall be as shown on the Contract Drawings. Where not shown, furnish and install wires and cables to comply with this Section and NFPA 70 Standards.
- B. Unless otherwise shown on the Contract Drawings, solid conductors shall be soft, or annealed copper, conforming to ASTM B 33 (tinned), or ASTM B 3 (uncoated). Unless otherwise shown on the Contract Drawings, stranded copper conductors shall be concentric stranding conforming to ASTM B 8.
- C. Cable shall pass the flame propagation and smoke release criteria according to the test method of UL 1685.
- D. All cables, splices and terminations, for which there are established UL standards, shall bear the UL label.
- E. Cable Jacketing Labeling:
  - 1. The cable jackets shall be labeled using environmental resistance printing in the range of 2 to 4 foot intervals.
    - a. The label shall indicate:
      - (1) The length to the end of the cable in feet;
      - (2) The number of conductors in the cable;
      - (3) The date of manufacturer;
      - (4) The manufacturer’s name and part number.
- F. Site Conditions
  - 1. Environmental Limitations: Do not deliver or install UTP, and coaxial cables and connecting materials until wet work in spaces is complete and dry. For each cable type, environmental conditions must be maintained throughout storage and installation of cable.
  - 2. Environmental Conditions – Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability.
    - a) Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 30 to 90 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
    - b) Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation

in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.

- c) Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph, use NEMA 250, Type 4X enclosures.

## 2.02 ELECTRONIC CABLE

### A. Single Conductor Coaxial:

- 1. 75-ohm characteristic impedance, solid polyethylene core 97 percent coverage, copper-braid shield, low-smoke zero-halogen jacket, conforming to MIL-C-17.

### B. Multiconductor Cable

- 1. Quality and size of conductors shall be as shown on the Contract Drawings;
- 2. Color coded, low-loss polyolefin insulation, aluminum/mylar shielded, 22 AWG tinned-copper drawing wire, low-smoke zero-halogen jacket.

### C. Multiple Twisted Pair

- 1. Quality of twisted pairs and size of conductors shall be as shown on the Contract Drawings;
- 2. Tinned-copper conductors, color-coded, low-loss polyolefin insulation, unshielded, low-smoke zero-halogen jacket.

### D. Multiple Shielded Twisted Pair

- 1. Quality of twisted pairs and size of conductors shall be as shown on the Contract Drawings;
- 2. Tinned-copper conductors, color-coded, polyolefin insulation, overall aluminum/polyester shield and 22 AWG tinned-copper drain wire, low-smoke zero-halogen jacket.

### E. Category 6 Cable

- 1. 8 conductor 23AWG solid-bare copper conductors, color-coded polyolefin insulation, low-smoke zero-halogen jacket.
- 2. Category 6 cable shall be armored when not installed in conduit

## 2.03 IDENTIFICATION

### A. All cables shall comply with the following:

- 1. Cable tags shall be stainless steel metal tags, No. 28 gauge and 3/4-inch wide, embossed with letters and numbers 5/16-inch high, fastened to the cable with 1/16-inch diameter monel metal wire or stainless cables ties.
- 2. Submit a labeling plan and format to Engineer for approval prior to performing Control Signal Transmission Media work.



## **PART 3. EXECUTION**

### **3.01 PREPARATION**

- A. Examine raceways and other elements to receive cable for compliance with installation tolerance and other adverse conditions. Do not proceed with installation until unsatisfactory conditions have been correct.

### **3.02 INSTALLATION**

- A. Install cable as indicated in accordance with NFPA 70 requirements and manufacturer's written instructions. Cable shall be installed in locations as shown on the Contract Drawings by experienced workers in a careful professional manner.
  - 1. Install transmission media without damaging conductors, shield, or jacket.
  - 2. Do not bend cable, in handling or installation, to smaller radii than minimum recommended by manufacturer.
- B. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
  - 1. Pull cabled simultaneously where more than one is being installed in same raceway.
  - 2. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
  - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage media or raceway.
  - 4. Use splice and tap connectors that are compatible with cable material. All splice locations shall be approved by the Engineer
  - 5. Bond shields and drain conductors to ground at only one point in each circuit.
  - 6. Connect components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torqueing requirements are not included tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- C. Conform to the requirements of Section 260000 "ELECTRICAL GENERAL REQUIREMENTS", 260533 "RACEWAYS", 260534 "BOXES AND FITTINGS", 260529 "SUPPORTING DEVICES", and 260527 "ELECTRICAL BONDING" for cable installation within conduits, raceways or boxes.

### **3.03 TESTING**

- A. Conduct tests as follows for cables furnished and installed under this Section.
- B. After installation of cable and before energizing, the Contractor shall perform the following field tests:
  - 1. Copper Cable Procedures - Inspect for physical damage and test cable for continuity and shorts. Use time domain reflectometer with strip chart recording capability and anomaly resolution to within 12 inches in runs up to 1000 feet in length. Test cable segments for faulty connectors, spliced, terminations, and the integrity of the cable and its component parts.

- C. Any test equipment utilized for cable testing shall be currently calibrated within one year of date test is performed or as recommended by the manufacturer and shall either have a calibration tag or be accompanied with a certificate of calibration by an accredited testing facility. Certificate of calibration shall indicate the following:
  - 1. Kind of Equipment;
  - 2. Type/Model No;
  - 3. Product Number or options fitted;
  - 4. Manufacturer;
  - 5. Calibration Report;
  - 6. Calibration Date;
  - 7. Confirmation Intervals;
  - 8. Ambient Temperature/Relative Humidity.
- D. Operate control/signal systems to demonstrate proper functioning. Replace malfunctioning Cables with new materials, and then retest and recommission until satisfactory performance is achieved.
- E. All equipment, and personnel, and supervision necessary to conduct field test shall be provided by the Contractor.

#### 3.04 FIRESTOPPING

- A. Comply with TIA-569-B, "Firestopping" Annex A.
- B. Comply with BICSI Telecommunications Distribution Methods Manual, "Firestopping Systems" Article.

#### 3.05 GROUNDING

- A. For communications wiring, comply with TIA 607-A and with BICSI Telecommunications Distribution Methods Manual, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Section 260526 entitled "GROUNDING".

**END OF SECTION**

**SECTION 282310**  
**CONTROL AND SIGNAL TRANSMISSION MEDIA**  
**APPENDIX "A"**  
**SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

**1.01 SHOP DRAWINGS**

*[SMS entry instructions: Two separate submittals as listed below]*

- A. Factory Testing
  - 1. Cable factory test plan and procedures
  - 2. Cable test instruments and splicing equipment calibration certificates
- B. System Installation
  - 1. Cable termination procedures
  - 2. Cable block diagrams
  - 3. Cable installation plans
  - 4. Termination blocks
  - 5. Termination materials
  - 6. Connectors

**1.02 CATALOG CUTS**

*[SMS entry instructions: One submittal as listed below]*

- A. Materials
  - 1. Cable(s)
  - 2. Termination blocks
  - 3. Termination materials
  - 4. Connectors

**1.03 CONSTRUCTION AND INSTALLATION PROCEDURES**

*[SMS entry instructions: Four separate submittals as listed below]*

- A. Cable(s)
- B. Termination blocks
- C. Termination materials
- D. Connectors

**1.04 MANUALS, WARRANTIES/GUARANTEES**

*[SMS entry instructions: Four separate submittals as listed below]*

- A. Warranty/guarantee documentation for all materials, parts, and equipment with the Authority named as the Certificate Holder.
- B. Manuals
  - 1. Operations (upon approval, submit five copies to the Engineer, one binder per copy)
  - 2. Maintenance (upon approval, submit five copies to the Engineer, one binder per copy)
- C. Certificates
  - 1. Cable certificates, acknowledged by the communication system manufacturers, certifying that the cables are suitable for the connected equipment as described in Section 1.04 "Quality Assurance".
- D. Qualifications
  - 1. Qualification data for manufacturers as per Section 1.04 "Quality Assurance" stating their capabilities and experience. Include list of completed projects and other information specified.

#### 1.05 RECORD DOCUMENTS

*[SMS entry instructions: Four separate submittals as listed below]*

- A. Factory test results
- B. Field test results for all installed cable
- C. One reproducible set and four sets of prints of the Shop Drawings that reflect the actual as built condition of the entire cable system
- D. Cable Schedule – A listing of all installed cables runs including but not limited to the following: cable run number, cable origin point and cable destination pointy

**END OF APPENDIX "A"**

## **DIVISION 02**

### **SECTION 024114**

#### **CUTTING, PATCHING AND REMOVAL**

##### **PART 1. GENERAL**

###### **1.01 SUMMARY**

This Section specifies requirements for cutting, patching and removal of existing construction.

###### **1.02 QUALITY ASSURANCE**

- A. Cutting, patching and removal shall be performed by workers skilled in the specific trades involved.
- B. Site Conditions
  - 1. Except for portions shown to be relocated or retained by the Authority, remove and transport off Authority property all portions of the existing construction shown on the Contract Drawings to be removed in accordance with Division 01 clause entitled "Recycling of Construction Debris Material".
  - 2. All construction debris shall become the Contractor's property.
  - 3. Prior to start of Work, make an inspection accompanied by the Engineer to determine physical condition of adjacent construction that is to remain.

###### **1.03 SUBMITTALS**

See Appendix "A" for submittal requirements.

##### **PART 2. PRODUCTS**

###### **2.01 MATERIALS**

All materials required for patching shall be new. Patching materials shall match in every respect adjacent portions of the existing construction, unless otherwise shown on the Contract Drawings.

##### **PART 3. EXECUTION**

###### **3.01 PROTECTION**

- A. Protect existing adjacent surfaces to remain and finished surfaces at all times and repair or replace, if damaged, at no additional cost to the Authority and to the satisfaction of the Engineer.
- B. Protect all existing construction to remain and new construction including utilities, finishes and equipment from water, damage, weakening or other disturbance.

### 3.02 CUTTING, PATCHING AND REMOVAL

- A. Perform all cutting, patching and removal as shown on the Contract Drawings. Work shall be performed in accordance with the approved methods using approved materials.
- B. Do not cut or remove more than is necessary to accommodate the new construction or alteration.
- C. Maintain the integrity of all construction at all times.
- D. Do not allow removed materials and debris to accumulate at the construction site; remove them at the end of each work period or daily. All areas adjacent to, and leading to and from the site shall be kept free of removed materials and debris.
- E. Do not burn, bury, or dispose of in storm drains, wetlands or waterways on Authority property debris of any type.
- F. Dispose of debris resulting from removal operations in accordance with all local laws and regulations that would apply if the Authority were a private corporation.

END OF SECTION

## **SECTION 024114**

### **CUTTING, PATCHING AND REMOVAL**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

**A. Product Data**

Submit to the Chief of Materials Engineering, Materials Engineering Unit, Port Authority Technical Center, 241 Erie Street, Jersey City, New Jersey, 07310-1397, for approval, all product data sheets for the materials to be used for patching.

**B. Construction/Installation Procedures**

Submit to the Engineer plans, methods, equipment and procedures as applicable for cutting, patching and removal.

**END OF APPENDIX "A"**

**DIVISION 04**  
**SECTION 040700**  
**MASONRY GROUT**

**PART 1. GENERAL**

**1.01 SUMMARY**

- A. This Section specifies requirements for cementitious grout for use in unit masonry walls.
- B. Refer to other Division 04 Sections on unit masonry for installation of masonry grout.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

American Concrete Institute (ACI)/American Society of Civil Engineers (ASCE)/

The Masonry Society (TMS)

ACI 530.1/ASCE 6/ TMS 602      Specification for Masonry Structures.

American Society for Testing and Materials (ASTM)

ASTM C 94	Ready-Mixed Concrete.
ASTM C 143	Test Method for Slump of Hydraulic Cement Concrete.
ASTM C 150	Specification for Portland Cement.
ASTM C 207	Specification for Hydrated Lime for Masonry Purposes.
ASTM C 404	Specification for Aggregates for Masonry Grout.
ASTM C 476	Specification for Grout for Masonry.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver packaged materials in unopened packages legibly marked with manufacturer's name, brand and label information.
- B. Deliver, store and handle materials to prevent damage by water or moisture and contamination by foreign materials.
  - 1. Store cementitious materials on elevated platforms or in dispensing silo and under cover.
  - 2. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

**1.04 ENVIRONMENTAL REQUIREMENTS**

- A. Weather Requirements

Conform to requirements of ACI 530.1/ASCE 6/TMS 602 for hot and cold weather construction. Follow cold weather requirements for ambient temperatures below 40 degrees F. Follow hot weather requirements for ambient temperatures above 100 degrees F and for temperatures above 90 degrees F with wind speed above 8 mph.



- B. Perform the following procedures while masonry construction is in progress. Temperature ranges indicated refer to ambient temperature at time of installation. Do not heat water for grout above 140 degrees F.

1. 40 degrees F to 32 degrees F

Heat mixing water to produce grout temperature between 40 degrees F and 120 degrees F at the time of mixing.

2. 32 degrees F to 25 degrees F

Heat mixing water and aggregate to produce grout temperature between 70 degrees F and 120 degrees F at the time of mixing, and to provide in-place grout temperature above 70 degrees F.

3. 25 degrees F to 20 degrees F

Heat mixing water and aggregate to produce grout temperature between 70 degrees F and 120 degrees F at the time of mixing, and to provide in-place grout temperature above 70 degrees F. Heat masonry to a minimum of 40 degrees F prior to grouting.

4. 20 degrees F and below

Heat mixing water and aggregate to produce grout temperature between 70 degrees F and 120 degrees F at the time of mixing, and to provide in-place grout temperature above 70 degrees F. Heat masonry to a minimum of 40 degrees F prior to grouting, and provide heated enclosure with minimum 32 degree F air temperature.

#### 1.05 QUALITY ASSURANCE

Obtain grout ingredients of uniform quality from one manufacturer for each cementitious component and from one source and producer for each aggregate.

#### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

### **PART 2. PRODUCTS**

#### 2.01 MATERIALS

- A. Portland Cement

ASTM C 150, Type I, or Type III for winter construction, natural color.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Grout Aggregate: ASTM C 404.

- D. Water: Clean and potable.

- E. Admixtures: Addition of air-entraining materials or admixtures, plasticizers, accelerators, retarders, water repellent agents or other admixtures is not permitted.

#### 2.02 MIXES

- A. Grout shall comply with ASTM C 476, with proportions of ingredients determined by Table 1 Grout Proportions by Volume, for use in construction of reinforced and non-reinforced unit masonry.

- B. Use grout type as shown on the Contract Drawings (fine or coarse) or type in compliance with ACI 530.1/ASCE 6/TMS 602 Table 1.15.1 Grout Space Requirements.

### **PART 3. EXECUTION**

#### **3.01 PREPARATION**

- A. Batch, mix and deliver ready-mixed grout in accordance with batching, mixing and delivery requirements of ASTM C 94. Continuously agitate after mixing, until placement.
- B. Mix pre-blended dry grout materials in a clean mechanical batch mixer for 5 minutes.
- C. Measure materials by volume or equivalent weight. Do not measure by shovel.
- D. Use water to produce a slump between 8 and 11 inches, as measured per ASTM C 143.
- E. Perform hand mixing of small quantities of grout only if approved by the Engineer.

#### **3.02 ADJUSTMENTS**

Do not retemper grout. Discard grout that is not placed within 1-1/2 hours after water is first added to the batch.

#### **3.03 PROTECTION**

Curing: Conform to requirements of ACI 530.1/ASCE 6/TMS 602.

END OF SECTION

## **SECTION 040700**

### **MASONRY GROUT**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

A. Product Data

For each product indicated.

B. Certifications

Compliance with ASTM C 476 for masonry grout materials.

C. Test Reports

Test results supporting compliance with performance requirements for grout (compressive strength), if shown on the Contract Drawings.

D. Construction and Installation Procedures

For Cold or Hot Weather (if applicable): Detailed description of methods, materials and equipment to be used to comply with cold or hot weather requirements.

E. Design Mix

List products and mix proportions for grout and list source of aggregate (for information only).

END OF APPENDIX "A"

**DIVISION 05**  
**SECTION 055000**  
**MISCELLANEOUS STEEL**

**PART 1. GENERAL**

**1.01 SUMMARY**

- A. This Section specifies requirements for metal fabrications, including but not limited to structural steel and iron shapes, plates, bars, tubes and pipe.
- B. Items specified in this Section include but are not limited to the following, where shown on the Contract Drawings:
  - 1. Loose steel lintels.
  - 2. Shelf angles.
  - 3. Ladders and safety cages.
  - 4. Floor plates.
  - 5. Nosings and treads.
  - 6. Pipe bollards.
  - 7. Miscellaneous steel framing and supports.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

	<u>American National Standards Institute (ANSI)</u>
ANSI A 14.3	Safety Requirements for Fixed Ladders.
	<u>American Society of Mechanical Engineers (ASME)</u>
ASME B 18.2.1	Square and Hex Bolts and Screws, Inch Series.
ASME B 18.6.1	Wood Screws (Inch Series).
ASME B 18.6.3	Machine Screws and Machine Screw Nuts.
ASME B 18.21.1	Lock Washers (Inch Series).
ASME B 18.22.1	Plain Washers.
	<u>American Society for Testing and Materials (ASTM)</u>
ASTM A 27	Specification for Steel Castings, Carbon, for General Application.
ASTM A 36	Specification for Carbon Structural Steel.
ASTM A 47	Specification for Ferritic Malleable Iron Castings.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
ASTM A 123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
ASTM A 153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
ASTM A 500	Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
ASTM A 501	Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
ASTM A 563	Specification for Carbon and Alloy Steel Nuts.
ASTM A 780	Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
ASTM A 786	Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
ASTM A 1011	Specification for Sheet, Steel and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
ASTM B 633	Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
ASTM C 1028	Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
ASTM C 1107	Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
ASTM D 1187	Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
ASTM E 488	Test Method for Strength of Anchors in Concrete and Masonry Elements.
ASTM E 935	Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
ASTM F 568M	Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.
ASTM F 593	Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
ASTM F 594	Specification for Stainless Steel Nuts.
<u>American Welding Society, Inc. (AWS)</u>	
AWS D1.1	Structural Welding Code – Steel.
AWS D1.3	Structural Welding Code – Sheet Steel.
<u>Code of Federal Regulations (CFR)</u>	
29 CFR Part 1910, Subpart D	Fixed Ladders.
<u>The Society for Protective Coatings (SSPC)</u>	
SSPC-Paint 20	Paint Specification No. 20 – Zinc Rich Primers (Type I, Inorganic, and Type II, Organic).
SSPC-PA 1	Shop, Field and Maintenance Painting of Steel.
SSPC-SP 3	Surface Preparation Specification No. 3 – Power Tool Cleaning.
SSPC-SP 6	Surface Preparation Specification No. 6 – Commercial Blast Cleaning.

### 1.03 DESIGN AND PERFORMANCE REQUIREMENTS

#### A. Ladders

When installed, if any, shall comply with the following minimum requirements for structural performance, unless otherwise shown on the Contract Drawings:

##### 1. Treads and Platforms

Capable of withstanding a uniform load of 100 lbs. per sq. ft. and a concentrated load of 300 lbs., so located as to produce maximum stress conditions.

##### 2. Handrails and Toprails

Capable of withstanding the following loads applied as indicated below:

- a. Uniform load of 50 lbs. per linear ft. applied simultaneously in both vertical and horizontal directions.
- b. Concentrated load of 200 lbs. applied at any point in any direction when tested per ASTM E 935.
- c. Uniform and concentrated loads above need not be assumed to act concurrently.

##### 3. Guards

Intermediate rail balusters and panel fillers capable of withstanding a horizontal uniform load of 50 lbs. per sq. ft. of gross area of guard, including open areas of which they are part, of fabrication required or as shown on the Contract Drawings.

### 1.04 QUALITY ASSURANCE

- A. When required by Appendix "A", submit design calculations for ladders, signed and sealed by a Professional Engineer licensed in the state in which Work is to be performed, indicating compliance with these Design and Performance Requirements.

#### B. Fabricator Qualifications

Firm experienced in producing metal fabrications similar to those indicated for Work of this Contract with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.

#### C. Engineer Qualifications

A professional engineer who is legally qualified to practice in jurisdiction where construction site is located and who is experienced in providing engineering services required for applications shown on the Contract Drawings.

#### D. Welding Standards

Comply with applicable provisions of AWS D1.1 *Structural Welding Code – Steel* and AWS D1.3 *Structural Welding Code – Sheet Steel*.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

E. Field Measurements

Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabricating. Show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

**PART 2. PRODUCTS**

2.01 MATERIALS

A. Ferrous Metals

1. Metal Surfaces: For fabrication of Work exposed to view, use materials that are smooth and free of surface blemishes including pitting, roughness, seam marks, roller marks and rolled trade names.
2. Steel Plates, Shapes and Bars: ASTM A 36.
3. Rolled Steel Floor Plates: ASTM A 786.
4. Steel Bar Grating: ASTM A 1011 or ASTM A 36.
5. Steel Tubing: ASTM A 500, cold-formed; or ASTM A 501, hot-rolled; for exterior installations. Steel tubing shall be hot-dip galvanized coated per ASTM A 53.
6. Steel Pipe: ASTM A 53; type and grade (if applicable) as selected by fabricator and as required for design loading; Schedule 40 (standard weight), unless otherwise shown on the Contract Drawings; black finish, unless galvanized coating is shown on the Contract Drawings.
7. Brackets, Flanges and Fittings: Cast or formed metal of the same type material and finish as supported construction.
8. Gray Iron Castings: ASTM A 48, Class 30.
9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47 Grade 32510, or cast steel, ASTM A 27. Furnish bolts, washers and shims as required, hot-dip galvanized per ASTM A 153.

B. Fasteners

1. General

Zinc-Plated: ASTM B 633, Class Fe/Zn 25 (Service Condition 4—very severe) for exterior use and Class Fe/Zn 8 (Service Condition 2—moderate) where built into exterior walls. Select fasteners for type, grade and class required for application shown on the Contract Drawings.

2. Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563, and where indicated, flat washers.
3. Machine Screws: ASME B18.6.3.
4. Lag Bolts: ASME B18.2.1.
5. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
6. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

7. Plain Washers: Round, carbon steel, ASME B18.22.1.
  8. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
    - a. Interior Locations: Carbon steel components zinc-plated complying with ASTM B 633, Class Fe/Zn 8.
    - b. Exterior Locations: Alloy Group 1 stainless steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
- C. Paint
1. Shop Primer for Ferrous Metal
 

Zinc-rich primer, complying with SSPC-Paint 20, compatible with substrates and finish paint systems shown on the Contract Drawings. Comply with applicable requirements of Division 09 Section on Painting.
  2. Galvanizing Repair Paint
 

High zinc dust content paint for reglazing welds in galvanized steel with dry film containing minimum 94 percent zinc dust content, complying with SSPC-Paint 20.
  3. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Grout
- Pre-mixed, factory-packaged, nonshrink type, complying with ASTM C 1107, as manufactured by one of the following, or approved equal, for specified application:
1. Non-Metallic:
 

"Five Star Grout", Five Star Products, Inc., Fairfield, CT  
 "Masterflow 713 Plus", Master Builders, Inc. (Degussa), Cleveland, OH  
 "NS Grout", Euclid Chemical Co., Cleveland, OH
  2. Metallic:
 

"Embeco 636 Plus", Master Builders, Inc. (Degussa), Cleveland, OH  
 "Five Star Metallic Grout", Five Star Products, Inc., Fairfield, CT  
 "NS Metallic Grout", Euclid Chemical Co., Cleveland, OH
  3. Use metallic grout in concealed locations where not exposed to moisture. Use non-metallic nonstaining grout in exposed, wet and exterior locations, unless otherwise shown on the Contract Drawings.



## 2.02 FABRICATION

### A. General

Fabricate items to sizes, shapes, profiles and dimensions required for application shown on the Contract Drawings or approved Shop Drawings, using proven details of fabrication and support. Use materials of type and thickness shown on the Contract Drawings or specified in this Section for various components of Work or, if not shown, as required to produce strength and durability in finished product for intended use.

1. Shop Assembly: Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly match mark units for reassembly and coordinated installation.
2. Form exposed Work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of 1/32 inch, unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
3. Weld corners and seams continuously, complying with AWS D1.1 and D1.3 recommendations as applicable. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints flush and smooth, using concealed fasteners wherever possible. Exposed fasteners, where used, shall be of type as shown on the Contract Drawings or, if not shown, Phillips flathead (countersunk) screws or bolts.
5. Fabricate joints that will be exposed to weather in a manner to exclude water, or with weep holes where water may accumulate.
6. Cut, drill and tap units to receive anchorage, hardware and similar items.
7. Furnish anchorage of type shown on the Contract Drawings, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use and for design loads. Furnish steel washers, except that where heads and nuts bear on wood structural connections, furnish malleable-iron washers.
8. Galvanizing  
Zinc coating by the hot-dip process for items shown on the Contract Drawings or specified in this Section to be galvanized. Coating thickness shall be as specified in the referenced standards.
  - a. Rolled, pressed and forged iron and steel shapes, castings, plates, bars and strip 1/8 inch thick and heavier and assembled fabrications: ASTM A 123.
  - b. Iron and steel hardware: ASTM A 153.

### B. Steel Ladders

1. Fabricate ladders for locations shown on the Contract Drawings, with dimensions, spacings, details and anchorages as shown. Comply with requirements of ANSI A 14.3 or OSHA 29 CFR 1910, whichever is more stringent.
  - a. Side rails shall be 1/2 inch by 2-1/2 inches continuous structural steel flat bar with eased edges, spaced 18 inches apart, unless otherwise shown.

- b. Bar rungs shall be 3/4-inch diameter solid structural steel, spaced 12 inches on center.
2. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
3. Top surface of each rung shall be non-slip; either coat the rung with aluminum oxide (corundum) granules set in epoxy resin adhesive or use a type of manufactured rung that is filled with aluminum oxide grout.
4. Support each ladder at top and bottom and at equally spaced intermediate points, so that no unsupported length of ladder shall exceed 5 feet. Use welded or bolted steel brackets, designed for adequate support and anchorage and to hold ladder clear of the wall surface with a minimum 7-inch clearance from wall to centerline of rungs.
5. Extend rails 42 inches above top rung and return rails to wall or structure, unless other secure handholds are furnished. If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure for secure ladder access.
6. Galvanize ladders, brackets and fasteners.
7. Ship's Ladders, if any

Fabricate of open type construction with structural steel channel or steel plate stringers, pipe handrails and open steel grating treads, unless otherwise shown on the Contract Drawings. Furnish brackets and fittings necessary for installation.

C. Ladder Safety Cages

Fabricate from structural steel flat bars, assembled by welding. Comply with requirements of ANSI A 14.3 or OSHA 29 CFR 1910, whichever is more stringent.

1. Top and bottom primary hoops shall be 5/16 inch by 4-inch bar. For cages longer than 20 feet, space intermediate hoops not more than 4 feet on center from 5/16 inch by 2-inch bar between the primary hoops. Vertical flat bars 5/16 inch by 2 inches shall be secured to each hoop at maximum 9-1/2 inches on center, unless otherwise shown on the Contract Drawings. Secure assembled safety cage to ladder rails and adjacent construction shown.
2. Galvanize ladder safety cages and fasteners.

D. Loose Bearing and Leveling Plates

For steel items bearing on masonry or concrete construction, flat, free from warps or twists and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

E. Loose Steel Lintels

1. Fabricate from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
2. Weld adjoining members together to form a single unit where shown on the Contract Drawings.
3. Size loose steel lintels for equal bearing of 1 inch per foot of clear span, but not less than 8 inches bearing at each side of openings, unless otherwise shown on the Contract Drawings.
4. Galvanize loose steel lintels located in exterior walls.

F. Shelf and Relieving Angles

1. Fabricate from steel angles of sizes indicated and for attachment to concrete framing. Fabricate with slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches on center, unless otherwise shown on the Contract Drawings.
2. Miter and weld corners. Provide open joints at expansion and control joints. Joint width shall be 2 inches larger than expansion or control joint.
3. Galvanize shelf and relieving angles located in exterior walls.

G. Miscellaneous Framing and Supports

1. Furnish miscellaneous steel framing and supports not part of structural steel framework, as required by the Contract Drawings to complete the Work.
2. Fabricate miscellaneous units as shown on the Contract Drawings or, if not shown, of required dimensions to receive adjacent other Work to be retained by framing. Fabricate from structural steel shapes, plates and bars of welded construction using mitered joints for field connection, except as otherwise shown on the Contract Drawings.
3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Space anchors 24 inches on center and furnish minimum anchor units of 1-1/4 inch by 1/4 inch by 8 inch steel straps, except as otherwise shown on the Contract Drawings.
4. Fabricate support for suspended toilet partitions as follows:
  - a. Beams  
  
Continuous steel shapes of size required to limit deflection to  $L/360$  between hangers, but use not less than C8 by 11.5 channels or another shape with equivalent structural properties.
  - b. Hangers  
  
Steel rods, 1/2-inch minimum diameter, spaced not more than 36 inches on center. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.
  - c. Braces and Angles  
  
Steel angles of size required for rigid support of beam and for secure anchorage.
5. Galvanize miscellaneous framing and supports at exterior locations and where shown on the Contract Drawings.

H. Miscellaneous Steel Trim

1. Fabricate units from structural steel shapes, plates and bars, with continuously welded joints and smooth exposed edges, unless otherwise shown on the Contract Drawings. Miter corners and use concealed field splices wherever possible. Furnish cutouts, fittings and anchorages as required for coordination of assembly and installation with other Work.
2. Galvanize miscellaneous steel trim at exterior locations. Galvanize miscellaneous steel trim at interior locations where shown on the Contract Drawings.

I. Floor Plate

1. Fabricate raised-pattern floor plates from rolled-steel floor plate of thickness and in pattern shown on the Contract Drawings.
2. Abrasive-Surface: Manufacturer's standard abrasive granules rolled into surface of steel plate where shown on the Contract Drawings. Coefficient of friction (COF) shall be 0.6 or higher when tested according to ASTM C 1028.
3. Include steel angle stiffeners and fixed and removable sections with steel bar drop handles for lifting as indicated.

J. Extruded Nosings and Treads

1. Fabricate of material, color, sizes and configurations shown on the Contract Drawings. If not shown, fabricate cast-iron units with an integral abrasive finish. Lengths shall be as required to accurately fit each opening or conditions.
  - a. Integral abrasive filler shall consist of aluminum oxide (corundum), silicon carbide or a combination of both, in an epoxy resin binder.
  - b. Solid abrasive type units without ribs.
2. Available Manufacturers

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

American Safety Tread Co., Inc., Helena, AL  
Balco Inc., Wichita, KS  
Safe-T-Metal Co., Inc., Mineola, NY  
Wooster Products Inc., Wooster, OH

3. Drill for mechanical anchors with countersunk holes located not more than 4 inches from ends and not more than 12 inches on center, evenly spaced between ends, unless otherwise shown on the Contract Drawings. Use closer spacing if recommended by the manufacturer.

K. Cast Nosings, Treads and Thresholds

1. Fabricate units of material, color, sizes and configurations shown on the Contract Drawings. If not shown, furnish cast-iron units with an integral abrasive finish. Lengths shall be as required to accurately fit each opening or conditions.
  - a. Cast units with an integral abrasive grit consisting of aluminum oxide (corundum), silicon carbide or a combination of both.
  - b. Plain surface texture, except where fluted or cross-hatched surfaces are shown on the Contract Drawings.
2. Available Manufacturers

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

American Safety Tread Co., Inc., Helena, AL  
Balco Inc., Wichita, KS  
Safe-T-Metal Co., Inc., Mineola, NY  
Wooster Products Inc., Wooster, OH

3. Furnish anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.
4. Drill for mechanical anchors with countersunk holes located not more than 4 inches from ends and not more than 12 inches on center, evenly spaced between ends, unless otherwise shown on the Contract Drawings. Use closer spacing if recommended by the manufacturer.

L. Corner Guards

Fabricate from steel angles of sizes as shown on the Contract Drawings, but not less than 3 by 3 by 5/16 inch extending from floor to 42 inches above floor. Fabricate with 3/8 inch steel base plates for bolting to floor and with 1/4 by 2 inch steel strap braces at top. Furnish at least 2 vertical angles at each location along the length of the ladder where connections are made (except at internal corners), with strap extended between angles and from each angle to wall or column.

M. Wheel Guards

Fabricate from 3/4-inch thick, hollow-core, gray-iron castings of size and shape shown on the Contract Drawings. Fabricate with holes for countersunk anchor bolts and grouting.

N. Pipe Bollards

1. Fabricate from Schedule 40 black steel pipe, unless otherwise shown on the Contract Drawings. Prime and finish with two coats of paint as specified in Division 09 Section on Painting. Cap bollards with 1/4-inch minimum steel plate finished to match pipe, unless indicated to be concrete filled.
2. Fabricate sleeves for bollard anchorage from steel pipe, matching shape and configuration of bollard and with outside dimensions not less than 3/4 inch greater than outside dimensions of bollard. Weld 1/4-inch thick steel plate closures to bottoms of sleeves. Plate closures shall be 1 inch greater in length and width than outside dimensions of sleeves.
3. Reflective marking tape, if any, shall be in color shown and as specified in Division 02 Section on removable retro-reflective pavement marking tape.

## 2.03 SHOP PAINTING

A. Surface Preparation

Prepare ferrous metal surfaces to comply with requirements for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications as follows:

1. Exterior: SSPC-SP 6.
2. Interior: SSPC-SP 3.

- B. Apply shop primer to surfaces of metal fabrications, except those that are galvanized or shown on the Contract Drawings to be embedded in concrete or masonry, in compliance with requirements of SSPC-PA 1 for shop painting.

## **PART 3. EXECUTION**

### **3.01 PREPARATION**

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the construction site in time for installation.

### **3.02 INSTALLATION**

- A. Furnish and install anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

- B. Cutting, Fitting and Placement

Perform cutting, drilling and fitting required for installation of metal fabrications. Set Work accurately in location, alignment and elevation plus level, true and free of rack, measured from established lines and levels. Furnish and install temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

- D. Field Welding

Comply with AWS D1.1 and D1.3 for procedures of manual shielded metal-arc welding, appearance and quality of welds made and methods used in correcting welding Work.

- E. Setting Loose Plates

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates or surfaces.
2. Set loose leveling and bearing plates on wedges or other adjustable devices. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.

- F. Miscellaneous Framing and Supports

Install framing and supports in compliance with requirements of items being supported, including manufacturer's written instructions and requirements.

- G. Supports for Toilet Partitions

Anchor supports securely to and rigidly brace from overhead building structure.

H. Nosings, Treads and Thresholds

1. Install with anchorage system indicated complying with manufacturer's recommendations.
2. Apply black bituminous coating to concealed bottoms, sides and edges of cast-iron units set into concrete.
3. Seal thresholds exposed to exterior with elastomeric sealant, complying with the applicable Division 07 Section on Sealants, for a watertight installation.

I. Wheel Guards

Anchor wheel guards to concrete or masonry construction complying with manufacturer's instructions. Fill cores solidly with concrete.

J. Bollards

1. Install bollards vertical to line and grade shown on the Contract Drawings.
2. Anchor bollards with 4 bolts through bottom plate with minimum 4 inch embedment into concrete, by core-drilling and grouting into concrete or by anchoring in place with concrete footings, as shown on the Contract Drawings.
3. Vibrate and tamp concrete to consolidate. Support and brace bollard until concrete has cured.
4. Seal joint between concrete footings and surrounding pavement and sidewalk in accordance with Division 02 Section on Pavement Joint Sealing.

3.03 ADJUSTING

A. Touch-Up Painting

1. Shop Painted Surfaces: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces. Apply by brush or spray in a minimum dry film thickness of 2.0 mils.
2. Galvanized Surfaces: Immediately after erection, clean field welds, bolted connections and abraded areas. Apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

**SECTION 055000**  
**MISCELLANEOUS STEEL**  
**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

A. Product Data

Manufacturer's technical information, specifications, anchor details and installation instructions for miscellaneous steel products used, including grout and paint products.

B. Shop Drawings

For fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Furnish templates for anchor and bolt installation under other Sections if required.

C. Samples

Representative samples of materials, color, texture or design of finished products for nosings, treads and thresholds, if any.

D. Design Calculations

Submit design calculations signed and sealed by a professional engineer licensed in the state in which Work is to be performed, showing compliance with Design and Performance Requirements loading criteria.

E. Qualifications

1. Professional Engineer: Include experience qualifications.
2. Fabricator: Experience, in-service performance and capability qualifications.
3. Welder: Evidence of current AWS certification.

END OF APPENDIX "A"



**DIVISION 05**

**SECTION 057600**

**STAINLESS STEEL FINISH**

**PART 1. GENERAL**

**1.01 SUMMARY**

- A. This Section specifies the application and repair of a non-directional stainless steel finish for Work specified in other Sections of these Specifications.

**1.02 QUALITY ASSURANCE**

- A. Uniformity of Finish: All stainless steel surfaces of each required type (sheet, plate and bars) shall appear to be identical. Closely follow the submittal requirements found in Appendix "A" of this Section, as supplemented by additional submittal and mock-up requirements found in other Stainless Steel Specification sections.
- B. If the Engineer rejects stainless steel sample submissions for the reason that the non-directional finish was applied by a different entity than the one that produced the originally approved samples, have all rejected stainless steel refinished by the approved entity at no additional cost to the Authority.
- C. Finisher Qualifications: The entity performing the stainless steel non-directional finish shall have completed within the last three years a minimum of two non-directional stainless steel applications of at least 1,500 square feet in area each.
- D. Unless otherwise specified or otherwise shown on the Contract Drawings, all exposed stainless steel surfaces shall receive the same non-directional finish.
- E. Furnish stainless steel products produced from the same mill for all stainless steel Work to receive a non-directional finish.

**1.03 SUBMITTALS**

- A. See Appendix "A" for submittal requirements.

**PART 2. PRODUCTS**

**2.01 STAINLESS STEEL NON-DIRECTIONAL FINISH**

- A. The stainless steel to receive a non-directional finish shall receive an AISI No. 4 base finish applied prior to application of final non-directional finishing. Apply over the AISI No. 4 base finish a "satin" or "angel-hair" type finish made up of various sized and shaped grain lines, ranging from 1 to 10 millimeters and going in all directions and giving the appearance of very fine random scratches. This applied treatment shall be achieved through the use of a rotating disk hand-held power buffer and shall be applied using a circular motion. Do not use any ferrous metal tools (other than stainless steel) in working the finished surfaces of stainless steel.

- B. The standard for non-directionality of stainless steel finishes applied under this Section shall be that the variation between adjacent areas of stainless steel must be imperceptible to the naked eye under normal daylight conditions. Submit range samples defining the maximum variation of finish that can be anticipated in the work. Pieces abutting or within 6 inches of each other, though not abutting, shall not vary by more than 1/2 the range and the variation shall be imperceptible to the naked eye under normal daylight conditions. Carefully inspect parts in the shop, grade for assembly compatibility and mark for installation location.
- C. Finishes shall be shop-applied, unless prior permission to utilize other application methods is given in writing by the Engineer.

**PART 3. EXECUTION**

**3.01 INSTALLATION**

- A. Carefully install stainless steel Work so as to minimize the occurrence of scratching and other surface damage. Follow the requirements of the individual Specification Sections for delivery, storage and handling procedures.
- B. Repair of Damaged Surfaces  
  
Should the surfaces become scratched or otherwise damaged upon or after installation, repair in the field to the satisfaction of the Engineer.
- C. Refer to the individual Sections of these Specifications noted above in 1.01 A for additional installation requirements.

END OF SECTION

## **SECTION 057600**

### **STAINLESS STEEL FINISH**

#### **APPENDIX "A"**

##### **SUBMITTALS**

- A. These submittal requirements are complementary to the submittal requirements found in other stainless steel Specifications Sections.
- B. Samples for Initial Selection: For required non-directional finish, submit fourteen (14) 24 inch x 24 inch sample panels of 18 gage sheet and 3/16 inch plate and fourteen (14) minimum 18-inch long samples of bars/structural shapes, if any. Samples shall show the full range of expected finish of these samples. The Engineer will select between six (6) and nine (9) samples for each type of material/finish as the acceptable range for Work of this Contract.
- C. Samples for Verification: Samples shall be on lengths of bars not less than 12 inches and sheet/plate/panels not less than 24-inch square showing the full range expected in the finished construction. Should an individual Stainless Steel specification require more extensive samples, those requirements shall take precedence. These requirements are in addition to any mock-up requirements for individual Work items or the assemblies in which they occur.
- D. Submit certificates, including types, quantities and batch numbers, for all stainless steel products receiving a non-directional finish.

**END OF APPENDIX "A"**

**DIVISION 06****SECTION 061000****ROUGH CARPENTRY****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for rough carpentry. As used in this Section "rough carpentry" shall mean Work of the kind described in 1.01 A and which is generally not exposed, except as otherwise shown on the Contract Drawings.

A. Types of rough carpentry specified in this Section include the following:

1. Wood framing.
2. Wood furring.
3. Wood grounds, nailers, blocking and sleepers.
4. Sheathing (walls and roof).
5. Subflooring and underlayment.
6. Plywood backing panels.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

	<u>The Engineered Wood Association (APA)</u>
APA Form No. E 30	Engineered Wood Construction Guide.
APA Form No. E 445S	Performance Standards and Qualification Policy for Structural-Use Panels.
	<u>American Society of Mechanical Engineers (ASME)</u>
B18.6.1	Wood Screws (Inch Series).
B18.2.1	Square and Hex Bolts and Screws, Inch Series.
	<u>American Society for Testing and Materials (ASTM)</u>
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
ASTM A 307	Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
ASTM A 563	Carbon and Alloy Steel Nuts.
ASTM D 226	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

ASTM D 5516	Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
ASTM D 5664	Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.
ASTM F 1667	Driven Fasteners: Nails, Spikes, and Staples.

American Wood Preservers Association (AWPA)

AWPA Standard C 2	Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Process.
AWPA Standard C 9	Plywood – Preservative Treatment by Pressure Process.
AWPA Standard C 20	Structural Lumber – Fire-Retardant Treatment by Pressure Process.
AWPA Standard C 27	Plywood – Fire-Retardant Treatment by Pressure Process.
AWPA Standard M 4	Care of Preservative-Treated Wood Products.

Building Officials and Code Administrators International, Inc. (BOCA)

National Building Code.

Council of American Building Officials (CABO)

CABO NER-272	Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction.
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Redwood Inspection Service (RIS)

Standard Specifications for Grades of California Redwood Lumber.

Society of Automotive Engineers-American Iron and Steel Institute (SAE-AISI)

System for Designating Carbon and Alloy Steels.

Southern Pine Inspection Bureau (SPIB)

Standard Grading Rules for Southern Pine Lumber.

U.S. Dept. of Commerce (DOC)/National Institute for Standards and Technology (NIST)

DOC PS 1	U.S. Product Standard for Construction and Industrial Plywood.
DOC PS 20	American Softwood Lumber Standard.

West Coast Lumber Inspection Bureau (WCLIB)

Standard No. 17	Grading Rules for West Coast Lumber.
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Western Wood Products Association (WWPA)

Western Lumber Grading Rules.

### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack materials above ground level on uniformly spaced supports to prevent deformation. Provide for air circulation within, around stacks and under temporary coverings including polyethylene and similar covering types.
1. Lumber and plywood pressure-treated with waterborne chemicals: Place a spacer between each course to provide for air circulation.

## 1.04 SUBMITTALS

See Appendix "A" for submittal requirements.

## **PART 2. PRODUCTS**

### 2.01 MATERIALS

#### A. Lumber

##### 1. Lumber Standards

Lumber shall comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review.

##### 2. Grade Stamps

Lumber shall be factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at the time of surfacing and producing mill.

- a. Exposed lumber shall have grade stamp applied to ends or back of each piece. Grade stamp may be omitted if a certificate of grade compliance from the inspection agency is submitted.

##### 3. Sizing

Sizes of lumber specified herein and on the Contract Drawings are nominal, except patterned sizes shall be as shown by detail dimensions on the Contract Drawings. Actual dressed sizes are as specified in DOC PS 20, for moisture content specified for each use.

##### 4. Surfacing: S4S (surfaced four sides) dressed lumber, unless otherwise shown on the Contract Drawings.

##### 5. Moisture Content: Seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes less than 5 inches in nominal thickness.

##### 6. Dimension Lumber

- a. Light framing (2 inches to 4 inches thick, 2 inches to 4 inches width): Any species of Construction grade.
- b. Structural light framing (2 inches to 4 inches thick, 2 inches to 4 inches width): Any species of No. 1 grade.
- c. Structural framing (2 inches to 4 inches thick, 5 inches width and greater): Any species of Select Structural grade.

##### 7. Boards

###### a. Exposed Boards

Where boards will be exposed in the finished Work, maximum moisture content shall be 19 percent, "S-Dry".

- (1) Where transparent, natural, or no finish is shown on the Contract Drawings, boards shall be Redwood, Select Heart Grade per Redwood Inspection Service (RIS).

- (2) Where painted finish is shown on the Contract Drawings boards shall be No. 1 Boards per Southern Pine Inspection Bureau (SPIB) rules, Select Merchantable Boards per West Coast Lumber Inspection Bureau (WCLIB) rules, or No. 2 Common Boards and better per Western Wood Products Association (WWPA) rules.
  - b. Concealed Boards
 

Where boards will be concealed by other Work, maximum moisture content shall be 19 percent, "S-Dry", and one of the following species and grade:

    - (1) Redwood Construction Common per RIS rules.
    - (2) Southern Pine No. 2 Boards per SPIB rules.
    - (3) Any species graded Construction Boards per WCLIB or WWPA rules.
  - c. Board Sizes: 1 inch by 8 inch boards (for sheathing, subflooring and similar uses), or in sizes shown on the Contract Drawings.
8. Miscellaneous Lumber

Furnish wood for support or attachment of other Work including bucks, nailers, blocking, furring, grounds, stripping and similar members. Lumber shall be of sizes and worked into shapes as shown on the Contract Drawings, and as follows:

- a. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- b. Grade: Standard grade light framing size lumber of any species or board size lumber as required for application as shown on the Contract Drawings, No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 grade boards per SPIB rules.

B. Construction Panels

- 1. Plywood Panel Standards
 

Comply with DOC PS 1 for plywood panels and, for products not manufactured under DOC PS 1 provisions, comply with APA Form No. E 445S.
- 2. Trademark
 

Each construction panel shall be factory-marked with APA trademark evidencing compliance with grade requirements.
- 3. Concealed APA Performance-Rated Panels
 

APA Performance-Rated panels complying with requirements shown on the Contract Drawings for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness, for the following applications:

  - a. Combination Subfloor-Underlayment: APA rated plywood Sturd-I-Floor® (APA trademark).
    - (1) Exposure Durability Classification: Exterior.
    - (2) Thickness: As shown on the Contract Drawings.
    - (3) Span Rating: As required to suit joist spacing shown on the Contract Drawings.
    - (4) Edge Detail: Tongue and groove, unless otherwise shown on the Contract Drawings.

- b. Underlayment (over the above specified subfloor-underlayment, over an APA exterior rated subfloor, or for resilient tile flooring application over combination subfloor-underlayment): 1/4-inch thick, APA C-C PLUGGED exterior plywood with sanded face.
- c. Wall Sheathing: APA rated plywood.
  - (1) Exposure Durability Classification: Exterior.
  - (2) Thickness: As shown on the Contract Drawings.
  - (3) Span Rating: As required to suit stud spacing shown on the Contract Drawings.
- d. Roof Sheathing: APA rated plywood.
  - (1) Exposure Durability Classification: Exterior.
  - (2) Thickness: As shown on the Contract Drawings.
  - (3) Span Rating: As required to suit rafter spacing shown on the Contract Drawings.
- 4. Plywood Backing Panels

Telephone or Electrical Equipment Backing Panels: Fire-retardant treated, APA C-D PLUGGED INT with exterior glue, in thickness shown on the Contract Drawings, or if not otherwise shown, not less than 15/32 inch.

C. Fasteners and Anchorages

Size, type, material and finish as shown on the Contract Drawings. Furnish metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

- 1. Wood Screws: ASME B 18.6.1
- 2. Bolts: ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers.
- 3. Lag Bolts: ASME B18.2.1
- 4. Nails and Staples: ASTM F 1667
- 5. Where rough carpentry is in direct contact with preservative treated wood, exposed to weather, in ground contact, or in area of high relative humidity, such as interior humidified spaces, kitchens, laundries, and showers, furnish fasteners and anchorages of AISI Type 304 stainless steel, or with a hot-dip zinc coating per ASTM A 153.

D. Miscellaneous

Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15-lb. type, where shown on the Contract Drawings.

E. Preservative Treatment by Pressure Process

Lumber or plywood shown on the Contract Drawings as "Trt-Wd" or "Treated", or specified in this Section to be treated, shall comply with applicable requirements of AWPAC Standard C 2 (Lumber) and AWPAC Standard C 9 (Plywood). Each treated item shall be marked with a Quality Mark consistent with the ALSC Board of Review.

- 1. Wood shall be pressure treated with water-borne preservatives after fabrication of item. Preservative type shall comply with AWPAC P 5, and shall be as appropriate for wood type and for use shown on the Contract Drawings.



2. Minimum Preservative Retention
    - a. Ground contact use: 0.40 pcf (6.4 kg/m<sup>3</sup>)
    - b. Above ground use: 0.25 pcf (4.0 kg/m<sup>3</sup>)
  3. Lumber and plywood shall be kiln-dried after treatment to a maximum moisture content of 19 percent and 15 percent, respectively. After drying, discard damaged or defective pieces as determined by the Engineer.
  4. End-Cut Preservative: Where treated lumber or plywood is cut after treatment, field-coat cut surfaces with heavy brush coat of same chemical used for treatment and comply with AWPA Standard M 4.
  5. The following items shall be treated in addition to those shown:
    - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with flashing, vapor barriers and waterproofing.
    - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry, concrete, or plaster.
- F. Fire-Retardant Treatment by Pressure Process

Lumber or plywood shown on the Contract Drawings as fire-retardant treated wood ("FRTW"), or specified in this Section to be fire-treated, shall be pressure impregnated with fire-retardant chemicals to comply with AWPA C 20 and AWPA C 27, respectively. Each treated item shall be identified with classification marking of Underwriters Laboratories, Inc., U.S. Testing, or Timber Products Inspection, indicating surface burn characteristics.

1. Flame spread rating: 0-25, per ASTM E 84 when tested for a 30 minute period; flame front shall not progress more than 10-1/2 feet beyond the centerline of the test burner at any time during the test.
2. Use treatment that does not promote corrosion of metal fasteners and anchors.
3. Use AWPA treatment Type A High Temperature (HT) at interior applications, and AWPA Exterior type for exterior or interior applications.
4. Treatment type shall have been tested for strength retention after exposure to elevated temperatures; ASTM D 5664 for lumber, ASTM D 5516 for plywood.
5. Treatment chemicals shall be free of halogens, sulfates, ammonium sulfate, and formaldehyde.
6. Lumber and plywood shall be kiln-dried after treatment to a maximum moisture content of 19 percent and 15 percent, respectively. After drying, discard damaged or defective pieces as determined by the Engineer.
7. Treatment type shall permit end cuts and drilled holes; do not rip saw or plane surfaces of fire-retardant treated lumber.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

- A. General
1. Discard units of material with defects which might impair quality of Work, and units which are too small to use in fabricating Work with minimum joints or optimal joint arrangement.

2. Set carpentry Work to required levels and lines, with members plumb and true to line, cut and fitted.
  3. Securely attach carpentry Work to substrate by anchoring and fastening as shown on the Contract Drawings, or if not shown, as required by the following:
    - a. CABO NER-272 for power driven fasteners.
    - b. BOCA *National Building Code*, Table 2305.2, "Fastening Schedule".
  4. Countersink nail heads on exposed carpentry Work and fill holes.
  5. Use common wire nails, except as otherwise shown on the Contract Drawings. Select fastener size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.
- B. Wood Framing
1. Install framing members of sizes and on spacings shown on the Contract Drawings, and frame openings as shown. Do not splice structural members between supports.
  2. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically furnished with the framing system used, use closely fitted wood blocks of nominal 2-inch thick lumber of the same width as framing members.
  3. Construct corners and intersections with not less than 3 studs. Install miscellaneous blocking and framing as shown on the Contract Drawings and as required for support of facing materials, fixtures, specialty items and trim.
- C. Wood Furring
1. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished Work. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or non-combustible materials, accurately fitted to close furred spaces.
  2. Install the following types of wood furring, where shown on the Contract Drawings:
    - a. Furring to receive plywood paneling: 1 inch by 3 inch furring at 24 inches o.c., horizontally and vertically, unless otherwise shown. Select furring free from knots capable of producing bent-over nails and resultant damage to paneling.
    - b. Furring to receive gypsum drywall and plaster lath: 1 inch by 2 inch furring at 16 inches o.c., vertically, unless otherwise shown
    - c. Suspended Furring: Size and spacing shown, including hangers and attachment devices. Level to a tolerance of 1/8 inch in 10 feet, except 1/4 inch in 10 feet for thick-coat plasterwork.
- D. Wood Grounds, Nailers, Blocking, and Sleepers
1. Install wherever shown on the Contract Drawings, and where required for screeding or attachment of other Work. Form to shapes as shown and cut as required for true line and level of Work to be attached. Coordinate location with other Work involved.
  2. Attach to substrates as required to support applied loading. Countersink bolts flush with surfaces, unless otherwise shown on the Contract Drawings. Build into masonry during installation of masonry work. Anchor to formwork before concrete placement.

3. Where plaster application is shown on the Contract Drawings, install permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.
- E. Construction Panels
1. Install in locations and thickness as shown on the Contract Drawings. Comply with applicable recommendations contained in APA's *Engineered Wood Construction Guide*, Form No. E 30 for types of construction panels and applications as shown.
  2. Nail panels to framing, space 1/8 inch at edges and ends, and stagger end joints, unless otherwise shown. For subflooring-underlayment, subflooring and roofing, orient long dimension or strength axis of panel continuous across two or more framing supports, and position panel end joints over framing.
    - a. Combination Subflooring-Underlayment: Panel edges not tongue-and-groove type shall be supported on 2 inch lumber blocking between joists. Sand and smooth edge joints receiving resilient flooring.
    - b. Subflooring: Sand joints smooth as preparation for underlayment or finish floor.
    - c. Underlayment: Butt panel joints to a close, but not tight fit (1/32 inch). Offset joints minimum of 2 inches from subfloor panels. Fill and sand edge joints receiving resilient flooring.
    - d. Roof Sheathing: Install edge support as shown on the Contract Drawings, or as recommended by the APA (clips, blocking or T&G edges).
    - e. Wall Sheathing: Nail to framing.
    - f. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION

**SECTION 061000**  
**ROUGH CARPENTRY**  
**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Product Data
  - 1. Manufacturer's specifications and installation instructions for subfloor-underlayment where shown on the Contract Drawings.
  - 2. Chemical treatment manufacturer's instruction for handling, storing, installation and finishing of treated material.
- B. Certifications
  - 1. Certification that moisture content of water-borne treated materials was reduced to specified levels prior to shipment to construction site.
    - a. Preservative Treatment  
Certification by treating plant stating preservative solution type and pressure process used, net amount of preservative retained and conformance with applicable standards, for each type of preservative used in the Work.
    - b. Fire-Retardant Treatment  
Certification by treating plant that treated material complies with specified standards.
    - c. Design Value Compliance  
Where dimensional lumber is required to comply with specific design values or minimum allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements.  
Compliance may be in the form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade.  
Design values shall be as approved by the American Lumber Standards Committee's Board of Review.
- C. Warranty
  - Chemical treatment manufacturer's written warranty for each treatment type.

END OF APPENDIX "A"

**DIVISION 07**

**SECTION 078413**

**PENETRATION FIRESTOPPING**

**PART 1. GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Attachment C - Scope of Work and Engineering Technical Specifications section “Shop Drawings, Catalog Cuts and Samples” applies to this Section.

**1.02 SUMMARY**

- A. This Section specifies requirements for furnishing and installing penetration firestopping for the following applications, where shown on the Contract Drawings:
1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.
  2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.
  3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

**1.03 REFERENCES**

The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM International)

- |            |  |
|------------|--|
| ASTM E 84  | Test Method for Surface Burning Characteristics of Building Materials. |
| ASTM E 814 | Test Method for Fire Tests of Penetration Firestop Systems.            |

Code of Federal Regulations

- |                 |           |
|-----------------|-----------|
| 40 CFR Part 763 | Asbestos. |
|-----------------|-----------|

FM Global

- |                |   |
|----------------|---|
| FM Global 4991 | Approval of Firestop Contractors.<br>Building Materials Approval Guide. |
|----------------|---|

Intertek Group

Directory of Listed Building Products.

Underwriters Laboratories Inc. (UL)

- |         |   |
|---------|---|
| UL 1479 | Fire Tests of Through-Penetration Firestops (ANSI).<br>Fire Resistance Directory. |
|---------|---|

## Qualified Firestop Contractor Program Requirements.

### 1.04 SUBMITTALS

- A. See Appendix "A" for submittal requirements.

### 1.05 FIELD CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation or other causes.
- B. Cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.
- C. Requirements shown on the Contract Drawings referring to specific design designations of through penetration firestop systems is intended to establish requirements for performance based on anticipated conditions that are expected to exist during installation. Any changes in conditions necessitating a change in the designated systems require the Engineer's prior approval. Submit documentation showing that the performance of any changed systems equals or exceeds that of the systems they would replace and are compliant with applicable codes.

### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Installation of penetration firestopping systems shall be by a firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors", or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements".
- B. Fire-Test-Response Characteristics: Firestopping shall comply with the following requirements:
  - 1. Firestopping tests shall be performed by an independent testing and inspecting agency as acceptable to the Engineer, such as UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that are acceptable to the Authority.
  - 2. Through-penetration firestop systems shall be identical to those tested in accordance with ASTM E 814 under conditions where positive furnace pressure differential of at 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Rated systems shall comply with the following requirements:
    - a. Through-penetration firestop system products bear classification marking of independent testing and inspecting agency as acceptable to the Engineer.
    - b. Through-penetration firestop systems shall correspond to ratings and applications shown on the Contract Drawings. Firestop systems shall be listed by UL in their "Fire Resistance Directory", by Warnock Hersey, FM Global or by another independent testing and inspecting agency acceptable to the Engineer.

- C. Mock-ups: Prior to installing firestopping, erect mock-ups for each different through-penetration firestop system when required on the Contract Drawings to verify selections made and to demonstrate qualities of materials and execution. Construct mock-ups to comply with the following requirements, using materials shown on the Contract Drawings for final installations:
  - 1. Locate mock-ups on site in locations shown on the Contract Drawings or, if not shown on the Contract Drawings, as directed by the Engineer.
  - 2. Notify the Engineer 1 week in advance of the dates and times when mock-ups will be erected.
  - 3. Obtain the Engineer's acceptance of mock-ups before start of firestopping Work.
  - 4. Retain and maintain mock-ups during construction in an undisturbed condition as a standard for judging completed Work.
    - a. When directed, dismantle and remove mock-ups from the construction site.
    - b. Accepted mock-ups in an undisturbed condition at time of issuance of the Certificate of Final Completion may become part of completed Work.
- D. Sequencing and Scheduling
  - 1. Notify the Engineer at least one (1) week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.
  - 2. Do not cover up firestopping installations that will become concealed behind other construction until the Engineer has examined each installation.
- E. Coordination
  - 1. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
  - 2. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.
  - 3. Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

## **PART 2. PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Products: Subject to compliance with all requirements, products shall be of one of the following manufacturers, or approved equal. Where site conditions may require penetration fire stopping systems other than those listed below, approved system to meet product requirements.
  - 1. Endothermic, Sealant
    - a. "3M Fire Barrier Sealant FD 150+"; 3M Fire Protection Products, St. Paul, MN.
    - b. "CP 606"; Hilti, Inc., Plano, TX.
    - c. "LC Firestop Sealant"; Specified Technologies, Inc., Somerville, NJ.
    - d. "Tremstop Acrylic Latex"; Tremco Commercial Sealants & Waterproofing, Beachwood, OH.
  - 2. Firestop Collars
    - a. "3M Plastic Pipe Devices"; 3M Fire Protection Products, St. Paul, MN.
    - b. "CP 643N"; Hilti, Inc., Plano, TX.

- c. "Biostop Pipe Collars"; RectorSeal Corporation, Houston, TX.
  - d. "SSC Intumescent Firestop Collars"; Specified Technologies, Inc., Somerville, NJ.
- 3. Intumescent Sealant
  - a. "3M CP 25 WB+"; 3M Fire Protection Products, St. Paul, MN.
  - b. "FS-ONE MAX"; Hilti, Inc., Plano, TX.
  - c. "Metacaulk 1000"; RectorSeal Corporation, Houston, TX.
  - d. "SSS Firestop Sealant"; Specified Technologies, Inc., Somerville, NJ.
- 4. Intumescent Putty
  - a. "3M Moldable Putty+ (Stix/Pads)"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CP 618"; Hilti, Inc., Plano, TX.
  - c. "Biostop/ Metacaulk Fire Rated Putty Sticks/Pads"; RectorSeal Corporation, Houston, TX.
  - d. "SSP Firestop Putty"; Specified Technologies, Inc., Somerville, NJ.
- 5. Intumescent Wrap Strips
  - a. "3M FS 195+ Wrap Strips"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CP 648-E"; Hilti, Inc., Plano, TX.
  - c. "Metacaulk Wrap Strip"; RectorSeal Corporation, Houston, TX.
  - d. "SSW Wrap Strips"; Specified Technologies, Inc., Somerville, NJ.
- 6. Job-Mixed Firestop Compounds
  - a. "3M Fire Barrier Mortar"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CP 637"; Hilti, Inc., Plano, TX.
  - c. "Bio K-10+ Fire Rated Mortar"; RectorSeal Corporation, Houston, TX.
  - d. "SSM Firestop Mortar"; Specified Technologies, Inc., Somerville, NJ.
  - e. "USG Firecode Compound"; United States Gypsum Co., Chicago, IL.
- 7. Pillows/ Bags/ Blocks
  - a. "CFS-BL"; Hilti, Inc., Plano, TX.
  - b. "Firestop Pillows"; RectorSeal Corporation, Houston, TX.
  - c. "SSB Series Firestop Pillows"; Specified Technologies, Inc., Somerville, NJ.
- 8. Silicone Sealants
  - a. "3M Fire Barrier 2000+"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CFS-S SIL GG"; Hilti, Inc., Plano, TX.
  - c. "Metacaulk 835+"; RectorSeal Corporation, Houston, TX.
  - d. "SIL Series Firestop Sealant"; Specified Technologies, Inc., Somerville, NJ.
  - e. "Fyre Sil and Fyre Sil/SL"; Tremco Commercial Sealants & Waterproofing, Beachwood, OH.
- 9. Firestop Board/ Sheet
  - a. "3M Barrier Composite Sheet CS-195+"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CP 675T"; Hilti, Inc., Plano, TX.
  - c. "CS Composite Sheet"; Specified Technologies, Inc., Somerville, NJ.



10. Pass-Thru Device
  - a. "3M Fire Barrier Pass-Through Device"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CP 653"; Hilti, Inc., Plano, TX.
  - c. "Metacaulk/ Bio Fireshield Pass-Thru Device"; RectorSeal Corporation, Houston, TX.
  - d. "EZ-Path Series Fire-Rated Pathway"; Specified Technologies, Inc., Somerville, NJ.
11. Firestop Plug
  - a. "3M Fire Barrier Plug"; 3M Fire Protection Products, St. Paul, MN.
  - b. "CFS-PL"; Hilti, Inc., Plano, TX.
  - c. "FP Series"; Specified Technologies, Inc., Somerville, NJ.
- B. Single Source Responsibility: Obtain through penetration firestop systems for each kind of penetration and construction condition shown on the Contract Drawings from a single manufacturer.

## 2.02 GENERAL PERFORMANCE REQUIREMENTS

- A. Penetration firestopping shall be in accordance with listed approved penetration firestopping tests and in accordance with manufacturer's written recommendations.
- B. Penetration firestopping systems shall bear classification marking of an independent testing agency.
  1. UL "Fire Resistance Directory".
  2. Intertek Group "Directory of Listed Building Products".
  3. FM Global "Building Materials Approval Guide".

## 2.03 MATERIALS

- A. Penetration Firestopping Systems
  1. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
  2. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
    - a. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
  3. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
    - a. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
    - b. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated, except for floor penetrations within the cavity of a wall.
    - c. W-Rating: Penetration firestopping systems showing no evidence of water leakage when tested in accordance with UL 1479.

4. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined in accordance with UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
    - a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 square feet at both ambient and elevated temperatures.
  5. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, in accordance with ASTM E 84.
  6. Firestopping products shall not contain asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
- B. Fill Materials
1. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
  2. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
  3. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
  4. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
  5. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
  6. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at construction site to form a nonshrinking, homogeneous mortar.
  7. Pillows/Bags/Blocks: Reusable heat-expanding pillows/bags/blocks consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags/blocks from being easily removed.
  8. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.04 ACCESSORIES

- A. Furnish components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by an independent testing and inspecting agency acceptable to the Engineer for conditions shown on the Contract Drawings.
1. Permanent forming/damming/backing materials.
  2. Substrate primers.
  3. Collars.
  4. Steel sleeves.

## 2.05 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application shown on the Contract Drawings.

## **PART 3. EXECUTION**

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

### 3.03 INSTALLATION

- A. General: Penetration firestopping systems shall comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  - 2. Install materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

#### 3.04 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS", using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
  - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

#### 3.05 ADJUSTING AND CLEANING

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing performed by the Authority, repair or replace penetration firestopping system to comply with specified requirements at no additional cost to the Authority.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

#### 3.06 PROTECTION

- A. Install final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of issuance of the Certificate of Final Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material, and furnish and install materials to produce systems complying with specified requirements.

END OF SECTION

**SECTION 078413**  
**PENETRATION FIRESTOPPING**

**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Shop Drawings
  - 1. Detailing materials, installation methods, and relationships to adjoining construction for each through penetration firestop system, and each type of construction condition penetrated and type of penetrating item. Include firestop design designation of an independent testing and inspecting agency acceptable to the Engineer evidencing compliance with requirements for each condition shown on the Contract Drawings.
  - 2. Documentation, including illustrations, from an independent testing and inspecting agency that is applicable to each through penetration firestop configuration for construction and penetrating items.
  - 3. Where site conditions require modification of an independent testing and inspecting agency's illustration to suit a particular through penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.
- B. Product Data
  - 1. Product data for each type of product specified.
- C. Certificates
  - 1. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- D. Manufacturer Test Reports
  - 1. Reports from, and based on tests performed by, an independent testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- E. Qualifications
  - 1. Qualifications for firms and persons specified under "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of engineers and owners, and other information specified.
- F. Sustainability Submittals
  - 1. Sustainability submittals in accordance with Division 01.

END OF APPENDIX "A"

## **DIVISION 07**

### **SECTION 079200**

#### **ARCHITECTURAL SEALANTS**

##### **PART 1. GENERAL**

###### **1.01 RELATED DOCUMENTS**

- A. Attachment C - Scope of Work and Engineering Technical Specifications section “Shop Drawings, Catalog Cuts and Samples” applies to this Section.

###### **1.02 SUMMARY**

- A. This Section specifies requirements for furnishing and installing interior and exterior cold liquid-applied joint sealants, as shown on the Contract Drawings with the following designations:
  - 1. ES-1: One-part non-acid curing silicone.
  - 2. ES-2: One-part acid curing, mildew-resistant silicone.
  - 3. ES-3a: One-part non-sag polyurethane.
  - 4. ES-3b: Two-part non-sag polyurethane.
  - 5. ES-4a: One-part pourable polyurethane.
  - 6. ES-4b: Two-part pourable polyurethane.
  - 7. ES-5: Latex sealant for interior locations.
  - 8. ES-6: One-part non-sag silyl-terminated polyether.
- B. For sealants for firestopping applications, see Division 07 Sections on firestopping. For horizontal joint sealants for exterior improvements, such as for concrete, sidewalks, asphalt roads, pavement joints and concrete crack repair, see Division 32 Sections of the Specifications.

###### **1.03 REFERENCES**

The following is a listing of the publications referenced in this Section:

###### American Society for Testing and Materials (ASTM International)

ASTM C 794	Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
ASTM C 834	Specification for Latex Sealants.
ASTM C 920	Specification for Elastomeric Joint Sealants.
ASTM C 1021	Practice for Laboratories Engaged in Testing of Building Sealants.
ASTM C 1087	Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
ASTM C 1193	Guide for Use of Joint Sealants.

ASTM C 1247	Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
ASTM C 1248	Test Method for Staining of Porous Substrate by Joint Sealants.
ASTM C 1330	Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
ASTM C 1521	Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

#### 1.04 SUBMITTALS

See Appendix "A" for submittal requirements.

#### 1.05 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F.
  - 2. Do not install sealants in conditions adverse to manufacturers recommendations.
  - 3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Verify that the entity performing sealant installation has successfully completed within the last 3 years at least 3 joint sealant installation involving quantities and complexities at least equal to those required for Work of this Section.
- B. Testing and Inspecting Agency Qualifications: Use an independent testing laboratory that demonstrates to the Engineer's satisfaction, based on evaluation of laboratory submitted criteria in accordance with ASTM C 1021, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.
- C. Mock-ups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- D. Pre-Construction Tests (for materials and assemblies prior to installation)
  - 1. All tests shall be performed off-site under controlled conditions.
  - 2. Preconstruction Laboratory Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
    - a. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

- b. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials and where sealant is used for structural glazing applications shown on the Contract Drawings.
  - c. Stain Testing: Use ASTM C 1248 or ASTM C 510 to determine stain potential of sealant when in contact with masonry substrates where masonry substrates are shown on the Contract Drawings.
  - d. Provide to the entity performing the preconstruction laboratory testing the number of pieces of each type of material as recommended by the joint sealant manufacturer, including joint substrates, joint sealant backings, and miscellaneous materials.
  - e. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - f. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
  - g. Testing will not be required if the Contractor can obtain from the joint sealant manufacturer data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted to the Engineer to be used in the Work.
- E. On-Site Field-Adhesion Testing of Installed Materials of Assemblies: Where required by the Contract Drawings, before installing sealants, field test their adhesion to joint substrates as follows and in accordance with 3.04 herein:
- a. Locate test joints where shown on the Contract Drawings or, if not shown, as directed by Engineer.
  - b. Conduct field tests for each kind of sealant and joint substrate.
  - c. Notify the Engineer seven days in advance of dates and times when test joints will be erected.
  - d. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
    - (1) Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      - (a.) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  - e. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  - f. Evaluation of Preconstruction Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.



## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the construction site in original unopened containers or bundles with labels clearly identifying the manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.
- B. Store and handle materials to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.

## PART 2. PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, products shall be of one of the following manufacturers, or approved equal:
  - 1. ES-1 (One-part non-acid curing silicone)
    - a. 2-sided silicone sealant, where shown on the Contract Drawings.
      - (1) "DowSil 795"; Dow Corning Corp., Midland, MI.
      - (2) "Sikasil WS-295"; Sika Corp., Lyndhurst, NJ.
      - (3) "Spectrem 2"; Tremco Inc., Beachwood, OH.
    - b. 4-sided silicone sealant, where shown on the Contract Drawings.
      - (1) "DowSil 995"; Dow Corning Corp., Midland, MI.
      - (2) "Sikasil SG 20"; Sika Corp., Lyndhurst, NJ.
      - (3) "Proglaze SSG"; Tremco Inc., Beachwood, OH.
  - 2. ES-2 (One-part acid curing, mildew-resistant silicone)
    - a. "DowSil 786"; Dow Corning Corp.; Midland, MI.
    - b. "SCS 1700 Sanitary"; GE Sealants & Adhesives, Waterford, NY.
    - c. "Sikasil GP"; Sika Corp.; Lyndhurst, NJ.
  - 3. ES-3a (One-part non-sag polyurethane)
    - a. "Dymonic 100"; Tremco Inc., Beachwood, OH.
    - b. "Sikaflex 1A"; Sika Corp., Beachwood, OH.
    - c. "Masterseal NP1"; BASF Corp., Florham Park, NJ.
  - 4. ES-3b (Two-part non-sag polyurethane)
    - a. "Dymeric 240FC"; Tremco Inc., Beachwood, OH.
    - b. "Loxon NS2"; Sherwin-Williams, Cleveland, OH.
    - c. "Masterseal NP2"; BASF Corp., Florham Park, NJ.

5. ES-4a (One-part pourable polyurethane)
  - a. "Loxon SL1"; Sherwin-Williams, Cleveland, OH.
  - b. "Masterseal SL1"; BASF Corp., Florham Park, NJ.
  - c. "Urexpam NR-201"; Pecora Corp., Harleysville, PA.
6. ES-4b (Two-part pourable polyurethane)
  - a. "Loxon SL2"; Sherwin-Williams, Cleveland, OH.
  - b. "Masterseal SL2"; BASF Corp., Florham Park, NJ.
  - c. "Urexpam NR-200"; Pecora Corp., Harleysville, PA.
7. ES-5 (Latex sealant for interior locations)
  - a. "AC-20 FTR"; Pecora Corp., Harleysville, PA.
  - b. "Masterseal NP 520"; BASF Corp., Florham Park, NJ.
  - c. "Tremflex 834"; Tremco Inc., Beachwood, OH.
8. ES-6 (One-part non-sag silyl-terminated polyether)
  - a. "Adseal 1940"; Adfast Corp., Earth City, MO.
  - b. "Masterseal NP 150"; BASF Corp., Florham Park, NJ.
  - c. "Titebond WeatherMaster Ultimate MP"; Franklin International, Columbus, OH.

B. Source Limitations

1. Obtain sealant and primer materials from a single manufacturer for each different required product.

## 2.02 GENERAL PERFORMANCE REQUIREMENTS

- A. Compatibility: Furnish joint sealants, backings and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer, based on testing and field experience.

## 2.03 MATERIALS

A. Nonstaining Silicone Joint Sealants (ES-1)

1. No staining of substrates when tested in accordance with ASTM C 1248.
2. Silicone, nonstaining, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

B. Mildew-Resistant Joint Sealants (ES-2)

1. Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
2. Silicone, Mildew Resistant, single-component, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

C. Immersible Joint Sealants (ES-3a and ES-3b)

1. Suitable for immersion in liquids; ASTM C 1247, Class 1 or Class 2; tested in deionized water unless otherwise indicated by manufacturer.
2. Urethane, Immersible, single-component (ES-3a), non-sag, plus 35 to 50 percent and minus 35 to 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35 (minimum), Uses T, NT, and I.
3. Urethane, Immersible, multicomponent (ES-3b), non-sag, plus 25 to 50 percent and minus 25 to 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25 (minimum), Uses T, NT, and I.

D. Urethane Joint Sealants (ES-4a and ES-4b)

1. Urethane, Single-component (ES-4a), pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
2. Urethane, Multicomponent (ES-4b), pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

E. Latex Joint Sealants (ES-5)

1. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade -18.

F. Silyl-Terminated Polyether Joint Sealants (ES-6)

1. Single-component, non-sag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether (STPE) joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

G. Color of Exposed Joint Sealants

1. At stone or masonry joints: Sealant color shall match adjacent mortar color, unless otherwise shown on the Contract Drawings, subject to Engineer's approval.
2. At other locations: As shown on the Contract Drawings, or if not shown, as selected by the Engineer from manufacturer's standard colors.

H. Sealant Backing

1. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint filler materials; and recommended by sealant manufacturer, based on laboratory testing, for applications shown on the Contract Drawings.
2. Cylindrical Sealant Backings (backer rod): ASTM C 1330, Type C (closed-cell material with a surface skin), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint sealant manufacturer for joint application shown on the Contract Drawings, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

3. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

I. Miscellaneous Materials

1. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates shown on the Contract Drawings, as determined from preconstruction joint sealant substrate tests and field tests.
2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
3. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
4. Vent Tubes (Weep Holes): Heat-bendable clear acrylic or polypropylene tubes, of proper diameter and recommended by the sealant manufacturer, where shown on the Contract Drawings and as required to direct moisture to the outside of the building.

**PART 3. EXECUTION**

3.01 EXAMINATION

- A. Examine joints shown on the Contract Drawings to receive joint sealants, with installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
  1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer and where required based on results of preconstruction field-adhesion testing. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 INSTALLATION

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications shown on the Contract Drawings, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile in accordance with Figure 8A in ASTM C 1193, unless otherwise shown on the Contract Drawings or specified to be flush in accordance with Figure 8B or recessed in accordance with Figure 8C.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed, and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in accordance with ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove and reapply sealants that fail to adhere to joint substrates during testing or to comply with other requirements, and retest failed and corrected applications until test results prove sealants comply with indicated requirements, all at no additional cost to the Authority.

### 3.05 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.06 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of issuance of Certificate of Final Completion. If, despite such protection, damage or deterioration occurs, cut out, remove and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work, at no additional cost to the Authority.

END OF SECTION

## **SECTION 079200**

### **ARCHITECTURAL SEALANTS**

#### **APPENDIX "A"**

#### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Samples
  - 1. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
  - 2. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- B. Product Data: For each joint sealant product, sealant backing, primer and accessory required, and instructions for joint preparation and sealant application.
- C. Certificates
  - 1. From joint sealant manufacturer attesting that its sealant products comply with 2.03 A-F as applicable, and that their sealant products are suitable for the use shown on the Contract Drawings.
- D. Manufacturer Test Reports
  - 1. Product Test Reports: For each kind of joint sealant, for tests performed by an independent testing agency acceptable to the Engineer.
  - 2. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
    - a. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
    - b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Schedules
  - 1. Joint Sealant Schedule: Include joint sealant application, joint location and designation, manufacturer and product name, formulation and color.



2. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
  - a. Joint sealant location and designation.
  - b. Manufacturer and product name.
  - c. Type of substrate material.
  - d. Test information.
  - e. Number of samples required.
- F. Qualifications
  1. Qualification Data: For qualified testing agency.
  2. Evidence of installer's experience and capabilities. Include lists of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- G. Inspection Reports
  1. Field-Adhesion Test Reports: For each sealant application tested indicating which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based in testing specified under Sections 1.06 E and 3.04.
- H. Sustainability Submittals
  1. Sustainability submittals in accordance with Division 01.

END OF APPENDIX "A"

**DIVISION 09**  
**SECTION 099100**  
**PAINTING**

**PART 1. GENERAL**

**1.01 SUMMARY**

- A. This Section specifies requirements for shop and construction site application of paint as shown on the Contract Drawings.
- B. Work of this Section includes surface preparation and painting of the following items and surfaces:
  - 1. Exterior and interior painting in accordance with Appendix "B" to this Section.
  - 2. Exposed bare and covered pipes, ducts and conduits, including color coding (if any), and hangers and supports.
  - 3. Galvanized steel, iron work and miscellaneous metal items, and surfaces of architectural, mechanical and electrical items, if any.
  - 4. Architectural woodwork and casework, if any.
    - a. Surface preparation and shop staining or painting of architectural woodwork and casework is specified in other Sections of the Specifications.
- C. These and similar items shall not be painted:
  - 1. Items with factory-applied top coat.
  - 2. Finished metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished metals.
  - 3. Concealed pipes, ducts and conduits.
  - 4. Concealed or inaccessible surfaces.
  - 5. Code required labels such as Underwriters Laboratories and Factory Mutual.
  - 6. Identification, performance rating, name or nomenclature plates of mechanical, electrical and fire equipment.
  - 7. Operating and moving parts of operating units and mechanical and electrical equipment such as: valves, damper operators, linkages, sinkages, sensing devices, motors, shafts and sheaves.
  - 8. Surfaces shown or scheduled on the Contract Drawings to receive spray-applied fire resistive material.
- D. Definitions: "QC" refers to quality control or a quality control program. This is a methodology employed by the Contractor to ensure compliance with Contract requirements.

## 1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

### American Society for Testing and Materials (ASTM)

ASTM A 780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
ASTM D 521	Standard Test Methods for Chemical Analysis of Zinc Dust (Metallic Zinc Powder).
ASTM D 523	Test Method for Specular Gloss.
ASTM D 562	Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
ASTM D 1475	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
ASTM D 2369	Standard Test Method for Volatile Content of Coatings.
ASTM D 2371	Standard Test Method for Pigment Content of Solvent-Reducible Paints.
ASTM D 2697	Standard Test Method Volume Nonvolatile Matter in Clear or Pigmented Coatings.
ASTM D 3359	Standard Test Method for Measuring Adhesion by Tape Test.
ASTM D 4259	Standard Practice for Abrading Concrete.
ASTM D 4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
ASTM D 4285	Standard Test Method for Indicating Oil or Water in Compressed Air.
ASTM D 4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
ASTM D 4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
ASTM D 4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
ASTM D 6386	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
ASTM D 7091	Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
ASTM F 1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride.

### American Welding Society (AWS)

AWS D1.1	Structural Welding Code – Steel.
AWS D1.5	Bridge Welding Code.

Northeast Protective Coating Committee (NEPCOAT)

NEPCOAT QPL      Qualified Products List

The Society for Protective Coatings (SSPC)

SSPC-PA 1	Shop, Field and Maintenance Painting of Steel
SSPC-PA 2	Procedure for Determining Conformance to Dry Coating Thickness Requirements.
SSPC-PA 17	Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements.
SSPC-SP 1	Solvent Cleaning.
SSPC-SP 2	Hand Tool Cleaning.
SSPC-SP 3	Power Tool Cleaning.
SSPC-SP 5	White Metal Blast Cleaning.
SSPC-SP 6	Commercial Blast Cleaning.
SSPC-SP 7	Brush-Off Blast Cleaning.
SSPC-SP 10	Near-White Blast Cleaning.
SSPC-SP 11	Power Tool Cleaning to Bare Metal.
SSPC-SP 16	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
SSPC-VIS 1	Visual Standard for Abrasive Blast Cleaned Steel.
SSPC-VIS 3	Visual Standard for Power and Hand Tool Cleaning.

1.03    AMBIENT TEMPERATURE AND HUMIDITY REQUIREMENTS

- A.      Comply with the manufacturer's technical data sheets subject to approval by the Engineer as to environmental conditions under which paint and finishes may be applied, and with the following:
1.      Do not apply paints in rain, snow, fog or mist, or when relative humidity exceeds 85 percent. Painting may be performed during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by the manufacturer(s) during application and drying periods.
  2.      Apply solvent based paint only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F and 95 degrees F.
  3.      Apply water-based paint only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 90 degrees F.
  4.      Apply paint to surfaces only when the surface temperature is at least 5 degrees F above the dew point.
  5.      Apply primer to non-metal surfaces only when the moisture content of surfaces meets the following criteria:
    - a.      Gypsum Wallboard: 0.5 percent maximum, when measured with an electronic moisture meter.
    - b.      Wood: 15 percent maximum, when measured with an electronic moisture meter.
    - c.      Concrete, Masonry and Plaster Walls: No visible moisture when measured in accordance with ASTM D 4263.

6. Do not apply primer to concrete floors unless the moisture vapor emission rate is less than 3 pounds/1,000 square feet/24 hours when tested in accordance with ASTM F 1869.
- B. When painting and/or abrasive blasting operations are performed out of doors, no Work shall be performed when the U.S. Weather Bureau forecasts precipitation to commence prior to or within two hours after completion of such procedures and application of paint.

#### 1.04 QUALITY ASSURANCE

##### A. Paint System Compatibility

The paint system, including all primers and undercoats, shall be produced by the manufacturer of the topcoat. Where this is not possible (as in cases of specialized primers used in the coating of miscellaneous components) review other Sections of the Specifications to determine the primer, surface preparation and treatment for the substrates and items to be field painted or finished as Work of this Section.

1. Notify the Engineer in writing of compatibility problems associated with the Work of this Section and substrates primed under other Sections of these Specifications.
- B. Where shown on the Contract Drawings, provide not less than a 100 square foot full-coat sample(s) on actual surface(s) to be coated as Work of this Section, at a location selected by the Engineer. Such sample(s), when approved by the Engineer, may be incorporated into the Work and shall establish standards for color, texture and workmanship for the remainder of the Work of this Section.

##### C. Painting of Steel - Requirements

All painting of steel and galvanized steel shall be done by firms that are approved by the Engineer.

##### 1. Shop and Field Technical Capabilities

- a. Shops shall have areas available for specific operations, such as: receiving and lay down for steel to be coated; pre-cleaning of items to be coated; surface preparation; coating application; drying and curing of coated items; storage of coating materials.
- b. Blasters and painters must be trained. This training shall consist of instruction by a qualified instructor and shall cover various types of surface preparation equipment, paints and application equipment. Maintain instructor qualifications and training records and produce them when requested.
- c. There shall be procedures or processes in place to record specifications and revisions and to clarify ambiguous or incomplete specifications.
- d. There shall be a procedure for informing quality control and production personnel of job/shop procedures to meet requirements of this Section.

##### 2. Quality Control (QC)

The entity performing painting of steel and galvanized steel shall have a written quality control program. The program shall contain, but not be limited to, the following:

- a. The qualifications of QC staff, including training records and experience.
- b. The authority of QC staff and reporting lines in the firm organization chart.
- c. Standards and specifications used by QC staff for inspection purposes.

- d. Inspection reports and other records documenting compliance with Authority requirements.
  - e. Inspection equipment and calibration standards used by QC staff and calibration procedures.
  - f. Procedure for QC staff to advise the foreman, in writing, of non-conforming Work.
3. Contractor's Responsibility
- a. The Contractor is responsible for Quality Control, which entails the daily inspection of all painting. All inspections shall be performed by Quality Control Staff. The Quality Control Program shall ensure that coating systems are applied according to this Section and the coating manufacturer's technical data sheets subject to approval by the Engineer for surface preparation, ambient conditions, application parameters, curing and film thickness. In the event of a conflict, the requirements of this Section shall prevail.
  - b. The Engineer may perform Quality Assurance inspections to verify that the Contractor's Quality Control program is being followed. The presence of Engineer Quality Assurance inspectors does not relieve the Contractor of complying fully with the requirements of this Section, and performing all required Quality Control inspections and tests.
4. Technical Advisor
- Obtain the services of a technical advisor employed by the coating manufacturer to assist the Engineer and the Contractor during this Work. The technical advisor shall be a qualified representative, approved by the Engineer and shall be at the shop or work site prior to the opening of the coating containers. Consult with the technical advisor for instruction in the proper mixing of components and application of the materials. Arrange for the technical advisor to remain at the site until the Engineer is satisfied that the Contractor's personnel have mastered the proper handling, mixing and application of the materials.
5. Schedule and Engineer Approval
- a. Submit a schedule for surface preparation and painting at least 30 days prior to beginning Work.
  - b. At least 10 days prior to painting, notify the Engineer.
  - c. Do not paint steel until approval to proceed is given by the Engineer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in the manufacturer's original unopened packages and containers bearing manufacturer's name, label and the following information:
  - 1. Manufacturer's name.
  - 2. Name or title of material.
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Shelf life.
  - 5. Contract or order number under which the material has been ordered.
  - 6. Lot and batch numbers.

- B. Store materials not in actual use in an enclosed storage area at a minimum ambient temperature of 45 degrees F and a maximum temperature of 90 degrees F. Maintain storage areas for coatings in a clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all necessary precautionary measures to ensure that workmen and Work areas are protected from fire hazards and health hazards resulting from handling, mixing and application of materials.
- C. Provide paint ready mixed to approved colors. Construction site tinting is prohibited.
- D. Extra Material

Where requirements for extra materials are shown on the Contract Drawings, deliver to the Engineer prior to issuance of the Certificate of Final Completion not less than one gallon of each color of each coating applied as Work of this Section. Deliver extra material in the manufacturer's original, unopened containers, clearly labeled with product identification and Contract number.

#### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

### **PART 2. PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Provide paint systems and products of manufacturers in accordance with Appendix "B" to this Section, or approved equal.
- B. When materials or products proposed to be used are products of manufacturers other than manufacturers specified in Appendix "B" to this Section, submit product information for approval.

#### 2.02 MATERIALS

- A. Provide colors as shown on the Contract Drawings, or if not shown, as required by the Engineer.

#### 2.03 MIXES

- A. Verify that the paint to be mixed has not exceeded its shelf life.
- B. Mix and prepare painting materials in accordance with the manufacturer's technical data sheets subject to approval by the Engineer and 1.05 C.
- C. Stir materials before application, and as required during application to produce a mixture of uniform density. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
- D. Mix only complete kits of multi-component materials.
- E. Colors

Each undercoat shall be a contrasting color to facilitate identification of each coat where multiple coats are to be applied as shown on the Contract Drawings.

## 2.04 ABRASIVES

- A. Provide expendable or recyclable abrasives that are dry and free of oil, grease and corrosion-producing or other deleterious contaminants.
- B. For the preparation of steel that is specified to be blasted, provide abrasives that are sized to produce a sharp, angular, uniform anchor pattern with a profile height of 2.0-3.5 mils, unless the requirements of the coating manufacturer are more restrictive. In this case, comply with profile requirements specified by coating manufacturer.

## 2.05 EQUIPMENT

- A. Surface Preparation Equipment
  - 1. Provide hand tools, power tools, abrasive blast cleaning and other surface preparation equipment sized properly to conduct the Work as specified in this Section and shown on the Contract Drawings.
  - 2. Provide specialized equipment for the surface preparation of difficult-to-clean areas. Specialized equipment may include, but is not limited to:
    - a. Angled nozzles or short nozzles for abrasive blast cleaning.
    - b. Spin blast equipment.
- B. Paint Application Equipment
  - 1. Provide paint brushes, rollers and spray equipment to conduct the Work as specified in this Section.
  - 2. Provide specialized equipment as required for the painting of difficult-to-paint areas. Specialized equipment may include, but is not limited to:
    - a. Angled spray nozzles or brushes for backs of nuts and bolts and other hard to reach areas.
    - b. Mitts, daubers or other methods to supplement brush application.

# PART 3. EXECUTION

## 3.01 PREPARATION

### A. General

Perform preparation and cleaning procedures in accordance with the paint manufacturer's technical data sheets subject to approval by the Engineer and as specified in this Section, for each particular substrate condition.

- 1. Ensure paint system compatibility in accordance with 1.04 A.
- 2. Do not conduct final surface preparation which exposes the substrate to damp environmental conditions, when the surface temperature is less than 5 degrees F above the dew point, or when the relative humidity is >85%.
- 3. Remove hardware, hardware accessories, machined surfaces, lighting fixtures and similar items in place and not to be painted, or provide surface-applied protection prior to surface preparation and painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items and remove protective coverings.



4. When previously painted surfaces requiring field top coating are glossy (greater than 50 units at 60 degrees), first remove the gloss using a 120 grit or greater (finer) grade sandpaper.
  5. Thoroughly clean and remove all dust, oil, grease and other contaminants from surfaces to be painted. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- B. Surface Preparation
1. Steel

Clean surfaces to remove oil, grease, soil and other soluble contaminants in accordance with SSPC-SP1 Solvent Cleaning. Where shown on the Contract Drawings, prepare surface in accordance with one or more of the following: SSPC-SP 2, SSPC-SP 3, SSPC-SP 5, SSPC-SP 6, SSPC-SP 7, SSPC-SP 10 and SSPC-SP 11. For welds, edges and holes, prepare surfaces to the same cleanliness level and profile as the surrounding steel.

    - a. Steel - Blast Cleaned

Prior to blast cleaning, remove slag, flux deposits, weld splatter and surface irregularities such as slivers, tears, fins and hackles; follow AWS D1.1 or D1.5 as applicable. Grind any resulting burrs smooth, including burrs around holes. Break or grind sharp edges such as those created by flame cutting and shearing. Unless otherwise shown on the Contract Drawings, perform abrasive blasting in accordance with SSPC-SP 10 Near White Blast Cleaning using a production line blast machine or by air blast. Abrasives used with blast machines may be all grit or a shot and grit mix. If a shot/grit mix is used, maintain a working mix that provides a sharp, angular profile. The use of all shot abrasive is not acceptable. Maintain the abrasive work mix such that the final surface profile is within the required range. Use SSPC-VIS 1 to evaluate the degree of cleaning.
    - b. Provide expendable or recyclable abrasives that are dry and free of oil, grease, and corrosion producing, or other deleterious contaminants. Daily (or more frequently if required) check the abrasive for oil, grease or dirt contamination with the vial test. The test consists of adding a sample of abrasive from the inside of the blast machine to a sealable vial filled with deionized water. The vial is shaken for one minute and allowed to settle for five minutes. If any oil or grease is floating on top of the water, then the abrasive is contaminated. If the water becomes cloudy, then it contains dirt. Do not use contaminated or dirty abrasives to blast steel surfaces.
    - c. Compressed Air Cleanliness
      - (1) Provide compressed air that is free from moisture and oil contamination.
      - (2) Use the white blotter test in accordance with ASTM D 4285 to verify the cleanliness of the compressed air. Conduct the test at least once per day for each compressor system. Sufficient freedom from oil and moisture is confirmed if soiling or discoloration are not visible on the paper.
      - (3) If air contamination is observed, change filters, clean traps, add moisture separators or filters or make adjustments as necessary to achieve clean, dry air. Reinspect surfaces prepared or coated since the last satisfactory test and repair, at no cost to the Authority, defective Work caused by contaminated air.

d. Surface Profile

The steel surface profile shall be sharp and angular with a range of 2.0-3.5 mil. Pay special attention to areas that may have been shielded during blasting. Measure the surface profile in accordance with SSPC-PA 17 using the surface profile depth replica tape method as detailed in ASTM D 4417. File the replica tapes with the Quality Control inspection records.

2. Galvanized Steel Surfaces

a. Hot-dip galvanizing shall be by the "dry kettle" process. Do not quench galvanized items following galvanizing nor shall galvanized surfaces be treated with waxes, oils or chromates.

b. Surface Preparation

(1) Prepare the surface for painting in accordance with ASTM D 6386 Zinc Phosphate Treatment. Follow the manufacturer's instructions for use of the materials. Prior to chemical treatment, remove white rust and other contaminants.

(2) Alternatively, the surface may be prepared by brush-off blast cleaning in accordance with SSPC-SP16.

3. Aluminum Surfaces

Clean surfaces of oil, grease, dirt and other foreign substances. Use solvent cleaning in accordance with SSPC-SP 1. If required by the coating manufacturer, uniformly roughen surfaces by sanding or prepare by brush-off blast cleaning in accordance with SSPC-SP 16.

4. Cementitious Materials

Prepare cementitious surfaces (concrete, concrete block and cement plaster) by removing efflorescence, chalk, dust, dirt, grease and oils. Remove oil and grease by detergent water cleaning and steam cleaning. Do not use solvents. For concrete surfaces, after removing oil and grease, prepare the surface for painting by abrasive blasting in accordance with ASTM D 4259.

a. For concrete and other cementitious materials, perform appropriate tests as described in 1.03 A.5 to ensure that the moisture content is at or below the limit for painting and use only materials that are capable of being applied to alkaline surfaces. Do not paint over surfaces where moisture content exceeds that permitted in 1.03 A.5.

5. Wood

Wipe off dust and grit from miscellaneous wood items and millwork prior to priming, using a solution of tri-sodium phosphate and water. Rinse off surfaces with clean water. Spot coat knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand with a fine grade sand paper between coats. Back prime interior and exterior woodwork.

a. Where clear finishes are shown on the Contract Drawings, ensure that fillers match wood tint. Work fillers into grain. Wipe excess from the surface.

### 3.02 APPLICATION

#### A. General

1. Apply paint in accordance with SSPC-PA 1 and the manufacturer's technical data sheets subject to approval by the Engineer. Use applicators and techniques best suited for substrate and type of material being applied.
  - a. For blast cleaned steel, apply the prime coat on the same day (within 12 hours) that the substrate was cleaned. If the base substrate is allowed to remain uncoated for more than 12 hours, or rerusting is observed, reblast the steel prior to painting.
2. Do not apply paint in areas where dust is being generated.
3. Apply each coat at proper consistency. After each coat has dried, visually examine for pinholes, fish eyes, blisters, runs, sags and missed areas. Repair defects and repaint.
4. Apply additional coats when undercoats, stains or other conditions show through top coat of paint, until paint film is of uniform finish, color and appearance. Apply stripe coats of the prime or midcoat to all edges, corners, crevices, holes (exposed in final construction), welds and other surface irregularities.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
6. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat black paint.
7. Paint backsides of access panels, and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms and side edges the same as exterior faces.
9. Sand lightly between each succeeding enamel or varnish coat to superficially roughen the entire surface leaving no smooth, unroughened areas.
10. Omit first coat (primer) on metal surfaces which have been shop-primed.
11. Paint primed surfaces to color shown on the Contract Drawings.
12. Where shown on the Contract Drawings, prime and paint the following to match adjacent surface: exposed bare pipes, ducts, conduits, boxes, hangers, brackets and supports, except where items are covered with a prefinished coating.
13. Color code equipment, piping conduit and exposed ductwork as shown on the Contract Drawings.

#### B. Scheduling Painting

Apply paint to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Abide by the coating manufacturer's minimum and maximum recoat times subject to approval by the Engineer. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Coating Thickness

Apply materials at the manufacturer's recommended spreading rate or wet film thickness, to establish a total dry film thickness as shown on the Contract Drawings or, if not shown, as recommended by coating manufacturer and as approved by the Engineer. Monitor paint application rate by use of wet film thickness gage in accordance with ASTM D 4414. Measure the dry film thickness of each coat. Comply with SSPC-PA 2 and ASTM D 7091 for the calibration, adjustment and use of the dry film thickness gages, and the frequency of measurements.

1. Give special attention to ensure that surfaces such as edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
2. Apply additional coating to areas of insufficient thickness. Use care during application to assure that all repairs blend in with the surrounding surfaces.
3. Unless directed otherwise by the Engineer, remove excessive coating thickness and reapply the affected coat(s).

D. Coating Adhesion

1. Apply all coats in such a manner to assure that they are well-adhered to each other and to the substrate. If the application of any coat causes lifting of an underlying coat, or if there is poor adhesion between coats or to the substrate, remove the coating in the affected area to adjacent sound, adherent coating and reapply the material.
2. If adhesion is suspect, conduct adhesion tests in accordance with ASTM D 3359 or ASTM D 4541 as directed by the Engineer and repair all test areas. The acceptance criteria for the testing will be established by the Engineer. Replace all defective coating that is revealed by the testing.

E. Completed Work

Match approved samples for color, texture and coverage. Remove, refinish or repair Work not in compliance with the requirements specified in this Section.

F. Field Painting - Steel Fasteners

1. After erection or installation, clean bolts, nuts and washers in accordance with SSPC-SP 11 with a 2 mil profile. Use SSPC-VIS 3 to evaluate the degree of cleaning.
  - a. For galvanized fasteners, solvent clean in accordance with SSPC-SP 1 followed by hand or power wire brushing. If stains of a blue lubricant are visible after cleaning, they may remain if they cannot be removed by wiping with a clean, white cloth.
2. Apply brush applications of primer and intermediate to bolts, nuts and washers after tensioning. Apply topcoat by spray application. Give careful attention to bolted connections to ensure that all bolts, nuts and washers are fully coated.
  - a. For galvanized fasteners, apply a two-coat system consisting of primer and topcoat.

G. Painting of Bare Areas and Repair of Damaged and Unacceptable Coatings

1. Surface Preparation of Localized Areas
  - a. Repair localized damage and unacceptable coatings.
  - b. For non-metal substrates, prepare surfaces in accordance with the coating manufacturer's written instructions.

- c. For steel and galvanized steel localized areas that do not expose the steel substrate, prepare surfaces by cleaning in accordance with SSPC-SP 3 Power Tool Cleaning.
  - d. For previously blast-cleaned steel, if the damage exposes the substrate, prepare surfaces by power tool cleaning with a Bristle Blaster in accordance with SSPC-SP 11 with a 2 mil profile. Use SSPC-VIS 3 to evaluate the degree of cleaning.
  - e. Welds and other bare areas shall be cleaned to the same level as the surrounding steel. If the surrounding steel was abrasive blast cleaned, welds and other small, bare areas may also be cleaned with a Bristle Blaster in accordance with SSPC-SP 11 with a 2 mil profile.
  - f. For galvanized steel, repair damaged galvanizing in accordance with ASTM A 780. Use a zinc-rich coating containing a minimum of 93 percent zinc in the dry film. For damage that exposes the substrate, clean surfaces in accordance with SSPC-SP 11.
- 2. Surface Preparation of Extensive Areas (total area greater than 1/2 square foot)
    - a. Repair extensive areas of damage or unacceptable coating by methods acceptable to the Engineer, based on the nature of the defect.
    - b. For previously blast-cleaned steel, blast surfaces back to original requirements. Use care to avoid overblast damage to the surrounding coating.
  - 3. Feathering of Repair Areas and Other Bare Areas
    - a. Feather the existing coatings surrounding each repair location. Feather for a distance of 1 to 2 inches to provide a smooth, tapered transition into the coating.
    - b. Verify that the edges of coating around the periphery of the repair areas are tight and intact by probing with a putty knife in accordance with the requirements of SSPC-SP 3 Power Tool Cleaning. Roughen the existing coating in the feathered area to assure proper adhesion of the touch up coats.
- H. Coating Application in Repair Areas and Other Bare Areas
- 1. When the bare substrate is exposed in the repair area, apply all coats of the system to the specified thicknesses.
  - 2. When the damage does not extend to the bare substrate, apply only the affected coats.
  - 3. Maintain the thickness of the system in overlap areas within the specified total thickness tolerances.
  - 4. For welds and other unpainted areas, apply all coats of the system.
- I. Clean-up

During progress of Work, remove discarded paint materials, rubbish, cans and rags daily. Upon completion of painting Work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

### 3.03 PAINT TESTING

- A. The Authority reserves the right to conduct tests of the materials at any time, and any number of times during shop or field painting.
  - 1. The Engineer may sample the paint(s) being used. A representative pint or quart sample of each component of paint(s) at the construction site will be transferred to metal containers, identified, sealed and certified in the presence of the Contractor.

2. Tests on paint samples may be conducted by the Engineer to confirm manufacturer's submittals made under Appendix "A". Any or all of the following tests may be conducted:
  - a. Viscosity (Stormer @ 25 degrees C) KU, ASTM D 562.
  - b. Percent Total Solids by Weight, ASTM D 2369.
  - c. Volatile Organic Compounds (VOC), ASTM D 2369.
  - d. Weight per Gallon, ASTM D 1475.
  - e. Volume Nonvolatile Matter, ASTM D 2697.
  - f. Pigment Content, ASTM D 2371.
  - g. Percent Metallic Zinc in Primer, ASTM D 521.
  - h. Specular Gloss of Finish Coat, ASTM D 523.
  - i. Infrared Identification - of individual components and of the mixed coatings for 2 component materials. Obtain each spectrum by sandwiching a small quantity (i.e., 1-2 drops) of material between 2 potassium bromide plates and obtaining a transmission infrared spectrum. For the mixed and cured material, use a solid sampling technique.
3. If the Engineer determines upon review of laboratory tests that the material being used does not comply with the requirements specified in this Section, he may direct the Contractor to stop painting Work and remove non-complying paint, to repaint surfaces coated with rejected paint or to remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

#### 3.04 PROTECTION

Protect other adjacent Work against damage by painting and finishing Work. Correct damage by cleaning, repairing or replacing, and repainting, as approved by the Engineer.

- A. Provide "Wet Paint" signs to protect newly painted finishes. After completion of painting operations, remove temporary protective wrappings for protection of adjacent and existing conditions.
- B. At completion of all Work of the Contract, touch-up and restore damaged or defaced painted surfaces.
- C. Ensure that coated items are not shipped until cured. Protect all fully coated and cured items from handling and shipping damages using padded slings, dunnage, separators and tie-downs.

END OF SECTION

## **SECTION 099100**

### **PAINTING**

#### **APPENDIX "A"**

#### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

**A. Product Data**

1. Manufacturer's technical data sheets including the following information for each coating:
  - Volume Solids
  - VOC
  - DFT range
  - DFT maximum
  - Zinc content (zinc primers only)
  - Slip coefficient (zinc primers only)
  - Substrates
  - Surface preparation
  - Profile
  - Storage temperature
  - Primers
  - Topcoats
  - Application equipment, including touchup
  - Mixing
  - Thinners
  - Thinning maximum
  - Sweat-in-time
  - Pot life
  - Application schedule -
  - Minimum surface/air temperatures and humidity
  - Maximum surface/air temperatures and humidity
  - Drying schedule -
  - Dry to handle
  - Dry to topcoat
  - Maximum recoat
  - Cure
2. Submit to the Engineer one copy of U.S. Department of Labor, Material Safety Data Sheets (MSDS) for hazardous chemicals utilized during the Work of this Section.

**B. Samples**

1. Submit in color(s) shown on the Contract Drawings, or if not shown, in color(s) as selected by the Engineer from manufacturer's color chart.
2. On a 12 inch by 12 inch hardboard or metal panels, two samples of each paint and coating material, if required by the Engineer. If more than one application method is to be used, submit two samples of each paint and coating material for each application method.
3. Identify each sample as to manufacturer, color name and number, location and application.
  - a. On actual wood surfaces, two 4 inch by 8 inch samples of each natural and stained wood material. Identify each sample as to manufacturer and location application.

C. Construction and Installation Procedures

Submit a surface prep/coating procedure if requested by the Engineer.

D. Schedules

Submit a schedule for surface preparation and painting.

E. Qualifications

1. Submit the paint applicator's qualifications and/or experience.
2. Submit instructor qualifications and training records for blasters and painters as required by 1.04 C.1.b, if requested by the Engineer.

F. Quality Assurance-Quality Control

Submit a copy of the quality control program, as required by 1.04 C.2, if requested by the Engineer.

G. Inspection Reports

Submit copies of daily inspection reports if requested by the Engineer.

END OF APPENDIX "A"



## SECTION 099100

### PAINTING

#### APPENDIX "B"

#### PAINT SCHEDULE

##### A. Exterior

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete Gloss	C-1G	Water Based Primer Sealer	Carboline Sanitile 120	Acrylic Gloss	Carboline Carbocrylic 3359 DTM	Acrylic Gloss	Carboline Carbocrylic 3359 DTM
			PPG Perma-Crete 4-603		PPG Pitt-Tech Plus 90-1310		PPG Pitt-Tech Plus 90-1310
			SW Loxon Acrylic Primer A24W8300		SW Pro-Industrial Acrylic Coating B66-600 Series		SW Pro Industrial Acrylic Coating B66-600 Series
			International Intercryl 520		International Intercryl 530		International Intercryl 530
Concrete Semi-Gloss	C-1S	Water Based Primer Sealer	Carboline Sanitile 120	Acrylic	Carboline Sanitile 155	Acrylic Semi-Gloss	Carboline Sanitile 155
			PPG Perma-Crete 4-603		PPG Pitt-Tech Plus 90-1210		PPG Pitt-Tech Plus 90-1210
			SW Loxon Acrylic Primer A24W8300		SW Pro Industrial Acrylic Coating B66-650 Series		SW Pro Industrial Acrylic Coating B66-650 Series
			Devco Devcryn 1448		Devco Devcryn 1448		Devco Devcryn 1448

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete Masonry Gloss	CM-1G	Water Based Block Filler	Carboline Sanitile 100	Acrylic Gloss	Carboline Carbocrylic 3359 DTM	Acrylic Gloss	Carboline Carbocrylic 3359 DTM
			SW Heavy Duty Block Filler B42W46		SW Pro Industrial Acrylic Coating B66-600 Series		SW Pro Industrial Acrylic Coating B66-600 Series
			PPG Speedhide 6-15 X I		PPG Pitt-Tech Plus 90-1310		PPG Pitt-Tech Plus 90-1310
			Devco Tru-Glaze-WB 4015		Devco Devcryn 1449		Devco Devcryn 1449
Concrete Masonry Semi-Gloss	CM-1S	Water Based Block Filler	Carboline Sanitile 100	Acrylic Semi-Gloss	Carboline Sanitile 155	Acrylic Semi-Gloss	Carboline Sanitile 155
			PPG Speedhide 6-15 X I		PPG Pitt-Tech Plus 90-1210		PPG Pitt-Tech Plus 90-1210
			SW Heavy Duty Block Filler B42W46		SW Pro Industrial Acrylic Coating B66-650 Series		SW Pro Industrial Acrylic Coating B66-650 Series
			Devco Tru-Glaze-WB 4015		Devco Devcryn 1448		Devco Devcryn 1448
Cement Plaster Walls & Soffits Gloss	P-1G	Water Based Primer Sealer	Carboline Sanitile 120	Alkyd Gloss	Carboline Carbocoat 30	Alkyd Gloss	Carboline Carbocoat 30
			PPG Perma-Crete 4-603		PPG 95-5000 Series		PPG 95-5000 Series
			SW Loxon Acrylic Primer A24W8300		SW Industrial Enamel HS B54Z-400 Series		SW Industrial Enamel HS B54Z-400 Series
			International Intercryn 520		International Intercryn 530		International Intercryn 530

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel Gloss	S-1G*	Organic Zinc Rich	Carboline Carbozinc 859	Epoxy	Carboline Carboguard 893	Aliphatic Polyurethane Gloss	Carboline Carbothane 134 HG
			PPG PMC Amercoat 68 HS		PPG PMC Amercoat 399		PPG PMC Amercoat 450 H
			SW Zinc Clad III HS		SW Macropoxy 646		SW Acrolon 218 B65-600
			International Interzinc 315B		International Intergard 475HS		International Interthane 990 UHS
Steel Semi-Gloss	S-1S*	Organic Zinc Rich	Carboline Carbozinc 859	Epoxy	Carboline Carboguard 893	Aliphatic Polyurethane Semi-Gloss	Carboline Carbothane 133 VOC
			PPG PMC Amercoat 68 HS		PPG PMC Amercoat 399		PPG PMC Amercoat 450 HSG
			SW Zinc Clad III HS		SW Macropoxy 646		SW Acrolon 218 HSB65-650
			International Interzinc 315B		International Intergard 475HS		International Interthane 870 UHS
Steel Gloss	S-2G*	Inorganic Zinc Rich	Carboline Carbozinc 11 HS	Epoxy	Carboline Carboguard 893	Aliphatic Polyurethane Gloss	Carboline Carbothane 134 HG
			Sherwin-Williams Zinc Clad DOT		Sherwin-Williams Steel Spec Epoxy		Sherwin-Williams Hi-Solids Polyurethane B65-300

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel Semi-Gloss	S-2S*	Inorganic Zinc Rich	Carboline Carbozinc 11 HS	Epoxy	Carboline Carboguard 893	Aliphatic Polyurethane Semi-Gloss	Carboline Carbothane 133 LV
			Sherwin-Williams Zinc Clad DOT		Sherwin-Williams Steel Spec Epoxy		Sherwin-Williams Hi-Solids Polyurethane B65-350

\*Systems S-1G/S-1S and S-2G/S-2S must be on the current New England Protective Coatings (NEPCOAT) Qualified Product List.

Steel Semi-Gloss	S-3S	Aluminum Epoxy Mastic	Carboline Carbomastic 15	Epoxy	Carboline Carboguard 890	Aliphatic Polyurethane Semi-Gloss	Carboline Carbothane 133 LV
			PPG PMC Amerlock 2 AL		PPG PMC Amercoat 385		PPG PMC Amercoat 450 HSG
			SW Epoxy Mastic Aluminum II		SW Macropoxy 646		SW Acrolon 218 HS B65-650
			International Interseal 670HS AL		International Interseal 670HS		International Interthane 870 UHS
Galvanized & Aluminum Gloss	N-1G	Primer	PPG Pitt-Tech Plus 90-912	N/A		Acrylic Gloss	PPG Pitt-Tech Plus 90-1310
			SW Pro Industrial Pro-Cryl B66 - 310 Series				SW Pro Industrial Acrylic Coating B66-600 Series
			Carboline Galoseal WB				Carboline 3359 DTM
			International Intercryl 520				International Intercryl 530

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Galvanized & Aluminum Semi-Gloss	N-1S	Primer	PPG Pitt-Tech Plus 90-912		N/A	Acrylic Semi-Gloss	PPG Pitt-Tech Plus 90-1210
			SW Pro-Cryl B66 - 310 Series				SW Pro Industrial Acrylic Coating B66-650 Series
			Carboline Galoseal WB Devoe Devcryl 1440				Carboline 3359 Devoe Devcryl 1448
Galvanized & Aluminum (Marine & Bridge)	N-2S	Epoxy Primer	Carboline Carboguard 893		N/A	Aliphatic Polyurethane	Carboline Carbothane 133 LV
			SW Macropoxy 646				SW Acrolon 218 HS B65-650
			PPG PMC Amercoat 385				PPG PMC Amercoat 450 HSG
Galvanized & Aluminum (Marine & Bridge) Gloss	N-2G	Epoxy Primer	Carboline Carboguard 893		N/A	Aliphatic Polyurethane Gloss	Carboline Carbothane 134 HG
			PPG PMC Amercoat 385				PPG PMC Amercoat 450 H
			SW Macropoxy 646				SW Acrolon 218 HS B65-600
			International Intergard 475 HS				International Interthane 8706 HS
Plywood Semi-Gloss	PW-1S	Acrylic Wood Primer	Carboline Sanitile 120	Acrylic Semi-Gloss	Carboline Carbocrylic 3359	Acrylic Semi-Gloss	Carboline Carbocrylic 3359
			SW Exterior Latex Wood Primer B42W08041		SW Metalatex B42 Series		SW Metalatex B42 Series
			PPG Speedhide 6-609		PPG Speedhide 6-900 X I		PPG Speedhide 6-900 X I
			Devoe Devcryl 1440		Devoe Devcryl 1448		Devoe Devcryl 1448

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete, Brick & Granite Clear Gloss Anti-Graffiti	AG-1	Primer Sealer	Carboline Carboguard 1340 Visual Pollution Tech. Crystal Clear SW Loxon 40% Silane (porous surfaces)		N/A	Aliphatic Urethane	Carboline Carbothane 134 Clear Visual Pollution Tech. Crystal Clear SW 2K Water Based Urethane AG Coating
Concrete, Brick & Granite Clear Flat Anti-Graffiti	AG-2	Primer Sealer	Degussa Tagguard Sivento Protectosil Tristar Proteus Masonry Sealer		N/A	Various	Degussa Tagguard Sivento Protectosil Tristar Proteus 940
Steel & Concrete Saltwater Immersion	CT-1	Coal Tar Epoxy (C-200A)	Carboline Bitumastic 300M International Intertuf 702 Sherwin-Williams Targuard		N/A	Coal Tar Epoxy (C-200A)	Carboline Bitumastic 300M International Intertuf 702 Sherwin-Williams Targuard
Steel, Jet Fuel Splash & Spill	S-4	Organic Zinc Rich	Carboline Carbozinc 859 Tnemec 90-97 Tneme-Zinc SW Zinc Clad III HS	Epoxy	Carboline Carboguard 890 Tnemec Epoxoline II Series N69 SW Macropoxy 646	Polyester Polyurethane	Carboline Carbothane 133 LV Tnemec CRU Series 290 SW Poly-Lon HP

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel Slip Critical "B"	S-5	Organic Zinc Rich	Carboline Carbozinc 859  PPG PMC Amercoat 68 HS  International Interzinc 315B		N/A		N/A
Steel Slip Critical "B"	S-6	Inorganic Zinc Rich (Shop Only)	PPG Dimetcote 9  Carboline Carbozinc 11 HS  Sherwin-Williams Zinc Clad DOT  International Interzinc 22HS		N/A		N/A
Steel (under concrete or grout)	S-7	Epoxy Mastic	Carboline Carboguard 890  PPG PMC Amerlock 2  Sherwin-Williams Macropoxy 646  International Interseal 670HS		N/A	Epoxy (immersion grade)	Carboline Carboguard 890  PPG PMC Amerlock 2  Sherwin-Williams Macropoxy 646  International Interseal 670HS

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel, Saltwater, Tidal	S-8	Epoxy	Carboline Carbomastic 615	N/A		Epoxy	Carboline Carbomastic 615
			International Interzone 954				International Interzone 954
			Sherwin-Williams Sher-Glass				Sherwin-Williams Sher-Glass
			International Interzone 954				International Interzone 954
			PPG Sigmashield 880				PPG Sigmashield 880
Steel, Ultra-Weatherable	S-9	Zinc Rich	Carboline Carbozinc 859	Urethane	Carboline Carbothane 134 HG	Fluorocarbon	Carboline Carboxane 950
			SW Zinc Clad III HS		SW Acrolon 218 HS		SW FluoroKem
			PPG PMC Amercoat 68 HS		PPG Durathane DTM 95-3300		PPG Coraflon ADS
Steel, Rapid Deployment	S-10	Zinc Rich	PPG 302H		N/A		PPG Kwikspar 600
			Sherwin-Williams Zinc Clad III				Sherwin-Williams Envirolastic 980PA
			International Interzinc 315B				International Intercure 99
Aluminum Ultra-Weatherable	N-3	Epoxy	Carboline Carboguard 888	Urethane	Carboline Carbothane 133 LH	Fluorocarbon	Carboline Carboxane 950
			Sherwin-Williams Macropoxy 646		Sherwin-Williams Acrolon 218 HS		Sherwin-Williams FluoroKem
			PPG PMC Amercoat 385		PPG Durathane DTM 95-3300		PPG Coraflon ADS



<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
<b>B. Interior</b>							
Steel, water tank	S-11	Epoxy	PPG PMC Amerlock 2 Carboline Carboguard 891 VOC SW Duraplate 235 PW International Interline 850	Epoxy	PPG PMC Amerlock 2 Carboline Carboguard 891 VOC SW Duraplate 235 PW International Interline 850	Epoxy	PPG PMC Amerlock 2 Carboline Carboguard 891 VOC SW Duraplate 235 PW International Interline 850
Steel, jet fuel tank	S-12	Epoxy Amine	PPG Amercoat 240 Carboline Plasite 9060 SW Shelcote II International Interline 850		N/A	Epoxy Amine	PPG Amercoat 240 Carboline Plasite 9060 SW Shelcote II International Interline 850
Concrete Flat	C-2F	Water Based Sealer	PPG Speedhide 6-2 SW ProMar B28W8200 Carboline Sanitile 120 International Intercryl 520	Acrylic	PPG Speedhide 6-70 SW ProMar B30W200 Carboline 3359 Flat International Intercryl 530	Acrylic Flat	PPG Speedhide 6-70 SW ProMar B30W200 Carboline 3359 Flat International Intercryl 530
Concrete Semi-Gloss	C-2S	Water Based Sealer	Carboline Sanitile 120 SW ProMar B28W8200 PPG Speedhide 6-2 Devoe Devcryl 1440	Acrylic	Carboline Carbocrylic 3359 SW ProMar B31W200 PPG Speedhide 6-500 Devoe Devcryl 1448	Acrylic Semi-Gloss	Carboline Carbocrylic 3359 SW ProMar B31W200 PPG Speedhide 6-500 Devoe Devcryl 1448

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete Heavy-Duty Gloss	C-3G	Epoxy	Carboline Carboguard 1340	Epoxy	Carboline Carboguard 890	Epoxy Gloss	Carboline Carboguard 890
			SW Macropoxy HS Epoxy		SW Pro Industrial HP Epoxy B67-200		SW Pro Industrial HP Epoxy B67-200
			PPG Amerlock 2/400		PPG Amerlock 2/400		PPG High Gloss Epoxy 95-501
Concrete Masonry Flat	CM-2F	Block Filler	PPG Speedhide 6-7	Acrylic	PPG Speedhide 6-70	Acrylic Flat	PPG Speedhide 6-70
			SW PrepRite B25W25		SW ProMar B30W200		SW ProMar B30W200
			Carboline Sanitile 100		Carboline 3359 Flat		Carboline 3359 Flat
			Devco Tru-Glaze-WB 4015		Devco Devcryn 1440		Devco Devcryn 1440
Concrete Masonry Semi-Gloss	CM-2S	Block Filler	Carboline Sanitile 100	Acrylic	Carboline Carbocrylic 3359	Acrylic Semi-Gloss	Carboline Carbocrylic 3359
			SW PrepRite B25W25		SW ProMar B31W200		SW ProMar B31W200
			PPG Speedhide 6-7		PPG Speedhide 6-500		PPG Speedhide 6-500
			Devco Tru-Glaze-WB 4015		Devco Devcryn 1448		Devco Devcryn 1448
Concrete Masonry Heavy-Duty Gloss	CM-3	Epoxy Block Filler	Carboline Carboguard 954HB	Epoxy	Carboline Carboguard 890	Epoxy Gloss	Carboline Carboguard 890
			SW Kem Cati-Coat HS B42W400		SW Pro Industrial HP Epoxy B67-200		SW Pro Industrial HP Epoxy B67-200
			PPG Amerlock 400BF		PPG Amerlock 2/400		PPG High Gloss Epoxy 95-501

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Cement & Gypsum Plaster Walls & Soffits Flat	P-1F	Acrylic Sealer	SW PrepRite B28W300	Acrylic	SW ProMar B30W200	Acrylic Flat	SW ProMar B30W200
			PPG Speedhide 6-2		PPG Speedhide 6-70		PPG Speedhide 6-70
			Carboline Sanitile 120		Carboline 3359 Flat		Carboline 3359 Flat
			Devco Devcryn 1440		Devco Devcryn 1440		Devco Devcryn 1440
Cement & Gypsum Plaster Walls & Soffits Semi-Gloss	P-1S	Acrylic Sealer	Carboline Sanitile 120	Acrylic	Carboline Carbocrylic 3359	Acrylic Semi-Gloss	Carboline Carbocrylic 3359
			SW PrepRite B28W300		SW ProMar B31W200		SW ProMar B31W200
			PPG Speedhide 6-2		PPG Speedhide 6-500		PPG Speedhide 6-500
			Devco Devcryn 1440		Devco Devcryn 1448		Devco Devcryn 1448
Gypsum Board Flat	GB-1F	Acrylic Sealer	SW PrepRite B28W8200	Acrylic	SW ProMar B30W200	Acrylic Flat	SW ProMar B30W200
			PPG Speedhide 6-2		PPG Speedhide 6-70		PPG Speedhide 6-70
			Carboline Sanitile 120		Carboline 3359 Flat		Carboline 3359 Flat
			Devco Devcryn 1440		Devco Devcryn 1440		Devco Devcryn 1440
Gypsum Board Semi-Gloss	GB-1S	Acrylic Sealer	Carboline Carbocrylic 120	Acrylic	Carboline Carbocrylic 3359	Acrylic Semi-Gloss	Carboline Carbocrylic 3359
			SW PrepRite B28W8200		SW ProMar B31W200		SW ProMar B31W200
			PPG Speedhide 6-2		PPG Speedhide 6-500		PPG Speedhide 6-500
			Devco Devcryn 1440		Devco Devcryn 1440		Devco Devcryn 1440

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel Semi-Gloss	S-13S	Acrylic Steel Primer	PPG Pitt-Tech Plus 90-912	Acrylic	PPG Pitt-Tech Plus 90-1210	Acrylic Semi-Gloss	PPG Pitt-Tech Plus 90-1210
			SW Pro Industrial Pro-Cryl Universal Primer B66-300		SW Sher-Cryl HPA B66-350		SW Sher-Cryl HPA B66-350
			Carboline 3358		Carboline 3359		Carboline 3359
			Devco Devcryl 1440		Devco Devcryl 1448		Devco Devcryl 1448
Steel Gloss	S-13G	Acrylic Steel Primer	Carboline Carbocrylic 3358	Acrylic	Carboline Carbocrylic 3359 DTM	Acrylic Semi-Gloss	Carboline Carbocrylic 3359 DTM
			SW Pro Industrial Pro-Cryl Universal Primer B66-300		SW Sher-Cryl HPA B66-300		SW Sher-Cryl HPA B66-300
			PPG Pitt-Tech Plus 90-912		PPG Pitt-Tech Plus 90-1310		PPG Pitt-Tech Plus 90-1310
			Devco Devcryl 1440		Devco Devcryl 1449		Devco Devcryl 1449
Steel Heavy-Duty Semi-Gloss (UV Exposure)	S-14S	Organic Zinc Rich	Carboline Carbozinc 859	Epoxy	Carboline Carboguard 888	Aliphatic Polyurethane Semi-Gloss	Carboline Carbothane 133 LH
			PPG PMC Amercoat 68 HS		PPG PMC Amercoat 399		PPG PMC Amercoat 450 HSG
			SW Zinc Clad III HS		SW Macropoxy 646		SW Acrolon 218 HS B65-650
			International Interzinc 315B		International Intergard 475HS		International Interthane 870 UHS

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Steel Heavy-Duty	S-15	Organic Zinc Rich	Carboline Carbozinc 859	Epoxy	Carboline Carboguard 890	Epoxy	Carboline Carboguard 890
			SW Zinc Clad III HS		SW Macropoxy 646		SW Macropoxy 646
			PPG PMC Amercoat 68 HS		PPG PMC Amerlock 2		PPG PMC Amerlock 2
			International Interzinc 315B		International Interseal 670HS		International Interseal 670HS
Galvanized & Aluminum Gloss	N-4G	Primer	Carboline Sanitile 120	N/A		Acrylic Gloss	Carboline Carbocrylic 3359 DTM
			PPG Pitt-Tech Plus 90-912				PPG Pitt-Tech Plus 90-1310
			SW Pro Industrial Pro-Cryl Universal Primer B66-310 Series				SW Sher-Cryl HPA B66-300
			International Intercryl 520				International Intercryl 530
Galvanized & Aluminum Semi-Gloss	N-4S	Primer	PPG Pitt-Tech Plus 90-912	N/A		Acrylic Semi-Gloss	PPG Pitt-Tech Plus 90-1210
			SW Pro Industrial Pro-Cryl Universal Primer B66-310 Series				SW Sher-Cryl HPA B66-350
			Carboline Sanitile 120				Carboline 3359
			Devco Devcryl 1440				Devco Devcryl 1448

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Galvanized & Aluminum Heavy Duty Semi-Gloss	N-5S	Epoxy	Carboline Carboguard 893		N/A	Aliphatic Polyurethane Semi-Gloss	Carboline Carbothane 133 LV
			SW Macropoxy 646				SW Acrolon 218 HS B65-650
			PPG PMC Amercoat 385				PPG Amercoat 450 HSG
			International Interseal 670 HS				International Interthane 880 HS
Plywood Flat	PW-2F	Acrylic	Carboline Sanitile 120	Acrylic	Carboline 3359 Flat	Acrylic	Carboline 3359 Flat
			SW PrepRite ProBlock B51W20		SW ProMar B30W200		SW ProMar B30W200
			PPG SealGrip 17-921		PPG Speedhide 6-70		PPG Speedhide 6-70
			Devoe Devcryl 1440		Devoe Devcryl 1440		Devoe Devcryl 1440
Plywood Semi-Gloss	PW-2S	Acrylic	Carboline Sanitile120	Acrylic	Carboline Carbocrylic 3359	Acrylic	Carboline Carbocrylic 3359
			SW Preprite ProBlock B51W20		SW ProMar B31W200		SW ProMar B31W200
			PPG SealGrip 17-921		PPG Speedhide 6-500		PPG Speedhide 6-500
			Devoe Devcryl 1440		Devoe Devcryl 1448		Devoe Devcryl 1448
Concrete Floor Clear Finish	CF-2	Epoxy	PPG MegaSeal HSPC 99-12700		N/A	Epoxy	PPG MegaSeal SL 99-12600
			SW ArmorSeal 33				SW 650 SL/RC
			Carboline Carboguard 1340				Carboline Sanitile 925

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete Floor Color Finish Heavy-Duty Gloss	CF-3	Epoxy	Carboline Semstone 110	Epoxy	Carboline Sanitile 945 SL	Epoxy	Carboline Sanitile 945 SL
			SW ArmorSeal 33		SW ArmorSeal 650 SL/RC		SW ArmorSeal 650 SL/RC
			PPG MegaSeal HSPC 99-12710		PPG MegaSeal SL		PPG MegaSeal SL
			Devcoe TruGlaze 4508H		Devcoe TruGlaze 4508H		Devcoe TruGlaze 4508H
Concrete Color Finish Anti-Graffiti	AG-3	Epoxy	Carboline Rustbond Penetrating Sealer		N/A	Polyester Urethane	Carboline Carbothane 133 LH
			SW Macropoxy646				2K Water Based Urethane AG Coating
Concrete Masonry, Color Finish Anti-Graffiti	AG-4	Concrete Block Filler	Carboline Carboguard 954 HB		N/A	Polyester Urethane	Carboline Carbothane 133 LH
			SW Kem Cati-Coat HS				Sherwin-Williams Polylon HP
C. Overcoat Systems							
Steel	S-16	Alkyd Spot Primer	Carboline Carbocoat 8215 VOC		N/A	Silicone Alkyd	Carboline 30
			SW Kromik Metal Primer				SW Steel Master 9500 B56-300 Series
			PPG Multiprime 97-680				PPG Sil-Shield 95-5000
			International Interprime 198				International Interloc 800

<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Galvanized & Aluminum Semi-Gloss	N-6S	Epoxy Spot Primer	Carboline 893 Epoxy	Tie Coat	Carboline Rustbond Series	Urethane	Carboline 133LH
			SW Macropoxy 646		SW Macropoxy 5000 Pre-Prime		SW Acrolon 218 HS B65-650
			PPG PMC Amercoat 385		PPG PMC Amerlock Sealer		PPG PMC 450 HSG
			International Interseal 670 HS		International Interseal 670 HS		International Interseal 670 HS
Steel Semi-Gloss	S-17	Epoxy Mastic Spot Primer	PPG PMC Amerlock 2AL	Tie Coat	PPG PMC Amerlock Sealer	Polyurethane	PPG PMC Amercoat 450 HSG
			Carboline Carbomastic 615 HS		Carboline Rustbond Series		Carboline 133 LH
			SW Epoxy Mastic Aluminum II		SW Macropoxy 5000 Pre-Prime		SW Acrolon 218 HS B65-650
			International Interseal 670HS AL		International Interbond 600		International Interthane 870HS
Concrete Semi-Gloss	C-4S	Spot Primer	Carboline Sanitile 120	Acrylic	Carboline Sanitile 155	Acrylic	Carboline Sanitile 155
			PPG Perma-Crete 4-603		PPG Pitt-Tech Plus 90-1210		PPG Pitt-Tech Plus 90-1210
			SW Loxon A24W8300		SW Pro Industrial Acrylic Coating B66-600		SW Pro Industrial Acrylic Coating B66-600
			Devco Tru-Glaze-WB 4030		Devco Devcryn 1448		Devco Devcryn 1448



<u>Surface</u>	<u>System Designation</u>	<u>Primer</u>	<u>Manufacturer's Product</u>	<u>2nd Coat</u>	<u>Manufacturer's Product</u>	<u>Top Coat</u>	<u>Manufacturer's Product</u>
Concrete Masonry Semi-Gloss	CM-4S	Block Filler Spot Primer	Carboline Sanitile 100	Acrylic	Carboline Sanitile 155	Acrylic	Carboline Sanitile 155
			SW H.D. Block Filler B42W46		SW Pro Industrial Acrylic Coating B66-600		SW Pro Industrial Acrylic Coating B66-600
			PPG Pitt-Glaze 16-90		PPG Pitt-Tech Plus 90-1210		PPG Pitt-Tech Plus 90-1210
			Devroe Tru-Glaze-WB 4015		Devroe Devcryl 1448		Devroe Devcryl 1448

#### **D. Interior - Sustainable Design (LEED v4)**

Concrete Masonry Flat	CM-5F	Block Filler	PPG 6-7 Speedhide Latex Block Filler 6-15 X I	Acrylic Flat	PPG Speedhide Zero Latex 6-4110XI	Acrylic Flat	PPG Speedhide Zero Latex 6-4110XI
			SW PrepRite B25W25		SW ProMar 200 Zero VOC B30-2600		SW ProMar 200 Zero VOC B30-2600
Concrete Masonry Semi-Gloss	CM-5S	Block Filler	PPG 6-7 Speedhide Latex Block Filler 6-15 X I	Acrylic	PPG Speedhide Zero Latex 6-4510XI	Acrylic Semi-Gloss	PPG Speedhide Zero Latex 6-4510XI
			SW PrepRite B25W25		SW ProMar 200 Zero VOC B31-2600		SW ProMar 200 Zero VOC B31-2600
Cement & Gypsum Plaster Walls & Soffits Semi-Gloss	P-2S	Acrylic Sealer	PPG Speedhide Zero Latex 4900 X I	Acrylic	PPG Speedhide Zero Latex 4510 X I	Acrylic Semi-Gloss	PPG Speedhide Zero Latex 4510 X I
			SW Loxon A24W8300		SW ProMar 200 Zero VOC B31-2600		SW ProMar 200 Zero VOC B31-2600

<b><u>Surface</u></b>	<b><u>System Designation</u></b>	<b><u>Primer</u></b>	<b><u>Manufacturer's Product</u></b>	<b><u>2nd Coat</u></b>	<b><u>Manufacturer's Product</u></b>	<b><u>Top Coat</u></b>	<b><u>Manufacturer's Product</u></b>
Gypsum Board Flat	GB-2F	Acrylic Sealer	PPG Speedhide Zero Latex 6-4900 X I I SW ProMar 200 Zero VOC B28W02600	Acrylic	PPG Speedhide Zero Latex 6-4110 X I SW ProMar 200 Zero VOC B30-2600	Acrylic Flat	PPG Speedhide Zero Latex 6-4110 X I SW ProMar 200 Zero VOC B30-2600
Gypsum Board Semi-Gloss	GB-2S	Acrylic Sealer	PPG Speedhide Zero Latex 6-4900 X I SW ProMar 200 Zero VOC B28W02600	Acrylic	PPG Speedhide Zero Latex 6-4510 X I SW ProMar 200 Zero VOC B31-2600	Acrylic Semi-Gloss	PPG Speedhide Zero Latex 6-4510 X I SW ProMar 200 Zero VOC B31-2600
Steel Semi-Gloss	S-18S	Acrylic Steel Primer	PPG 90-912 Series Pitt-Tech DTM Industrial Enamel SW Pro Industrial Pro-Cryl Primer B66-1310/1320	Acrylic	PPG Pitt-Tech Plus 90-1210 SW Pro Industrial Acrylic Coating B66-650	Acrylic Semi-Gloss	PPG Pitt-Tech Plus 90-1210 SW Pro Industrial Acrylic B66-650
Galvanized & Aluminum Semi-Gloss	N-7S	Primer	PPG 90-912 Series Pitt-Tech DTM Industrial Enamel SW Pro Industrial Pro-Cryl Primer B66-1310/1320	N/A		Acrylic Semi-Gloss	PPG Pitt-Tech Plus 90-1210 SW Pro Industrial Acrylic B66-650

END OF APPENDIX "B"

## **DIVISION 26**

### **SECTION 260000**

#### **ELECTRICAL GENERAL REQUIREMENTS**

##### **PART 1. GENERAL**

###### **1.01 SUMMARY**

Unless otherwise shown on the Contract Drawings, or unless otherwise specified in other Sections of these Specifications, the general requirements specified in this Section are applicable to all electrical work of this Contract. Additional requirements applicable to individual Sections of these Specifications are specified in those Sections, or are shown on the Contract Drawings.

###### **1.02 REFERENCES**

The following is a listing of publications referenced in this Section:

	<u>American National Standards Institute (ANSI)</u>
ANSI C 2	National Electrical Safety Code.
	<u>American Society of Testing and Materials (ASTM)</u>
ASTM D 178	Standard Specification for Rubber Insulation Matting.
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code.
	<u>Occupational Safety and Health Administration (OSHA)</u>

###### **1.03 QUALITY ASSURANCE**

- A. Any entity performing Work shall have had experience on at least two projects involving quantities and complexities at least equal to those required under this Division or the applicable Section thereof.
- B. All workmen performing under this Division shall be skilled workers of the trade involved. Where specialty work, such as splicing or welding are required, submit proof of training, experience and work history for each workman, for review by the Engineer. Only approved workmen shall perform specialty work.
- C. All electrical work shall be performed under the supervision of an electrical contractor, licensed in the state (and the city as required) in which the work is to be performed. Submit a copy of the qualifying license for review by the Engineer.
- D. All calculations required by this and other various Sections of these Specifications, or as shown on the Contract Drawings, shall be certified and sealed by a Professional Engineer licensed in the state in which the Work is to be performed, and shall be submitted to the Engineer for review.

- E. Various Sections of these Specifications contain the requirement for the specific material or equipment to be furnished with an experience statement "satisfactorily used for purposes similar to those intended herein" or words of similar intent and a statement that specifies the required experience time. These statements shall mean that the manufacturer of the material or equipment being furnished for the Work specified in this Contract shall have manufactured similar material or equipment to that specified, for at least the time specified.
- F. In various Sections of this Division there is a statement that refers to the length of required experience that must be satisfied.
- G. Polyvinyl Chloride (PVC): PVC conduits, PVC-insulated power wiring, or items containing PVC, except PVC-insulated wiring for communications systems, remote control, signaling, and power limited circuits, shall not be installed in any indoor area. PVC-insulated wiring for communications systems, remote control, signaling, and power-limited circuits shall be furnished and installed in accordance with NFPA 70.
- H. Asbestos  
Asbestos or items containing asbestos shall not be furnished or installed.
- I. Conformance Labels  
All electrical materials and equipment for which there is a nationally recognized standard shall bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories Inc., Factory Mutual, ETL, or approved equal. Where the phrase "where there are established UL standards, shall bear the UL label", or words of similar intent appear in other Sections, the instructions for the conformance label above shall apply.

#### 1.04 CODES AND STANDARDS

- A. The electrical installation shall conform to all requirements of ANSI C2, NFPA 70, and the codes and standards specified in other Sections, all local codes and the requirements of OSHA, which would be applicable if the Authority were a private corporation.
- B. Standards publications of technical organizations and regulatory agencies are referenced in other Sections, and unless stricter requirements are indicated, materials and equipment so specified shall be manufactured, tested and installed to conform, as a minimum, to the requirements of such reference standards and publications.
- C. Installations for aeronautical markers, lighting, guidance signs, and other work as shown on the Contract Drawings, shall comply with the standards of the Federal Aviation Administration (FAA), where applicable.
- D. In case of conflict between provisions of codes, laws and ordinances, the more stringent requirement shall apply.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in manufacturers' original unopened protective packaging.
- B. Store materials in original packaging in a manner to prevent soiling, physical damage, wetting or corrosion prior to installation.
- C. Handle in a manner to prevent damage to finished surfaces.
- D. Where possible maintain protective coverings until installation is complete and remove such covers as part of final cleanup.

- E. Touch up any damage to finishes to match adjacent surfaces to the satisfaction of the Engineer.

#### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

#### 1.07 SPECIAL TERMS

Throughout this and other Sections of this Division the term "Authority" is used. In PATH contracts, substitute the term "PATH" is deemed substituted for the term "Authority".

### **PART 2. PRODUCTS**

#### 2.01 MATERIAL AND EQUIPMENT TO BE FURNISHED

Equipment and materials furnished shall be new and unused, prior to this installation, first grade commercial quality and shall be essentially the standard cataloged products of a manufacturer regularly engaged in the manufacture of the products. Only those items specifically shown on the Contract Drawings as existing, relocated or Authority furnished shall be reused in this installation. Rebuilt or remanufactured equipment will not be permitted.

#### 2.02 IDENTIFICATION

- A. All parts of equipment, such as switchboards, panel boards, safety switches, motor starters, circuit breakers, time clocks, contactors and similar items shall be identified by name, function or control with laminated plastic nameplates consisting of two black sheets with one white sheet bonded to and between the two outer sheets and having letters machine engraved in the face sheet to the depth of the white plastic. Nameplates shall not be smaller than 1 inch by 3 inches with characters not less than one-quarter inch. Where letter sizes are not specified, use one-inch high letters for panel boards, switchboards and motor control centers and one quarter inch high elsewhere. Nomenclature shall be according to a schedule approved by the Engineer.
- B. All device plates other than lighting switch plates, telephone and 120 volt, single phase, 15 or 20 ampere receptacles, shall have black or white (as directed) silk-screened lettering Helvetica Medium type face (or other type face as directed by the Engineer) designating:
  - 1. System.
  - 2. Voltage (where applicable).
  - 3. Number of phases (where applicable).
  - 4. Current rating (where applicable).
  - 5. Frequency (where applicable).
- C. Before placing orders for nameplates or silk-screened device plates, submit a typewritten list to the Engineer for review.
- D. The outside of the covers of all junction or pull boxes located above hung ceilings and the inside of the covers of all junction or pull boxes exposed shall be labeled with an indelible marker indicating the operating voltage and the system contained therein.

- E. All device plates of receptacles connected to a standby or emergency power distribution system shall be labeled with an orange plastic nameplate, engraved with the panel board and circuit number to which the receptacle is connected. Nameplate character engraved shall be not less than one-quarter inch in height.
- F. Unless otherwise shown on the Contract Drawings, all panel boards, switchboards, switchgear, circuit breakers, switches and transformers connected to a standby or emergency power distribution system shall be finished Federal Safety Orange in color.

## 2.03 RUBBER MATTING

- A. Provide continuous insulated rubber matting not less than 36 inches wide and not less than one quarter inch thick in one piece in front of:
  - 1. Substation transformers.
  - 2. Switchgear.
  - 3. Switchboards.
  - 4. Motor control centers.
  - 5. Panel boards.
  - 6. On each side and end of a standby or emergency generator set.
  - 7. Other locations as shown on the Contract Drawings.
- B. Matting shall conform to ASTM D 178, Type 2.

## PART 3. EXECUTION

### 3.01 GENERAL

- A. Work of this Division shall include all labor, material and apparatus necessary for the completion of all electrical work as shown on the Contract Drawings and as hereinafter specified, left ready for satisfactory operation.
- B. Coordinate with Authority operations and construction by other trades.
  - 1. Coordinate with the Work of all trades as necessary to facilitate timely completion, avoid unnecessary cutting and patching and to ensure proper installation and operation of all equipment.
  - 2. Coordinate all components and aspects of the Work, in order to minimize power shutdowns to the power distribution systems. Should any part of the Work require an "off-hours" shutdown in excess of 8 hours, supply temporary services or feeders as required to maintain operation of the existing systems and equipment.
  - 3. Furnish to appropriate trades, shop drawings, catalog cuts and instructions necessary for construction of concrete bases, concrete encasement, anchor bolts, and other construction required to accommodate installations under other Sections.
  - 4. Obtain all wiring diagrams and other instructions required for proper electrical connection of equipment installed or furnished under other Divisions of these Specifications and coordinate the installation, wiring and connections for equipment furnished under this Division, or other various Divisions.
- C. The arrangement of electrical equipment and conduit runs as shown on the Contract Drawings and described in the Specifications is schematic. Locate and install electrical work in coordination with other trades so that all electrical equipment and material is installed with working clearances in accordance with NFPA 70. Route conduit to avoid interference with existing installation and with work to be performed by other trades.

- D. The location of equipment and motors shown on the Contract Drawings shall be subject to minor revisions due to field conditions or coordination with other trades without any increase in Contractor's compensation. Prior to roughing-in, verify the exact location of all electrical connections to equipment and motors from reviewed shop drawings and field verification.
- E. Maintain records of all inspections, testing, overload and overcurrent settings throughout the construction and any corrective actions taken, and submit records to the Engineer for review.
- F. All electrical work shall be subject to inspection by the Engineer. Correct any deficient work, as required for the approval of the Engineer.
- G. Any equipment, materials, wiring or labor that are a necessary part of the electrical work and to its proper performance, although not specifically mentioned herein or shown on the Contract Drawings, shall be furnished and installed as if called for in detail, without additional cost to the Authority.

### 3.02 REMOVALS, RELOCATIONS, RECONNECTIONS, RESTORATIONS

- A. Relocate existing equipment and materials as shown on the Contract Drawings.
- B. Unless otherwise shown on the Contract Drawings, existing equipment and materials that are to be removed and not required to be relocated under this Contract, will become the property of the Contractor and shall be removed from the property of the Authority, and shall be properly disposed of. Disposal of equipment and materials shall comply with all local, state and Federal laws and regulations as if the Authority was a private corporation.
- C. Unless specifically shown on the Contract Drawings, salvaged equipment and materials shall not be reused in the installation.
- D. If existing electrical feeders, wiring, conduit, lighting fixtures or equipment interfere with the installation of new construction of any trade, the existing electrical feeder, wiring and conduit shall be rerouted or the equipment relocated in a manner approved by the Engineer to permit installation of the new construction. Where existing circuits or devices, or portions of the existing wiring system are to remain in service, but are interrupted by the construction, continue the existing wiring to maintain the remainder of the wiring system in operation.
- E. Notify the Engineer immediately of any damage caused by the Contractor to existing wiring, services or feeders that are to remain in service. Repair the damage in a workmanlike manner to restore to service, at no cost to the Authority.
- F. Before shutdown or discontinuation of service on any circuit, system or feeder, coordinate such activities with the Engineer in order to minimize shutdown periods. Provide a minimum of two weeks notice in writing to the Engineer before performing any shutdowns. The minimum period may be reduced with the express written permission of the Engineer.

### 3.03 LOCATION OF EQUIPMENT

- A. Unless otherwise shown on the Contract Drawings, the location of outlets or devices, from finished floor to center of plate or device, shall be as follows:
  - 1. Lighting switches: 48 inches.
  - 2. Thermal switches: 48 inches.
  - 3. Receptacles: 16 inches.

4. Telephone outlets: 16 inches.
  5. Fire alarm stations: 48 inches.
  6. Fire alarm horn/light signals: 7 feet 6 inches.
  7. Clocks: 7 feet 8 inches.
- B. Unless otherwise shown on the Contract Drawings, the location of equipment, from finished floor to top of enclosures shall not exceed 6 feet, 6 inches, and shall not protrude more than 4 inches if higher than 27 inches.
1. In exposed or public locations, panel boards and cabinets shall generally be flush mounted and all covers shall be identical in layout and size, and shall be installed to maintain a level and straight top and bottom alignment.
  2. In concealed locations, or in closets or electrical or mechanical rooms, or non-public locations, panel boards and cabinets shall generally be surface mounted and shall be installed to maintain a level and straight top alignment.

#### 3.04 DISSIMILAR METALS

- A. Dissimilar metals shall mean those metals that are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating so as to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.
- B. Transitions in raceways, from one metal to a dissimilar metal shall only be made at boxes or other enclosures, except where shown on the Contract Drawings.

#### 3.05 NAMEPLATES

Secure nameplates on equipment or walls with stainless steel or brass screws.

#### 3.06 RUBBER MATS

- A. Install rubber mats in front of each panelboard, switchboard, motor control center, switchgear and substation transformers, and along each side and the end of each generator set, or as shown on the Contract Drawings.
- B. Rubber mats, when installed, shall lay flat without curling.

#### 3.07 CUTTING AND PATCHING

- A. Perform all cutting and patching of existing construction required for installation of all materials and equipment as specified in this Division.
- B. Perform all patching to match existing adjacent construction to the satisfaction of the Engineer and using the best possible workmanship of the various trades involved.

#### 3.08 FINAL FIELD TESTS

- A. The entire electrical installation shall be inspected prior to final acceptance testing, thoroughly cleaned, and damaged finishes touched up after final completion and prior to final acceptance testing being performed. Not less than 30 days prior to the testing, furnish a test plan, to the Engineer for review, outlining all aspects of the testing, including tests to be performed and the expected results.



- B. Perform the following field test in the presence of the Engineer to demonstrate the reliability of the electrical installation. Give the Engineer a minimum of one-week advance notice of such tests.
  - 1. Operate all electrical systems and equipment for a period of 24 hours, unless in the opinion of the Engineer, a different test period is required, to prove the operation and performance of a system and its equipment.
  - 2. Should the foregoing test reveal any defects, promptly correct such defects and re-run the tests until the entire installation conforms to the requirements of these Specifications and the Contract Drawings.
- C. Tests requiring certified reports and those requiring factory or field inspection shall be conducted and reported to the Engineer in conformance with standards herein specified.
- D. In addition to the tests outlined above, after completion of the electrical system and prior to occupancy:
  - 1. The following equipment and devices, as a minimum, shall be thermographically inspected utilizing a Hughes Aircraft Probeye infrared detector, or approved equal, with videotaping attachment.
    - a. High voltage cable splices and connections.
    - b. Switchboard.
    - c. Transformer.
    - d. Switchgear.
    - e. Panelboards.
    - f. Motor control centers.
    - g. Automatic transfer switch and emergency power system connections.
    - h. Chiller motor and starter connections.
    - i. All 600 volt (nominal) cable connections rated 100 amperes (#3 AWG) or greater.
    - j. Other equipment as shown on the Contract Drawings.
  - 2. The inspection shall be made by an independent inspection company such as Infrared Services, Inc, Montville, N.J., General Electric Apparatus Service Division, or approved equal. The inspection shall be made with all equipment, motors, lighting fixtures, and miscellaneous loads operating and with all equipment covers removed. Inspection reports complete with color photographs of the infrared scan and control photographs indicating the ambient temperature and any hot spots of each item inspected shall be submitted to the Engineer for approval. Any equipment, connections or devices indicated to be operating improperly performing equipment shall be replaced or repaired by the Contractor at no cost to the Authority. The cost of the inspections and necessary repairs shall be included in the Contract.
- E. Demonstrate to the Engineer equipment or systems installed or modified in this Contract.
  - 1. After completion of all testing, and prior to placing equipment or systems in operation, demonstrate the features and operation of the equipment or systems to the Engineer, and all other staff or interested parties, as designed by the Engineer, so that operational and maintenance personnel are familiarized with the equipment and systems, as follows:
    - a. Switchboards and panelboards.
    - b. Transformer.

- c. Switchgear.
  - d. Motor control centers.
  - e. Fire alarm and smoke detection systems.
  - f. Automatic transfer switches.
  - g. Standby/Emergency generator sets.
  - h. Other equipment as shown on the Contract Drawings.
- 2. Provide the necessary accessories, test equipment, and personnel, for each demonstration.
  - 3. Complete all arrangements for the demonstrations through the Engineer.
  - 4. Upon the completion of each demonstration or instructional session, obtain "sign-off" from the Engineer. The "sign-off" shall state that the demonstration or instructions for use were provided, that they were complete and were given to the designated personnel.

END OF SECTION

## **SECTION 260000**

### **ELECTRICAL GENERAL REQUIREMENTS**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

**A. Shop Drawings**

1. Substation and high-voltage transformers.
2. Switchgear.
3. Switchboards.
4. Motor control centers.
5. Emergency lighting battery systems.
6. Working drawings for the installation sequence of medium voltage cables, and other systems where shown on the Contract Drawings, including the reel designations for each leg of the installation. Drawings shall include the calculations for pulling tensions and sidewall pressure of all cable pulls, including identification of manhole locations with splices and manholes that will be "pulled-through" without splicing. Calculations shall be certified and sealed by a Professional Engineer licensed in the State in which the Work is to be performed.

**B. Catalog Cuts**

1. Conduit, and fittings.
2. Wire and cable.
3. Wiring devices.
4. Multi-outlet assemblies.
5. "Standard" outlet and junction boxes.
6. Medium voltage cable, splicing and termination kits.
7. Lightning arresters.
8. Capacitors.
9. Panel boards and cabinets.
10. General purpose transformers.
11. Circuit breakers.
12. Lighting fixtures.
13. Pulling devices and end seals.
14. Special pull and junction boxes.
15. Supporting devices.

**C. Certifications**

Training, experience and work history for certified splicers and welders.

D. Design Calculations

Calculations where required by the Specifications or the Contract Drawings.

E. Maintenance Manuals

Operation and maintenance manuals, where required by the Specifications or the Contract Drawings.

F. Schedules

Nameplate designations.

G. Record Documents

One set of Shop Drawings revised, completed and brought up to date showing the permanent construction as actually made, in accordance with "Shop Drawings, Catalog Cuts and Samples", and showing the exact location of all equipment and conduit runs, as actually installed.

H. Site Inspection Reports

A final copy of the records and certified test reports for all tests, to the Engineer for review, for not less than the following:

1. Primary cable and terminators insulation testing.
2. Insulation testing of 600V (nominal) cables rated 100 amperes (#3 AWG) and above.
3. Ground resistance test of each service ground.
4. Ground fault circuit breaker and receptacle testing.
5. Setting of all adjustable overcurrent devices.
6. Setting or size of all overload elements installed, indicating the following:
  - a. Motor designation.
  - b. Nameplate horsepower, full load current, voltage and phases.
  - c. Operating current and voltage.
  - d. Overload element size or setting.
7. Emergency power distribution equipment and system test results.

END OF APPENDIX "A"

**DIVISION 26****SECTION 260519****WIRES, CABLES, SPLICES, TERMINATIONS  
(600 VOLTS OR LESS)****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for wires, cables, splices, terminations, and appurtenances for electrical systems of 600 volts or less.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM)

ASTM B 1	Hard-Drawn Copper Wire
ASTM B 2	Medium-Hard-Drawn Copper Wire
ASTM B 3	Soft or Annealed Copper Wire
ASTM B 8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B 33	Tinned Soft or Annealed Copper Wire for Electrical Purposes
ASTM B 174	Bunch-Stranded Copper Conductors for Electrical Conductors
ASTM B 189	Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes
ASTM D 2802	Ozone-Resistant Ethylene-Propylene-Rubber Insulation for Wire and Cable
ASTM D 3005	Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
ASTM E 662	Standard Test Method for specific Optical Density of Smoke Generated by Solid Materials

Federal Specifications (FS)

HH-I-553	Insulation Tape, Electrical (Rubber, Natural and Synthetic)
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Insulated Cable Engineers Association (ICEA)

ICEA S-19-81	Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 3)
ICEA S-61-402	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 5)

ICEA S-66-524	Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 7)
ICEA S-68-516	Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 8)
ICEA T-33-655	Guide for Low Smoke, Halogen-Free (LSHF) Polymeric Cable Jackets <u>Institute of Electrical and Electronics Engineers (IEEE)</u>
IEEE 383	Type Test of Class 1E Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations
IEEE 837	Standard for Qualifying Permanent Connections Used in Substation Grounding
	<u>Military Specifications</u>
MIL C-24643	Electrical Cable and Cord for Shipboard Use, Testing for Low Smoke and Halogens <u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code <u>Naval Engineering Standards</u>
NES 713	Determination of Toxicity Index of Products of Combustion From Small Specimens of Materials <u>Underwriters Laboratories Inc. (UL)</u>
UL 44	Rubber-Insulated Wires and Cables
UL 62	Flexible Cord and Fixture Wire
UL 83	Thermoplastic-Insulated Wires and Cables
UL 467	Grounding and Bonding Equipment
UL 510	Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 854	Service-Entrance Cables
UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
UL 1685	Standards for Safety Vertical Tray Fire Propagation and Smoke Release Test for Electrical and Optical Fiber Cables

### 1.03 QUALITY ASSURANCE

- A. Wires and cables which have been manufactured more than two years prior to installation shall not be used in the Work of this Section.
- B. Tapes for splices or terminations shall be dated by the tape manufacturer to indicate that they have been manufactured no longer than six months prior to use in the Work of this Section.
- C. Polyvinyl Chloride (PVC): PVC-insulated power wiring and items containing PVC, except PVC-insulated wiring for communications systems, remote control, signaling, and power-limited circuits, shall not be installed in indoor area. PVC-insulated wiring for communications systems, remote control, signaling, and power-limited circuits shall be furnished and installed in accordance with NFPA 70.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Single conductor wire or cable sizes #4/0 AWG and larger that are to be installed in the same raceway shall be paralleled by the cable manufacturer prior to shipment. Cable assembly overall diameter shall be kept to a minimum.
- B. Wire and cable sizes #4/0 AWG and larger shall be provided with factory-applied caps unless otherwise shown on the Contract Drawings. End seals shall be heat-shrink, irradiated, modified polyolefin, and shall be sized for individual wires and cables.
- C. Store material in a clean, dry space and protect it from the weather.

#### 1.05 SUBMITTALS

See Appendix "A" for submittals requirements.

### **PART 2. PRODUCTS**

#### 2.01 MANUFACTURERS

Subject to compliance with requirements of this Section, provide wires, cables, wire and cable splicing, terminating and arcproofing materials of manufacturers as shown on the Contract Drawings.

#### 2.02 WIRES AND CABLES

- A. General
  - 1. Definitions
    - a. Wire shall be defined as a solid or stranded conductor smaller than No. 6 AWG with or without insulation.
    - b. Cable shall be defined as a single conductor No. 6 AWG or larger, or two or more conductors of any size wire under a common covering.
  - 2. Locations, types, sizes and numbers of wires and cables are shown on the Contract Drawings. Where not indicated, provide proper wire and cable selection to comply with this section and NFPA 70 Standards.
  - 3. Unless otherwise shown on the Contract Drawings, solid conductors shall be soft or annealed copper, conforming to ASTM B 33 (tinned), ASTM B 189 (lead-coated or lead-alloy coated), or ASTM B 3 (uncoated). Unless otherwise specified in this Section or unless otherwise shown on the Contract Drawings, stranded copper conductors shall be concentric stranding conforming to ASTM B 8.
  - 4. Unless otherwise shown on the Contract Drawings, cable jackets for interior use shall be low smoke, low toxicity, non-halogen, flame retardant type and shall meet the following performance characteristics:
    - a. Cables shall pass the flame propagatory and smoke release criteria according to the test method of UL 1685.
    - b. The halogen content of cable jackets shall not exceed 0.2 percent according to the test method of MIL-C-24643. The Authority classifies 0.2 percent or less halogen content as "non-halogen".
    - c. The toxicity index of cable jackets shall not exceed 4.0 according to the test method of NES 713.
    - d. The cable jackets shall comply with ICEA T-33-655 for smoke generation.

- e. The acid gas content of cable jackets shall not exceed a maximum of 3.0 percent according to the test method of MIL-C-24643.
5. Use the additional performance characteristics for wires and cables which will be installed in subway areas, substations, tunnels, etc. where stringent flame retardency, low smoke, low toxicity, zero halogen and good circuit integrity during a fire are required.
  - a. Wires shall pass the flame propagatory criteria according to the test method of VW-1.
  - b. The halogen content of both the wire and cable insulation and cable jacket(s) shall not exceed 0.2 percent according to the test method of MIL-C-24643. The Authority classifies 0.2 percent or less halogen content as "non-halogen".
  - c. The toxicity index of both the wire and cable insulation and cable jacket(s) shall not exceed 2.0 according to the test method of NES 713.
  - d. The acid gas content of both wire and cable insulation and cable jacket(s) shall not exceed a maximum of 2.0 percent according to the test method of MIL-C-24643.
  - e. The wire and cable insulation materials shall pass the smoke generation test in accordance with ASTM E 662. Wire and cable insulation when tested on a specimen of 80 mils thick slab shall not exceed the following values:
 

Flaming Avg. Ds (4 minutes)	100
Flaming Avg. Dm (20 Minutes)	200
Non-Flaming Avg. Ds (4 minutes)	100
Non-Flaming Avg. Dm (20 minutes)	350
  - f. The cable jacket materials shall pass the smoke generation test in accordance with ASTM E 662. Wire and cable jacket when tested on a specimen of 80 mils thick slab shall not exceed the following values:
 

Flaming Avg. Ds (4 minutes)	50
Flaming Avg. Dm (20 minutes)	150
Non-Flaming Avg. Ds (4 minutes)	50
Non-Flaming Avg. Dm (20 minutes)	250
6. Color-Coding for Power and Lighting Conductors
  - a. Insulation or covering of wires and cables shall be factory color-coded by the use of colored compounds or coatings. The color-code shall be followed consistently throughout the performance of the Work.
  - b. Upon written request of the Contractor, the Engineer may permit the use of the following methods in lieu of the wire or cable manufacturer's color-coding, when limited quantities of wire and cable are involved, for sizes #8 AWG and larger.
    - (1) For dry locations only, spiral application of 3/4 inch wide, colored pressure sensitive plastic tape, half lapped for a distance of not less than six inches may be used. To prevent unwinding, the last two wraps of tape shall be applied with no tension.



- (2) For wet or dry locations, application of three, 3/16 inch wide, colored, fungus-inert, self-extinguishing, self-locking, nylon cable ties spaced 3 inches apart may be used. The ties shall be snugly applied with a special tool or pliers, and any excess removed.
  - (3) Each wire and cable shall be color-coded at all terminal points, in all manholes, boxes, or other similar enclosures.
  - (4) Color markings shall be applied so as not to obliterate the manufacturer's identification markings.
- c. Color code chart shall be as follows:

<u>Conductor</u>	<u>System Voltage</u>	
	<u>208Y/120V</u>	<u>480Y/277V</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

7. All wires, cables, splices and terminations, for which there are established UL standards, shall bear the UL label.
- B. General-Purpose Wires and Cables
- Unless otherwise shown on the Contract Drawings, general purpose wires and cables shall be as follows:
1. General-purpose wires and cables shall be single conductor, ASTMB8, Class B stranded for sizes #8 AWG and larger, and solid for sizes #10 AWG and smaller.
  2. Select from the following list of UL wire and cable types:
    - a. Type XHHW: Flame retarding, Cross-linked-polyolifin insulation, conforming to UL 44, for dry locations only.
    - b. Type XHHW-2: Flame retardant, Cross-linked-polyolifin insulation, conforming to UL 44.
    - c. Type THWN: Flame retardant, moisture and heat resistant thermoplastic insulation with a nylon jacket or equivalent; Double rated THHN-THWN gasoline-oil resistant II; conforming to UL 83.  
The use of this cable shall be in accordance with the requirements of paragraph 1.03C of this Section.
    - d. Type USE: Heat and moisture resistant ethylene- propylene-rubber insulation with heavy duty thermosetting chlrosulphanated polyethylene or heavy- duty neoprene jacket; multiple rated "USE-RHH-RHW"; conforming to ASTM D 2802, ICEA S-68-516, UL 44 and UL 854. Unless otherwise indicated, Type USE shall be the only wire and cable used for underground installations.

C. Overhead Service Cables

Unless otherwise shown on the Contract Drawings, overhead service cables shall be two or more type SE, ASTM B 8, Class B or Class C stranded, hard-drawn copper conductors, ethylene-propylene-rubber insulation, with heavy duty neoprene or heavy duty thermosetting chloro-sulphonated polyethylene jacketed, marked "sunlight resistant", conforming to ASTM D 2802, UL 44 and UL 854. Cable shall be factory assembled with copper-clad messenger conforming to ICEA S-68-516.

D. Portable Cords

Unless otherwise shown on the Contract Drawings, portable cords shall be as follows:

1. Type S shall be 60 degrees C rated, with heavy-duty thermosetting insulation and jacket, conforming to UL 62, 600-volt rated.
2. Type SO shall be oil resistant, 60 degrees C rated, with heavy-duty thermosetting insulation and jacket, conforming to UL 62, 600-volt rated.
3. Type G or Type W shall be 90 degrees C rated, with ethylene-propylene-rubber insulation and Hypalon jacket, 600-volt rated.
4. Special types shall be used only where shown on the Contract Drawings.

E. Lighting Fixture Wires

Unless otherwise shown on the Contract Drawings, lighting fixture wires shall be stranded only, and shall be Type SF-2, silicone rubber insulated conforming to UL 62.

F. Grounding Wires and Cables

Unless otherwise shown on the Contract Drawings, grounding wires and Cables shall be as follows:

1. Insulated
  - a. Solid for sizes #8 AWG and smaller; ASTM B 8, Class B stranded for sizes #6 AWG and larger; and of the same insulation type as the power conductors.
  - b. Covering shall be a continuous green color and conform to ASTM B 33 and UL 44.
2. Uninsulated
  - a. General

Solid for sizes #8 AWG and smaller; ASTM B8, Class B stranded for sizes #6 AWG and larger.
  - a. In raceways

Soft-drawn and conforming to ASTM B 3.
  - b. Direct buried or encased in concrete

Soft-drawn, medium-hard-drawn, or hard-drawn and conforming to ASTM B 1, B 2 or B 3, respectively.

G. Control Wires and Cables

Unless otherwise shown on the Contract Drawings, control wires and cables shall be as follows:

1. Single conductor wires and cables shall be ASTM B 8, Class B stranded, type XHHW or XHHW-2 flame retardant, cross-linked-polyolifin insulation. Both shall conform to UL44 and ICEA S-66-524.

2. Multiconductor cables shall be ASTM B 8, Class B or Class C stranded, Control Cable Type B, conforming to ICEA S-61-402. Color-coded as per ICEA S-61-402, Method No. 1 for NFPA 70 applications (with white and green) or ICEA S-19-81, for paired conductor cables. Select from the following list of cable types.
  - a. Individual ethylene-propylene rubberinsulation with overall flame retardent, cross-linked-polyolifin jacket; conforming to ICEA S-68-516, UL 44, and UL 1581.
  - b. Individual ethylene-propylene-rubber insulation with individual and overall flame-retardent, cross-linked polyolifin jackets; conforming to ICEA S-68-516 and UL 44.
  - c. Individual flame retardent, cross-linked-polyolifin insulation with and overall flame retardent, cross-linked-polyolifin jacket; conforming to ICEA S-66-524.
  - d. Individual cross-linked-polyolifin insulation with overall polyvinyl chloride jacket conforming to ICEA S-66-524.
  - e. Individual polyolifin insulation with individual and overall polyvinyl chloride jackets conforming to ICEA S-61-402.

#### H. Switchboard Wires and Cables

Unless otherwise shown on the Contract Drawings, switchboard wires and and cables shall be as follows:

1. Switchboard wires and cables shall be single conductor, ASTM B 8, Class B stranded, except that for wires and cables crossing hinged joints and swinging panels, and where "Extra Flexible" wire or cable is shown on the Contract Drawings, conductors shall be ASTM B 174, Class K stranded.
2. Wires and cables shall be Type SIS, cross-linked-thermosetting-polyethylene insulation, conforming to ICEA S-61-402, IEEE383 and UL 44.

#### I. Cable Tags

1. Dry Locations
  - a. Fiberglass tags, 1/16 inch thick and 3/4 inch wide, indented with letters and numbers 5/16 inch high, with #14 AWG copper or nylon, weather-resistant cable ties.
  - b. Lighting branch circuit wiring and single conductor signal and control wiring may be identified with "Quiklables" manufactured by W. H. Brady Company, or approved equal.
2. Wet Locations
 

Stainless steel metal tags, No. 28 gauge and 3/4 inch wide, embossed with letters and numbers 5/16 inch high, with #14 AWG copper or nylon, weather-resistant cable ties, or stainless steel cable ties.

### 2.03 SPLICING, TERMINATING AND ARCPROOFING MATERIALS

#### A. General

1. All splicing, terminating and arcproofing materials shall be compatible so that no one material will adversely affect the physical or electrical properties of any other, or of the wire or cable itself.
2. All materials for making splices and terminations shall be specifically designed for use with the type of wire or cable, insulation and installation and operating conditions of the specific application.

B. Connectors

Subject to compliance with requirements of this Section, provide connectors of the following types:

1. Solderless, uninsulated, high conductivity, corrosion resistant, compression connectors conforming to UL 467 and IEEE 837;
2. Insulated, indenter type compression butt connectors;
3. Insulated, integral self-locking flexible shell, expandable spring connectors;
4. Uninsulated, indenter type compression pigtail connectors;
5. Welded type connectors.

C. Terminals

Subject to compliance with requirements of this Section, provide terminals of the following types:

1. Solderless, uninsulated, high conductivity, corrosion resistant, compression terminals conforming to UL 467 and IEEE 837;
2. Insulated, compression terminals;
3. Solderless, high conductivity, corrosion resistant, hex screw type, bolted terminals;
4. Welded type terminals.

D. Shrinkable Tubing

Subject to compliance with requirements of this Section, provide shrinkable tubing of the following types:

1. Either irradiated modified polyvinyl chloride or irradiated modified polyolefin heat shrinkable tubing;
2. Cold shrinkable tubing.

E. Tapes and Sealers

1. Vinyl Tapes

Flame-retardent, cold and weather-resistant, 3/4 inch or 1 1/2 inches wide, as required, and conforming to UL 510 and ASTM D 3005.

- a. For interior, dry locations, provide 7 mils, conforming to ASTM D 3005 (Type I); Scotch (3M) No. 33, or approved equal.
- b. For exterior or damp and wet locations, provide 8.5 mils, conforming to ASTM D 3005 (Type II); Scotch (3M) No. 88, or approved equal.

2. Rubber Tapes

Ethylene-propylene, rubber-based, 30-mil splicing tape, rated for 130 degrees C operation; 3/4 inch and wider (1, 1 1/2, 2 inches) as shown on the Contract Drawings or approved by the Engineer, conforming to Federal Specification HH-I-553 (Grade A); Scotch (3M) No. 130C, or approved equal.

3. Insulating Putty

Rubber-based, 125-mil elastic filler putty; 1 1/2 inches wide; Scotch (3M) Scotchfil, or approved equal.

4. Silicone Rubber Tapes

Inorganic silicone rubber, 12-mil, 130 degrees C rated, anti-tracking, self-fusing tape; 1 inch wide; Scotch (3M) No. 70, or approved equal.

- 5. Sealer  
Liquid applied, fast-drying sealant; Scotch (3M) Scotchkote, or approved equal.
- F. Resin Filled Splices
  - 1. Epoxy Molded Type  
Two-piece, snap-together molded bodies, sized for wire or cable, with two-part low viscosity polyurethane insulating and sealing compound, rated for 600 volts, using crimp-type wire connector; Scotch (3M) No. 82-A1, 82-A2 or 82-A3 compound, or approved equal.
  - 2. Re-Enterable Type  
Transparent, molded bodies clamped with stainless steel strain-relief bar and shield continuity connectors, sized for wire or cable, with loosely woven polyester spacer web and jelly-like urethane formulation for permanent re-entry capability; Scotch (3M) No. 78-R1 thru 78-R5, with No. 2114 compound, or approved equal.
- G. Arcproofing Materials
  - 1. Fire resistant tapes shall be Scotch (3M) No. 77, or approved equal.
  - 2. Glass cloth binding tapes shall be Scotch (3M) No. 69, or approved equal.
- H. Special splicing materials and methods shall be as shown on the Contract Drawings.

#### 2.04 SHOP TESTS

- A. For quantities as shown on the Contract Drawings, regular dielectric-withstand and insulation-resistance in water tests for wires and cables shall be performed in accordance with UL44.
- B. Flame tests for wires and cables shall be performed in accordance with IEEE 383.
- C. The test results shall be certified for each reel/coil/box of wire or cable.
- D. Factory inspection and witnessing of tests by the Engineer shall be required for all wires and cables furnished under this Contract. The Engineer reserves the right to require additional testing, or to waive factory inspection or witnessing of tests. The Contractor shall notify the Engineer 14 days in advance of the scheduling of such factory tests.

### **PART 3. EXECUTION**

#### 3.01 PREPARATION

- A. Prior to pulling wires and cables, clean raceway systems of all foreign matter and perform all operations necessary so as not to cause damage to wires and cables while pulling.
- B. Prior to pulling wires and cables into underground conduit systems, place a feeding tube approved by the Engineer at the entrance end of such systems.

#### 3.02 INSTALLATION

- A. Wire and Cable Installation
  - 1. General
    - a. Keep wires and cables dry at all times.
    - b. Seal wire and cable ends with watertight end seals if splicing or terminating does not follow at once.

- c. Before splicing or terminating wires and cables, make a thorough inspection to determine that water has not entered the wires and cables or that the wires and cables have not been damaged.
    - d. Use adequate lubrication when installing cables in conduits or raceways. Any pulling compounds shall be compatible with the finish of the wires and cables furnished.
  - 2. General Purpose Wires and Cables
    - a. Minimum wire or cable size shall be #12 AWG for light and power service.
    - b. Wires or cables shall be at least #10 AWG for the entire length of branch circuits, where distances to first outlets are as follows:
      - (1) 100 feet or more on 480Y/277 Volt systems.
      - (2) 70 feet or more on 208Y/120 Volt systems.
  - 3. Lighting Fixture Wires
    - a. For wiring within lighting fixtures only, where sizes #14 AWG or smaller are required, use Type SF-2 fixture hookup wire. Type SF-2 wire shall not be used for wiring end-to-end connected fluorescent fixtures.
    - b. For connecting lighting fixtures to branch circuit conductors, use either Type RHH-VW-1, XHHW or USE, up to 90 degrees C, in dry locations.
  - 4. Grounding Wires and Cables
    - a. Use bare, uninsulated wire and cable only where shown on the Contract Drawings or where approved by the Engineer.
    - b. Insulated grounding cable shall be of the type specified in this Section or as shown on the Contract Drawings.
  - 5. Control Wires and Cables
 

Control wires and cables shall not be smaller than #14 AWG unless otherwise shown on the Contract Drawings.
- B. Splicing and Terminating
  - 1. General
 

Splicing and terminating shall be as specified in this Section. Details of special splicing and terminating shall be as shown on the Contract Drawings. Any splicing or terminating methods other than those specified below, for which the components are in accordance with the requirements of this Section, shall be submitted to the Engineer for approval.
  - 2. General Purpose Wires and Cables
    - a. Splices in dry locations for sizes #10 AWG and smaller
 

Splicing shall be completed using one of the following:

      - (1) Insulated, integral, self-locking flexible shell, expandable spring connectors shall be applied to the twisted conductors. Two, half-lapped layers of vinyl tape, extending to a distance of not less than one inch from the connector, shall be applied.
      - (2) Compression type, insulated butt connectors shall be applied to the butted conductors by means of an appropriate crimping tool, providing controlled indentation. Two, half-lapped layers of vinyl tape, extending to a distance of not less than one inch from the connector, shall be applied.

- (3) Compression type, pigtail connectors shall be applied to the conductors by means of an appropriate crimping tool, providing controlled indentation. The connector shall be covered with a polyamide cap and two, half-lapped layers of vinyl tape, extending to a distance of not less than one inch from the connector, shall be applied.
- b. Splices in dry locations for sizes #8 AWG and larger  
Splicing shall be completed using all of the following:
  - (1) Connectors shall be split sleeve solderless type or solderless compression type.
  - (2) Fill indents of connectors with Scotchfil insulation putty.
  - (3) Apply rubber splicing tape equal to the original insulation rating.
  - (4) Apply two, half-lapped layers of vinyl tape, or a shrinkable tubing.
- c. Splices in wet locations
  - (1) Same as dry locations specified in 3.02B.2.a and 2.b, except that after vinyl tape is applied, cover with two coats of sealer or shrinkable tubing.
  - (2) Resin-filled splice shall be covered with two, half-lapped layers of vinyl tape and two coats of sealer or shrinkable tubing.
- d. Terminations in dry locations for sizes #10 AWG and smaller  
Terminations shall be compression terminals, insulated or uninsulated.
- e. Terminations in dry locations for sizes #8 AWG through #3/0 AWG
  - (1) Ring tongue terminals shall be solderless, uninsulated compression crimp type.
  - (2) Ring tongue lugs shall be bolted hex screw type.
- f. Terminations in dry locations for sizes #4/0 AWG and larger.  
Ring tongue terminals shall be solderless, uninsulated compression crimp type.
- g. Terminations in wet locations  
In addition to the dry location terminations specified in 3.02 B.2.d, 2.e and 2.f, cover the entire termination area with two, half-lapped layers of vinyl tape and apply two coats of sealer over the tape.
- 3. Overhead Service Cables  
Splices and terminations in overhead service cables shall be the same as specified in 3.02 B.2.c and 2.g, respectively, appropriate for overhead service.
- 4. Portable Cords
  - a. Splices shall not be made in portable cords.
  - b. Terminations shall be made only at apparatus to be served or at branch circuit connection by means of any of the following:
    - (1) Insulated, integral, self-locking flexible shell, expandable spring, or crimp type connectors;
    - (2) Insulated, crimp type, compression connectors;
    - (3) Uninsulated, ring tongue terminals for connection to wire terminal strip block.
- 5. Lighting Fixture Wires  
Connections to branch circuit and to fixture wiring shall be made by either insulated, integral, self-locking flexible shell, expandable spring, or crimp type connectors.

6. Grounding Wires and Cables
  - a. Splices and terminations shall be installed in accordance with the manufacturer's recommendations.
  - b. In hazardous or classified locations, splices and terminations shall be solderless high conductivity, corrosion resistant, compression type connectors and terminations shall be clamp type pressure connectors, suitable for such use.
  - c. All underground connections shall be covered with two coats of asphalt base paint.
7. Control Wires and Cables
  - a. Splices shall be made in accordance with the requirements specified in 3.02 B.2.c and shall be enclosed in a re-enterable splicing case. Where shielded cable is shown on the Contract Drawings, the shielding shall be continued through the splice. Shields shall be grounded at one location only unless otherwise shown on the Contract Drawings.
  - b. Terminations shall be insulated, indenter type ring tongue terminals.
8. Switchboard Wires
  - a. No splices are permitted.
  - b. Terminations shall be insulated, indenter type ring tongue terminals.
- C. Arcproofing
  1. Arcproofing shall be applied where shown on the Contract Drawings.
  2. Arcproofing, which has been disturbed for any reason, shall be reinstalled as soon as possible after the disturbance.
  3. Arcproofing shall be installed as follows:
    - a. Wires and cables shall be grouped by circuit and arcproofing applied over the group of wires and cables comprising one circuit. Splices shall be arcproofed individually and the taping shall join with and be overlapped by the group taping.
    - b. Arcproofing shall be applied in two wrappings of half-lapped tape, bound with glass cloth tape applied at the ends of the fire resistant tape, and at intervals not to exceed 24 inches along the entire length of the cables. The two wrappings shall be applied with opposing-lays.
    - c. Arcproofing shall be extended into the conduit opening or end bell of the raceway entering a handhole, manhole or box.
    - d. Arcproofing tape shall be 1 1/2 inches wide where the diameter of the individual cable, or of the circumscribed circle for the circuit group, is less than 1 3/4 inches. For larger diameters, the tape shall be 3 inches wide.
- D. Identification of Wires and Cables
  1. Each wire and cable shall be identified by its circuit in all cabinets, boxes, manholes, handholes, wireways and other enclosures and access locations, and at all terminal points.
  2. The circuit designations shall be as shown on the Contract Drawings. Tags shall be attached to wires and cables in such a manner as to be readily visible.
  3. The tag ties shall be wrapped around all conductors comprising the circuit or feeder to be identified.
  4. Wires and cables which are arcproofed shall also be identified outside the applied arcproofing.



### 3.03 FIELD TESTS

Test all wires and cables up to equipment installed under this Contract with a 1000-volt Megohmmeter. Furnish the Engineer with a copy of the "Megger" readings together with an outline of the method used. If, in the opinion of the Engineer, any reading is lower than that required by applicable codes, promptly replace the materials involved, at the Contractor's expense, and retest.

END OF SECTION

## **SECTION 260519**

### **WIRE, CABLES, SPLICES, TERMINATIONS (600 VOLTS OR LESS)**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Wires and cables for each type and size;
- B. Splice kit materials and installation procedures.
- C. Submit certified shop test reports for wires and cables.
- D. Submit field test results for wires and cables, including "Megger" readings with the test method used.

END OF APPENDIX "A"

**DIVISION 26**  
**SECTION 260526**  
**GROUNDING**

**PART 1. GENERAL**

1.01 SUMMARY

This Section specifies requirements for grounding.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

Administrative Code

Electrical Code of the City of New York

American National Standards Institute (ANSI)

ANSI C 2      National Electrical Safety Code

Institute of Electrical and Electronics Engineers (IEEE)

IEEE Std      Recommended Practice for Grounding of Industrial and Commercial  
142-1991      Power Systems

IEEE Std      Recommended Practice for Powering and Grounding Sensitive Electronic  
1100-1992      Equipment

National Fire Protection Agency (NFPA)

NFPA 70      National Electrical Code

Underwriters Laboratories Inc. (UL)

UL 467      Grounding and Bonding Equipment

1.03 QUALITY ASSURANCE

- A.      Components and installation shall comply with NFPA 70, "National Electric Code."
- B.      Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in NFPA 70 Article 100.

1.04 SUBMITTALS

See Appendix "A" for submittal requirements.

## **PART 2. PRODUCTS**

### **2.01 GENERAL**

Furnish grounding elements for switchgear, transformers, cabinets panelboards, starters, and miscellaneous electrical equipment, for all non-current-carrying metallic portions of the entire electrical system and for exposed non-electrical systems located in electrical substations or switchgear rooms as required by ANSI C 2, NFPA 70, and building codes which would be applicable, if the Authority were a private corporation.

### **2.02 MANUFACTURERS**

Subject to compliance with the requirements of this Section, provide grounding products of manufacturers as shown on the Contract Drawings.

### **2.03 GROUND RODS**

Ground rods shall be copper clad steel. Unless otherwise shown on the Contract Drawings, the rods shall be 3/4-inch diameter by 10 feet long.

### **2.04 GROUNDING CONDUCTORS**

- A. Provide grounding conductors in accordance with the requirements of NFPA 70, Sections entitled "WIRES, CABLES, SPLICES, TERMINATIONS (600 VOLTS OR LESS)," "WIRES, CABLES, SPLICES, TERMINATIONS (MEDIUM VOLTAGE)," and "TAXIWAY/RUNWAY WIRES AND CABLES," as applicable, and as specified on the Contract Drawings.
- B. Equipment grounding conductors shall be green insulated.
- C. Isolated grounding conductors shall be green insulated with yellow striping.

### **2.05 ABOVE GRADE CONNECTIONS**

Connectors to piping, fencing, and conduit systems shall be listed and labeled as grounding connectors for the materials used.

### **2.06 BELOW GRADE CONNECTIONS**

Buried Cable and ground rod connections shall be exothermic welds. Welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors shown on the Contract Drawings.

### **2.07 GROUNDING BUSHINGS**

Grounding Bushing shall be insulated type.

### **2.08 LIGHTNING PROTECTION COMPONENTS**

Lightning protection components shall be provided as specified in Section entitled "LIGHTNING PROTECTION SYSTEM."

## **PART 3. EXECUTION**

### **3.01 INSTALLATION**

#### **A. General**

Install grounding elements for switchgear, transformers, cabinets, panelboards, starters, and miscellaneous electrical equipment, for all metallic non-current carrying portions of the entire electrical system and for exposed non-electrical systems located in electrical substations or switchgear rooms as required by ANSI C 2, NFPA 70 and building codes which would be applicable, if the Authority were a private corporation.

#### **B. Install grounding as shown on the Contract Drawings.**

#### **C. Grounding and bonding equipment for use in connection with interior wiring systems shall conform to UL 467.**

#### **D. Install separate insulated equipment grounding conductors with circuit conductors to maintain grounding system at equipotential. Raceway system shall not be utilized as the equipment ground.**

#### **E. Connect exposed metallic piping or ductwork of any non-electrical system that is located in an electric substation or switchgear room, to ground in the room. Where the run through the room exceeds 15 feet in length, make ground connections at both the entering and leaving points of the piping or ductwork.**

#### **F. Ground all non-current-carrying metallic enclosures of electrical conductors, or exposed non-current-carrying metallic parts of electrical equipment, or of power apparatus.**

#### **G. Connections:**

##### **1. General**

Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

##### **2. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.**

##### **3. Make connections with clean bare metal at points of contact.**

##### **4. Make all connections of grounding connector cables to ground rods by exothermic welding method. Welds that are puffed up, or that show convex surfaces indicating improper cleaning are not acceptable.**

##### **5. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.**

##### **6. Tighten grounding and bonding conductors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values for connectors and bolts.**

- 7. Where insulated grounding conductors are connected to ground rods, or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.
- H. All sensitive electronic equipment including computers and other components specified on the Contract Drawings, shall be connected to an isolated grounding system. The isolated grounding system shall be installed as specified on the Contract Drawings. The isolated grounding system and the electrical power equipment grounding system must be connected together at a single point, as shown on the Contract Drawings and in accordance with the requirements of NFPA 70, and all applicable local codes. Utilization of a grounding electrode separate from, and not connected to, the electrical power equipment grounding system is not acceptable
- I. All ground rods in grounding loops shall have less than 5 ohms resistance to ground. All individual or isolated ground rods shall have a maximum of 25 ohms resistance to ground. The maximum overall grounding system resistance to ground shall be as shown on the Contract Drawings.

### 3.02 FIELD TESTS

Make ground resistance tests at all ground rods to verify that grounding system is at equipotential and to ensure compliance with the requirements specified in 3.01 I above, in the presence of the Engineer, and prepare all test results in tabulated form indicating location and time of each test and soil resistivity measured. If ground resistance on a grounding resistance test is higher than the value specified in 3.01 I, either increase the length of the rod or add more rods to the grounding system until the required ground resistance is achieved.

END OF SECTION

## **SECTION 260526**

### **GROUNDING**

#### **APPENDIX "A"**

#### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Catalog Cuts for ground rods, connectors and connection materials, and grounding fittings.
- B. Ground Resistance Test Results.

END OF APPENDIX "A"

**DIVISION 26****SECTION 260527****ELECTRICAL BONDING****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for furnishing, installing and testing an electrical bonding system for corrosion control/stray current mitigation on all underground structures.

**1.02 REFERENCES**American Society for Testing and Materials (ASTM)

ASTM B 3 Soft or Annealed Copper Wire

ASTM B 8 Concentric-Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft  
RFP 59136 - 199

Military Specifications (MIL)

MIL A-18001 Anode, Corrosion Preventative Zinc, Slab, Disk and Rod Shapes

National Association of Corrosion Engineers (NACE)

NACE RP 0169 Control of External Erosion on Underground or Submerged Metallic Pipe Systems

**1.03 DESIGN AND PERFORMANCE REQUIREMENTS**

The Electrical Bonding System shall be designed, manufactured and installed in accordance with the latest revision of applicable standards ASTM, MIL and NACE. In case of conflict between various standards, the more stringent requirement shall apply.

**1.04 QUALITY ASSURANCE**

- A. The Contractor shall provide the Electrical Bonding System design, certified by a NACE accredited Corrosion Engineer, licensed as a Professional Engineer in the state in which the work is to be performed, and experienced in corrosion control procedures. Submit the qualifications of the Corrosion Specialist, for review by the Engineer.
- B. Electrical bonding devices, of type and sizes required, shall have been satisfactory used for the purposes similar to those herein, for not less than three years.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials in original packaging in a manner to prevent soiling, damage, wetting or corrosion prior to installation.
- B. Handle in a manner to prevent damage to finished surfaces.
- C. Where possible, maintain protective coverings until installation is complete and remove such covers as part of final cleanup.



## 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

## PART 2. PRODUCTS

### 2.01 MANUFACTURERS

Subject to compliance with requirements of this Section, provide electrical bonding materials and equipment of the manufacturers listed on the Contract Drawings.

### 2.02 MATERIALS

#### A. Electrical Bonding Devices

Unless otherwise shown on the Contract Drawings, furnish materials and products in accordance with the following requirements:

1. Cables shall be stranded copper, #8 AWG minimum, conforming to ASTM B 3 and B 8, insulated with 0.11 inches of high molecular weight polyethylene.
2. Zinc Reference Electrode shall conform to the requirements of MIL A-18001, 1-1/4 inches by 1-1/4 inches by 9 inches long, 5 pound, 1/4" dia. steel core package electrode, and in accordance with the following requirements:
  - a. Lead wire shall comply with 2.02.A.1, and shall be factory connected to the anode center with the connection sealed in cast epoxy resin encapsulation.
  - b. Electrode shall be packaged in a permeable package cloth sack, total weight as recommended by the manufacturer, containing compacted backfill of mixture with the following requirements:

<u>Material</u>	<u>Percent</u>
Hydrated Gypsum	50
Bentonite	50

- c. Epoxy resin encapsulation shall be two-piece, snap-together molded bodies, sized for cable, with two-part low viscosity polyurethane insulating and sealing compound, rated for 600 volts.

#### B. Buried cable and ground rod connection shall be exothermic welded.

#### C. Junction boxes shall be in accordance with Section 260534, entitled "BOXES AND FITTINGS".

## PART 3. EXECUTION

### 3.01 EXAMINATION

- A. Verify that electrical installations, structural, mechanical and other related work satisfy the requirements for performance of the work for this Section in accordance with the Contract Documents.
- B. Report immediately to the Engineer any electrical, structural or related construction defects in areas where bonding devices are to be installed, and do not attempt to rectify any defect unless specifically instructed to do so by the Engineer.

- C. Provide control and inspection of all exothermic bonding connections before casting them in concrete and for proper electrical connections of all underground structural members.

### 3.02 PREPARATION

Before installation of electrical bonding devices, the Contractor shall investigate the site condition to determine, what preparatory work, if any, will be needed.

### 3.03 INSTALLATION

#### A. General

1. Install electrical bonding devices in accordance with approved printed manufacturer's installation procedures, and as specified.
2. Coordinate with other trades, to electrically bond all structural steel and reinforcing bars, embedded in the concrete below grade. Bonding shall be completed in closed circuit to minimize corrosion activity, and shall conform to the Corrosion Specialist design.

#### B. Bonding Connections

1. Bond bare or uncoated reinforcing steel using single insulated conductors or straps, exothermically welded to steel beams.
2. Cross bond all bare or reinforcing steel, using exothermic welds.
3. Make welds in accordance with manufacturer's requirements.

#### C. Conductors

1. Use continuous, insulated conductors, without splices, between welded connections.
2. At the end of line of bonded steel beams, connect the insulated header cable, using exothermic welds, and terminate this cable inside the test junction box as shown on Contract Drawings. Where structural beams or steel members are coated, clean and coat with coal tar epoxy after completion and cooling of welded area.

#### D. Test Electrode Wells and Junction Boxes

1. Bury electrodes of type and at locations shown on the Contract Drawings. Excavate and backfill holes in accordance with the manufacturer's written instructions and in accordance with the following requirements:
  - a. Wet packaged electrode thoroughly before backfilling the hole.
  - b. Use fine clay soil, free from stones and bricks, for backfilling.
2. Install header cables of size, and at location shown on the Contract Drawings.
3. Install test junction box of type, and at locations, shown on the Contract Drawings in accordance with Section 260534 entitled "BOXES AND FITTINGS".
4. Run electrode lead wires to test junction boxes as shown on the Contract Drawings.
5. Install size and type of conduit shown on the Contract Drawings, in accordance with the requirements of Section 260533 entitled "RACEWAYS".
6. Install cable, leaving slack in test junction boxes.
7. Use exothermic welds, sealed with cast epoxy resin encapsulation, for splices made in direct buried cable.

E. Identification

Identify all cables, in each test junction box, using fiber tags (1/16 inch thick and 3/4 inches wide) intended with letters and numbers 5/16 inch high, fastened to cables with #14 AWG weatherproof copper wire.

F. Field Tests

Test that materials are installed and connected as shown on the Contract Drawings, and as required by the Corrosion Specialist's certified design.

1. Test the complete Electrical Bonding System to ensure electrical continuity. The tests must show that the elements of the structure are electrically bonded and prepared for connection to the test box.
2. Testing shall be in accordance with NACE RP 0169 requirements.
3. All test data shall be included in a final report, prepared by the Corrosion Specialist, indicating the initial conditions, with a listing of further recommendations pertaining to the maintenance and periodic testing of the system(s).
4. The Contractor shall correct any deficiencies discovered during the tests.

END OF SECTION

## **SECTION 260527**

### **ELECTRICAL BONDING**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples", Attachment C - Scope of Work and Engineering Technical Specifications:

- A. The Electrical Bonding System design, certified by a NACE accredited Corrosion Specialist, licensed as a Professional Engineer in the state in which the work to be performed.
- B. Shop Drawings
  - 1. Details of bonding of structural steel and reinforcing bars encased in concrete below grade.
  - 2. Steel and concrete shop drawings, including all required welds, bonding connections and recoating or patching of protective coatings.
  - 3. Layout drawings of test electrodes, cabling and test junction boxes.
- C. Submit 12 copies of all test data, and the final report.
- D. Submit qualifications of the Corrosion Specialist and a copy of NACE certificate.

END OF APPENDIX "A"

**DIVISION 26**  
**SECTION 260529**  
**SUPPORTING DEVICES**

**PART 1. GENERAL**

1.01 SUMMARY

- A. This Section specifies requirements for hangers and supports, sleeves and fasteners used to support electrical raceways and equipment, except as specified in B below.
- B. Supporting devices, furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Sections of the Specifications.

1.02 REFERENCE

The supporting devices, specified in this Section shall be constructed, installed and tested in accordance with requirements of the following publications:

	<u>American Institute of Steel Construction Inc. (AISC)</u>
AISC	Manual of Steel Construction
	<u>American Iron and Steel Institute (AISI)</u>
AISI	Specifications for the Design of Cold-Formed Steel Structural Members
	<u>American Society for Testing and Materials (ASTM)</u>
ASTM A 36	Structural Steel
	<u>American Welding Society (AWS)</u>
AWS D1.1	Structural Welding Code, Steel
	<u>National Electrical Contractors Association (NECA)</u>
NECA 5055	Standard of Installation
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code

1.03 QUALITY ASSURANCE

Supporting devices, of types and sizes required, shall have been satisfactory used for purposes similar to those intended herein for not less than three years.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, protective packaging.
- B. Store materials in a clean, dry space and protect them from weather.
- C. Handle in a manner to prevent damage to finished surfaces.
- D. Where possible, maintain protective coverings until installation is complete and remove such coverings as part of final cleanup.
- E. Touch up damage to finishes to match adjacent surfaces, including re-coating of galvanized or plated surfaces where damaged, cut or drilled.

## 1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

## **PART 2. PRODUCTS**

### 2.01 MANUFACTURERS

Subject to compliance with requirements of this Section, provide supporting devices of the acceptable manufacturers as shown on Contract Drawings.

### 2.02 HANGERS AND SUPPORTS

#### A. General

1. Unless otherwise shown on the Contract Drawings, provide hangers and supports as specified below.
2. Where more than one type of hanger or support is suitable for the intended use, selection is at the Contractor's option, subject to approval by the Engineer.
3. Hangers and supports, for which there are established Underwriters Laboratories Inc. (UL) standards, shall bear the UL label.

#### B. Raceway Support

1. Clevis Hangers  
For supporting horizontal conduit; galvanized steel; with hole for treaded steel rod.
2. Riser Clamps  
For supporting vertical conduits; galvanized steel; with two or three bolts and nuts, and 4-inch ears.
3. Reducing Couplings  
Steel rod reducing coupling; size as required; galvanized or plated steel
4. C-Clamps  
Black malleable iron or galvanized or plated steel; with hole for threaded rod.
5. I-Beam Clamps  
Galvanized or plated steel, 1-1/4-inch x 3/16-inch stock; 3/8-inch cross bolt; 2-inch flange width
6. Right Angle or Parallel beam Clamps  
Galvanized steel clamps for supporting or fastening conduit up to 2-inch trade size
7. One-Hole Conduit Straps  
For supporting up to 1-inch conduit or electrical metallic tubing (EMT); galvanized steel
8. Two-Hole Conduit straps  
For supporting conduit or EMT larger than 1-inch galvanized steel; 3/4" strap width.
9. Hexagon Nuts: galvanized steel
10. Round Steel Rod: galvanized or plated steel; threaded
11. Trapeze Hangers: Same as Specified in 2.02 C below
12. The following types of hangers and supports shall not be used:
  - a. Perforated metal strapping;

- b. Slotted, perforated angles;
  - c. Spring pressure or torsion clips, hangers or supports.
- C. Equipment Supports
- 1. U-channel strut system shall be 12-gauge, hot-dipped galvanized steel. Provide with drilled or slotted holes as required for the application and with the following fittings which mate and match with U-channel:
    - a. Fixture hangers
    - b. Channel hangers
    - c. End caps
    - d. Beam clamps
    - e. Wiring stud
    - f. Thin wall conduit clamps
    - g. Rigid conduit clamps
    - h. Conduit hangers
    - i. U-bolts

D. Supporting Steel Sections and Channels

Supporting steel sections and channels shall be fabricated of ASTM A 36 steel in accordance with the appropriate requirements of the AISC, AISI, and AWS publications specified in 1.02, and shall be hot-dipped galvanized after fabrication.

E. Cable Supports

- 1. Provide cable supports with insulating wedging plug for non-armored type electrical cables in risers. Assembly shall include body of galvanized malleable iron with insulating wedging plug.
- 2. Provide cable supports for armored type electrical cables in risers. Assembly shall include body and pressure plates of galvanized steel.

## 2.03 SLEEVES AND SEALS

A. General

- 1. Unless otherwise shown on the Contract Drawings, provide sleeves and seals as specified below.
- 2. Where more than one type of sleeve or seal is suitable for the intended use, selection is at the Contractor's option, subject to approval by the Engineer.
- 3. Sleeves and seals, for which there are established, UL standard, shall bear the UL label.

B. Pipe Sleeves

- 1. Provide pipe sleeves for conduits penetrating concrete or masonry floor and walls, as follows:
  - a. Steel Pipe  
Fabricate from schedule 40, galvanized steel pipe; remove burrs.
  - b. Iron Pipe  
Fabricate from cast iron or ductile iron pipe; remove burrs.
  - c. Plastic Pipe

Fabricate from either fiberglass or Schedule 40, PVC plastic pipe; remove burrs. Fiberglass sleeves may be utilized for interior or exterior usages, but PVC sleeves shall be utilized for exterior usage only.

2. Sleeves shall have a minimum inside diameter as shown below, based on the installed raceway diameter.

<u>Raceway Diameter (inches)</u>	<u>Sleeve Inside Diameter (inches)</u>
1 or less	2
1-1/4 to 2	3
2-1/2 to 3	4
3-1/2 to 4	5
5	6
6	7

3. Where a sleeve encloses only one conductor, phase or polarity, or a ground wire or cable, the sleeve shall be non-ferrous.

C. Interlocking Modular Seals

Provide interlocking modular type seals for conduit access located in exterior foundation and pit walls. The seals shall be multi-link, stainless steel bolted connection, high-temperature fittings.

D. Sealing Bushings

Provide sealing bushings for conduit access core-drilled through foundation walls or floors. The bushings shall be molded, one-piece neoprene sealing rings with PVC coated steel or uncoated aluminum pressure plates, stainless steel hex socket head cap screws and flat washers.

E. Fire Seals

Provide UL listed, 3 hour rating, silicone based foam, fire resistive, waterproof joint sealing system to prevent the passage of hot gases and fire.

F. Wall and Floor Seals

Provide watertight and pressure-tight wall and floor seals suitable for sealing around conduit passing through exterior concrete floors and walls. Assembly shall include steel sleeves, galvanized malleable iron body, neoprene sealing grommets and rings, metal pressure rings, membrane clamp were required by foundation design and pressure clamps with type 316 stainless steel hex head cap screws. Seal sizes shall be maximum published size for conduit to be installed therein.

## 2.04 FASTENERS

A. General

1. Unless otherwise shown on the Contract Drawings, provide fasteners as specified below.
2. Where more than one type of fasteners is suitable for the intended use, selection is at the Contractor's option, subject to approval by the Engineer.



- B. Toggle Bolts  
Toggle bolts shall be spring head, galvanized or plated steel, 1/4-inch to 1/2-inch sizes, length as required.
- C. Expansion Anchors  
Expansion anchors shall be metallic expansion anchors or shields, including drop-in anchors, wedge and sleeve anchors, and two-piece and three-piece shields for lag screws or machine screws or bolts.
- D. Powder activated Fasteners  
Powder activated fasteners shall be steel, pin or stud type, selected for proper length and penetration for the equipment, clamp or strap to be installed, and the base material.
- E. Bolts, Nuts, Lockwashers and Washers
  - 1. All hardware shall be galvanized or plated steel, unless otherwise shown on the Contract Drawings.
  - 2. Bolts and nuts, 1/4-inch trade size and larger, shall be hex head or hex socket type, standard American sizes.
  - 3. Lockwashers shall match the finish of the furnished bolts and nuts, and generally be installed one-per-bolt, at the nut end of the assembly.
  - 4. Washers shall be standard or fender type, as required, and sized to match the installed bolts or screws.
- F. The following types of fasteners shall not be used:
  - 1. Lead anchors or studs;
  - 2. Wooden plugs or anchors;
  - 3. Plastic anchors;
  - 4. "Nail-in" anchors, either of plastic or metal type.

### **PART 3. EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that electrical installations, structural, mechanical and other related Work satisfy the requirements for performance of the Work of this Section in accordance with the Contract Documents.
- B. Report immediately to the Engineer any electrical, structural or related construction defects in areas where supporting devices are to be installed, and do not attempt to rectify any defect unless specifically instructed to do so by the Engineer.

#### **3.02 PREPARATION**

Before installation the supporting devices, the Contractor shall investigate the site condition to determine, what preparatory work, if any, will be needed.

#### **3.03 INSTALLATION**

- A. General
  - 1. Install hangers and supports, sleeves and fasteners in accordance with approved printed manufacturer's installation procedures, and as specified.

2. Coordinate all affected trades and all aspects of the electrical work, including installation of raceways and wiring as necessary to interface installation of supporting devices with other work.
  3. Install hangers and supports, and attachments to properly support raceways, equipment and accessories from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze hangers where possible. Install hangers and supports with maximum spacing not to exceed that permitted by NFPA 70 and NECA 5055, as applicable, unless otherwise shown on the Contract Drawings.
  4. Secure threaded rod couplings, trapeze hangers or supports or similar horizontal elements, using lock washers and jam nuts to prevent loosening.
- B. Conduit and Raceway Supports
1. Do not support raceways from hung ceiling supports or members, or metal roof deck.
  2. Do not support raceways from mechanical ductwork, ductwork supports, piping or piping supports.
  3. Threaded rod for the support of conduits, raceways or trapeze hangers of the given size, shall be not less than the following:
- | Conduit, Raceway, Hanger Size<br>(inches) | Threaded Rod Size<br>(inches) |
|---|-------------------------------|
| 2 or less                                 | 3/8                           |
| 2-1/2 to 3-1/2                            | 1/2                           |
| 4 to 5                                    | 5/8                           |
| 6   | 3/4                           |
4. Where trapeze hangers are used, bolt or clamp the raceways in place to at least every third hanger and to the first hanger on each side of a bend, fitting, junction or pull box or change in direction.
- C. Sleeves
1. Unless otherwise shown on the Contract Drawings, extend sleeves for raceways and risers one inch beyond top of finished floor, curb or building element being penetrated.
  2. Install sleeves level and plumb, accurately located and positioned to conform to the requirements of the equipment and in accordance with the approved layout drawings.
  3. Install interlocking modular seals in tandem, one at the interior and one at the exterior face of the pipe sleeve.
  4. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.
- D. Fasteners
1. Wood screws, lag screws, carriage bolts or machine screws shall be utilized for wood or materials of similar fibrous nature.
  2. Welded or blazed threaded studs, bolts or machine screws or clamps shall be utilized for structural and miscellaneous steel, iron or other metals.
  3. Metallic expansion shields, wedge anchors or drop-in anchors, with lag screws, bolts or machine screws shall be utilized for solid masonry or concrete.

4. Sleeve anchors, drop-in anchors or toggle bolts shall be utilized for concrete masonry units (CMU). Do not use powder-activated fasteners in CMU.
- E. Dissimilar Metals
1. "Dissimilar metals" shall mean those metals which are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data.
  2. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.

END OF SECTION

**SECTION 260529**  
**SUPPORTING DEVICES**

**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Shop Drawings  
Submit layout drawings for dimensioned locations of inserts, sleeves and anchors when required by the Contract Drawings.
- B. Catalog Cuts
  - 1. Hangers and supports
  - 2. Sleeves
  - 3. Fasteners
- C. Submit calculations for the following:
  - 1. Supporting steel sections and channels, properly reflecting installed and future loading, including:
    - a. Safety factors of not less than 4 to 1;
    - b. Deflection ratio of not greater than 1/240.
  - 2. Special hangers and supports shown on the Contract Drawings
  - 3. Hangers, supports and fasteners when required by but not specifically shown on the Contract Drawings.

END OF APPENDIX "A"

**DIVISION 26**  
**SECTION 260533**  
**RACEWAYS**

**PART 1. GENERAL**

1.01 SUMMARY

This Section specifies requirements for raceways.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

American National Standards Institute (ANSI)

ANSI C 80.1	Rigid Steel Conduit - Zinc Coated
ANSI C 80.3	Electrical Metallic Tubing - Zinc Coated
ANSI C 80.5	Rigid Aluminum Conduit
ANSI C 80.6	Intermediate Metal Conduit - Zinc Coated

National Electrical Manufacturers Association (NEMA)

ANSI/NEMA FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA RN 1	Polyvinyl – Chloride (PVC) externally coated galvanized rigid steel conduit and intermediate metal conduit
NEMA TC-3	PVC Fittings for use with rigid PVC Conduit and Tubing
NEMA TC-6	PVC and ABS plastic utilities duct for underground installation
NEMA TC-8	Extra-strength PVC plastic utilities duct for underground installation
NEMA TC-14	Filament – Wound Reinforced Thermosetting Resin Conduit and Fittings

National Fire Protection Association (NFPA)

NFPA 70	National Electric Code
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Underwriters Laboratories Inc. (UL)

ANSI/UL 1	Flexible Metal Conduit
ANSI/UL 5	Surface Metal Raceways and Fittings
ANSI/UL 6	Rigid Metal Conduit
ANSI/UL 209	Cellular Metal Floor Raceways and Fittings
ANSI/UL 360	Electrical Liquid-tight Flexible Steel Conduit
ANSI/UL 514B	Fittings for Conduit and Outlet Boxes

ANSI/UL 651	Schedule 40 and 80 Rigid PVC Conduit
ANSI/UL 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
ANSI/UL 797	Electrical Metallic Tubing
ANSI/UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
ANSI/UL 884	Underfloor Raceways and Fittings
ANSI/UL 1242	Intermediate Metal Conduit
ANSI/UL 1479	Fire Tests of Through-Penetration Firestops

### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in manufacturer's original, unopened, protective packaging. Protective caps shall be removed only upon installation of conduit.
- B. Store materials in a clean, dry space and protect them from weather.
- C. Handle in a manner to prevent damage to finished surfaces.

### 1.04 SUBMITTALS

See Appendix "A" for submittal requirements.

## PART 2. PRODUCTS

### 2.01 MATERIALS

- A. General
  - 1. Locations, types and sizes of raceways are shown on the Contract Drawings.
  - 2. Minimum size of conduit shall be 3/4 inch.
  - 3. Conduit shall be supplied in a minimum of 10-foot lengths and accordance with UL 6.
- B. Rigid Metal Conduit
  - 1. RGS - Rigid galvanized steel conduit (Heavy-wall) hot dipped galvanized inside and out, with hot dipped galvanized threads, conduit shall conform to UL 6 and ANSI C80.1.
  - 2. RGS/PVC - PVC coated, rigid galvanized steel conduit (Heavy-wall) hot dipped galvanized inside and out with hot dipped galvanized threads. The interior of the conduit shall have a thermoplastic or thermosetting coating of a nominal thickness of .007 (7 mils) and shall conform to NEMA TC-14. All PVC coated conduit shall conform to NEMA RN-1.
  - 3. IMC - Intermediate metal conduit, galvanized steel (medium-wall) conduit, threads shall be galvanized and shall conform to ANSI/UL 1242 and ANSI C80.6.
  - 4. ALC - Aluminum conduit shall conform to UL 6 and ANSI C 80.5.
  - 5. All preformed elbows shall be the same in construction to and of a type designed for use with the appropriate conduit and shall conform to UL 6.
  - 6. All fittings shall be threaded and shall conform to NEMA FB-1.
  - 7. If threads are cut after the zinc coating has been applied, the threads shall be treated with protective coating of zinc equivalent to hot-dipped process and conform to NEMA RN-1.

- C. Electrical Metallic Tubing
  - 1. EMT - Electrical metallic tubing (thin-wall) shall be galvanized steel and shall conform to ANSI/UL 797 and ANSI C 80.3.
  - 2. All fittings shall be indenter or compression type made of malleable or pressed steel and shall conform to ANSI/NEMA FB 1.
- D. Cellular Metal Floor Raceway
  - Cellular Metal Floor Raceway and Fittings shall conform to NFPA 70 and ANSI/UL 209.
- E. Flexible Metal Conduit
  - 1. FSC - Flexible steel (galvanized) conduit shall conform to ANSI/UL 1.
  - 2. LSC - Liquid-tight flexible metal conduit shall conform to ANSI/UL 360.
  - 3. Fittings shall be of a type designed for use with the respective conduit and shall conform to ANSI/UL 514B.
- F. Surface Metal Raceways
  - 1. Surface raceways shall conform to ANSI/UL 5.
  - 2. Surface metal raceways shall come complete with all necessary accessories for installation.
- G. Underfloor Raceways
  - 1. Duct, fittings, and accessories shall be suitable for encasement in concrete and shall conform to NFPA 70 and ANSI/UL 884.
  - 2. Underfloor raceways shall come complete with all necessary accessories for installation.
- H. Rigid Nonmetallic Conduit
  - 1. PVC Type 40 Standard Wall polyvinyl chloride (PVC) conduit shall conform to ANSI/UL 651 and NEMA TC-3.
  - 2. PVC Type 80 Heavy wall polyvinyl chloride (PVC) conduit shall conform to ANSI/UL 651.
  - 3. PVC Type "A" Light wall polyvinyl chloride (PVC) conduit shall conform to ANSI/UL 651A
  - 4. PVC Type EB Light wall polyvinyl chloride (PVC) conduit shall conform to ANSI/UL 651A and NEMA TC-8.
  - 5. PVC Type DB Light wall polyvinyl chloride (PVC) conduit shall conform to ANSI/UL 651A and NEMA TC-8.
  - 6. HDPE Type 40 Standard wall High-Density Polyethylene (HDPE) Conduit shall conform to ANSI/UL 651A and NEMA TC-6.
  - 7. FRE - Fiberglass Reinforced Epoxy (FRE) conduit shall conform to ANSI/NEMA TC-14.
- I. Fire stops, Through Penetrations of Conduits
  - 1. Where raceways penetrate wall or floor, fire stops with a fire rating equal or greater than the rating of the penetrated wall or floor shall be provided.
  - 2. All fire stops shall conform to the UL 1479.
- J. Wireways
  - 1. Wireways shall be seamless galvanized steel construction, cover to be locked with captive screws and shall conform to ANSI/UL 870.

2. Wireways shall come complete with all necessary accessories for installation.
- K. Fastening Devices
- Provide inserts, clamps, bolts and washers, or any other type of fastening devices conforming to the requirements of the Section entitled "SUPPORTING DEVICES", required to secure conduits to walls or above hung ceilings. Unless otherwise shown on the Contract Drawings, all fasteners shall be hot dipped galvanized and of sizes and types recommended by the equipment manufacturer.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

- A. General
1. All conduit bends shall be accomplished with a trade approved bending tool and in accordance with the manufacturer's recommendations and NFPA 70.
  2. Ream conduit ends free from burrs prior to installation, and draw joints up tight.
  3. Make transitions in conduit from one metal to a dissimilar metal only at boxes or other enclosures, unless otherwise shown on the Contract Drawings.
  4. Install concealed conduits or tubing in as direct a line as possible.
  5. Install exposed raceways, located above hung or accessible ceilings, parallel with or at right angles to the lines of buildings and as close to the ceiling as possible, unless otherwise shown on the Contract Drawings.
  6. Install expansion fittings in all conduits that cross expansion joints, where conduits attach to independent structures, or where exposed to large temperature changes.
  7. Securely fasten threaded conduits entering enclosures, other than threaded cast boxes, by means of two lock-nuts, one on each side of the enclosure. Terminate the conduits in insulated bushings.
  8. Cap all free ends of empty conduit to prevent water entrance.
  9. Conduit through roofs and external walls of buildings, manholes and other structures shall be watertight. Contractor shall submit detailed shop drawings for the Engineer's approval.
  10. Where portions of an interior raceway system are exposed to widely different temperatures, make provisions to prevent circulation of air from a warmer to a colder section through the raceways.
  11. Apply zinc rich paint to all exposed threads after joints have been made up clean and tight.
  12. Support all conduits as required in these Specifications under Section entitled "SUPPORTING DEVICES".
  13. All conduit runs shall leave or enter structures perpendicularly.
  14. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or mono-filament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- B. Rigid Metal Conduit
1. RGS shall be used where Fire Alarm Systems are installed.
  2. RGS/PVC shall not be used indoors.



3. IMC may not be used in wet locations, or high corrosive area, otherwise NFPA 70 Article 345 fully applies.
- C. Electrical Metallic Tubing  
EMT used for power feeder or branch circuits, shall not exceed 2-inch trade size. EMT used for control circuits and communications systems shall not exceed 4-inch trade size.
- D. Cellular Metal Floor Raceway  
Installation limits shall be defined by NFPA 70.
- E. Flexible Metal Conduit
  1. Install FSC for motor connections and for other equipment connections where subject to movement and vibration. Conduit shall be installed to permit maximum flexibility, without crushing or permanent deformation, and shall not exceed 18 inches in length, without approval of the Engineer.
  2. Use LSC for the same installation conditions as FSC above, and where also subjected to one or more of the following conditions:
    - a. Exterior locations;
    - b. Condensating, moist, wet or humid conditions;
    - c. Corrosive atmospheres;
    - d. Water spray;
    - e. Dripping oil, grease or water.
  3. Install FSC and LSC with a separate, insulated copper, code-sized, equipment-grounding conductor, installed inside the flexible conduit.
- F. Surface Metal Raceways
  1. Only metallic surface metal raceways will be permitted, unless otherwise shown on the Contract Drawings. Installation shall be in accordance with manufacturer's written recommendations and instructions accompanying the raceways.
  2. Provide surface raceway system with means for assuring a continuous ground path throughout.
  3. Use fittings without sharp edges introduced into any part of the raceway system.
- G. Underfloor Raceways  
Install underfloor raceways in accordance with the Contract Drawings NFPA 70, ANSI/UL 884 and the recommendations and requirements of the manufacturer.
- H. Polyvinyl Chloride (PVC) Conduit
  1. PVC Conduit shall not be used indoors.
  2. PVC Conduits Types 40 and 80 conform to NFPA 70 Article 347 except it shall not be used indoors.
  3. PVC Conduits Types 40, A and EB shall be used for concrete encasement.
  4. PVC Conduit Type DB shall be used for direct burial, sand encased.
- I. High-Density Polyethylene (HDPE) Conduit
  1. HDPE conduit shall not be used indoors.
  2. HDPE Type 40 shall be used for direct burial or encased in concrete.
- J. Fiberglass Reinforced Epoxy (FRE) Conduit
  1. Shall be installed as described in NFPA 70.

2. All sweeps, bends, or changes in direction shall be done with fittings only.
  3. Elbows and fittings shall be manufactured from the same resin/hardener/glass system as the conduit.
- K. Dissimilar Metals
1. "Dissimilar metals" shall mean those metals which are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data.
  2. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.
- 3.02 FIELD TESTS
- A. Conduit Cleaning and Testing
1. After installation of conduits and accessories and completion of all concreting operations, if any, carefully clean and clear all conduit runs of all obstructions and foreign matter to the satisfaction of the Engineer.
  2. Test conduits, in the presence of the Engineer, by pulling through each conduit a flexible cylindrical mandrel having an outside diameter not more than 1/4 inch smaller than the inside diameter of the conduit, but nominally 85 percent of the trade diameter, whichever is larger. Only nylon cable of adequate strength shall be used to pull the mandrel through the conduit system. The use of rope will not be permitted.
- B. Connections to Existing Conduits
1. Where conduits installed under this Contract are connected to existing conduits, or conduits installed by others, test the entire run to the nearest box, manhole, handhole, or equipment enclosure as specified in 3.02 A.2 above.
  2. Report immediately to the Engineer any defect or stoppage found in portions of the conduit system not installed under this Contract. Do not attempt to rectify any defect or stoppage found in conduit not installed under this Contract unless specifically instructed to do so by the Engineer. The Contractor's compensation for the rectifying of such defects or stoppages at the direction of the Engineer will be determined in accordance with the Clause of the Contract providing compensation for Extra Work.
  3. The Engineer shall be the sole judge as to whether a defect or stoppage exists. Perform all tests required by the Engineer to enable him to make his decision.

END OF SECTION

## **SECTION 260533**

### **RACEWAYS**

#### **APPENDIX "A"**

#### **SUBMITTALS**

Submit the following in accordance with requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

A. Shop Drawings

Raceway systems - only when shop drawings are required by the Contract Drawings

B. Catalog Cuts

1. Conduit and Tubing
2. Surface Metal Raceway and Accessories
3. Underfloor Raceway and Accessories
4. Wireways and Auxiliary Gutters

END OF APPENDIX "A"

**DIVISION 26**  
**SECTION 260534**  
**BOXES AND FITTINGS**

**PART 1. GENERAL**

**1.01 SUMMARY**

- A. This Section specifies requirements for electrical boxes and fittings.
- B. Types of electrical boxes and fittings specified in this Section are:
  - 1. Outlet Boxes
  - 2. Device Boxes
  - 3. Pull Boxes
  - 4. Junction Boxes
  - 5. Conduit Bodies
  - 6. Fittings

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

	<u>National Electrical Manufacturers Association (NEMA)</u>
NEMA OS1	Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA OS2	Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code
	<u>Underwriters Laboratories Inc. (UL)</u>
UL 50	Cabinets and Boxes
UL 514A	Metallic Outlet Boxes
UL 514B	Fittings for Conduit and Outlet Boxes
UL 514C	Nonmetallic Outlet Boxes, Flush Device Boxes, and Covers
UL 886	Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations

**1.03 QUALITY ASSURANCE**

Boxes and fittings, of types and sizes required, shall have been satisfactorily used for purposes similar to those intended herein for not less than three years. A list of acceptable manufacturers is shown on Contract Drawing.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver material in manufacturer's original, unopened, protective packaging.
- B. Store materials in a clean, dry space and protect them from weather.

- C. Handle in a manner to prevent damage to finished surfaces.
- D. Where possible, maintain protective coverings until installation is complete and remove such coverings as part of final cleanup.
- E. Touch up any damage to finishes to match adjacent surfaces.

## 1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

## PART 2. PRODUCTS

### 2.01 MATERIALS

#### A. General

1. Locations, types and sizes of boxes and fittings are shown on the Contract Drawings.
2. Boxes and fittings shall be metallic, unless otherwise shown on the Contract Drawings, and shall conform to NEMA 0S1, NEMA 250, UL 50, UL 514A, UL 514B, and NFPA 70.
3. Nonmetallic boxes and fittings, shown on the Contract Drawings, shall conform to NEMA 0S2, NEMA 250, UL 50, UL 514C, and NFPA 70.
4. Boxes and fittings to be located in hazardous (classified) areas, as shown by "area plans" on the Contract Drawings shall conform to UL 886 & NFPA 70.
5. All electrical materials and equipment, for which there are established UL standards, shall bear the UL label.
6. Where the sizes or dimensions of a box are not shown on the Contract Drawings, all boxes, whether for use on power, communications, signaling, control, telephone, or other purposes, shall be sized as follows:
  - a. In straight pulls, the length of the box shall not be less than 8 times the trade diameter (nominal inside diameter) of the largest raceway.
  - b. Where angle or "U" pulls are made, the distance between each raceway entry inside the box and the opposite wall of the box shall not be less than 6 times the trade diameter of the largest raceway. The distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in any row on the same wall of the box. The distance between raceway entries enclosing the same conductor shall not be less than 6 times the trade diameter of the larger raceway.
  - c. Where a conduit entry is in the wall of a box opposite a removable cover, the minimum distance between the entry and the cover shall be as follows:
 

<u>Conduit Size</u>	<u>Distance Between Entry and Cover</u>
Up to 1-1/4"	4"
1-1/4" and 1-1/2"	6"
2" and 2-1/2"	8"
3" and larger	12"
  - d. The minimum depth of a box shall be not less than two times the trade diameter of the conduit entries in a single row and not less than 1-1/2 times the sum of the trade diameter of the largest raceway in each row for multiple rows.

7. Weatherproof cast boxes shall be used for exterior or damp locations. Weatherproof boxes shall be hot-dipped galvanized cast-steel or cast-aluminum. Cast boxes shall be threaded conduit entrance type provided with mounting lugs. Materials shall match the type of conduit i.e., galvanized steel or aluminum, used in the conduit run.
  8. Covers for boxes located in public spaces or where shown on the Contract Drawings shall be furnished with tamper-resistant hardware.
  9. Cover plates for outlet boxes are specified in the Section 262726 entitled "WIRING DEVICES".
- B. Interior Outlet and Device Boxes
1. Provide galvanized, flat-rolled, sheet-steel interior outlet wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct boxes with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
  2. Outlet boxes shall be of proper sizes and shapes for conduits and wires entering them, and equipped with plaster ring or cover as necessary for the wiring devices to be installed.
  3. Boxes for switches and receptacles shall be 4-inch square, minimum 2 1/8-inch deep, for up to two devices; solid, ganged boxes for over two devices; and installed so that device covers shall be tight and plumb with wall finish.
  4. Provide suitable barrier in boxes where two or more 277-volt switches are to be installed, to isolate each on its own phase.
  5. Boxes for lighting fixture installation shall be 4-inch square, minimum 2 1/8-inch deep, and provided with 3/8-inch studs.
  6. Boxes to be installed in ceilings, plenums, or spaces used for supply or return of environmental air shall be UL listed for such use, without holes, openings or penetrations, and complete with gasketed cover plates.
  7. Provide all sheet-steel boxes with suitable knockouts.
- C. Exterior Outlet and Device Boxes
1. Provide corrosion-resistant, cast metal, weatherproof outlet wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation.
  2. For outlet boxes to be installed flush or recessed in exterior walls, provide galvanized, sheet-steel boxes, with suitable depth and tile, plaster or masonry rings for the wall construction.
  3. Provide cast-metal faceplates with spring-hinged, waterproof caps suitably configured for each application, including faceplate gaskets and stainless steel or brass screws or fasteners. Faceplate material shall match the type of box i.e., galvanized steel or aluminum.
- D. Junction and Pull Boxes
1. General
    - a. Unless otherwise shown on the Contract Drawings, provide galvanized, code-gauge, sheet-steel junction and pull boxes and covers for interior locations and cast-metal boxes and covers for exterior locations of types, shapes and sizes to suit each respective location and installation, and equipped with stainless steel hinges, nuts, bolts, screws and washers.

- b. Junction or pull boxes having any dimension larger than 36 inches shall contain racks or supports for all cables or conductors.
  - c. Provide pull boxes with suitable insulating barriers where shown on the Contract Drawings or required by code. Vertical-offset pull boxes shall contain cable supports at turns to prevent cables from resting on corners.
  - d. Where shown on the Contract Drawings, provide boxes with provisions for padlocking.
  - e. Special boxes shall be as shown on the Contract Drawings.
  - f. Where shown on the Contract Drawings, catches or vault handles shall be lockable. Locks shall be keyed alike for the same service, such as power, communications, signal or telephone. Each service type shall be keyed differently.
  - g. All covers in exposed exterior locations, or other areas as shown on the Contract Drawings, shall be gasketed.
  - h. For covers heavier than 20 pounds or more than 24 inches in any dimension, provide two replaceable studs, located on each side of the box flange, to support the cover during installation.
  - i. Boxes containing, or designated for, conductors operating at greater than 600 volts (phase-to-phase) shall be constructed of minimum 12-gauge steel.
2. Interior Junction and Pull Boxes
- a. Finished Areas
    - (1) Junction and pull boxes, located in finished areas and having any dimension larger than 12 inches, shall be furnished with flush-mounting, lockable, hinged covers, similar to adjacent panelboard cabinets. Locks shall be keyed alike for the same service, such as power, communications, signal or telephone. Each service type shall be keyed differently. Hinged covers shall contain catches to keep covers closed. Covers having any dimension larger than 36 inches and all multiple-section doors shall contain 3-point vault handles. Covers shall be furnished shop-primed for field painting, and shall be finished with a color as selected by the Engineer.
    - (2) Boxes having any cover dimension 12 inches or less shall be furnished with flush-mounting, screw-on covers, unless otherwise shown on the Contract Drawings.
  - b. Unfinished Areas
 

Junction and pull boxes, located in electrical or telephone closets or rooms, in mechanical equipment rooms, in areas above hung or accessible ceilings or in areas shown on the Contract Drawings as "unfinished," shall be furnished with screw-on covers for boxes having any cover dimension 24 inches or less, and with either single or multiple-section hinged covers for boxes having any cover dimension larger than 24 inches.
3. Exterior Junction and Pull Boxes
- a. Junction and pull boxes, located in sidewalks, decks and in areas shown on the Contract Drawings as "finished", shall be furnished with flush-mounting, screw-on covers.

- (1) Boxes having any cover dimension 24 inches or less shall be cast-steel. Boxes shall be furnished with asphaltic paint finish on surfaces to be embedded in earth or concrete.
- (2) Covers having any dimension larger than 24 inches shall be cast-steel "sidewalk" frames and covers, suitable for installation on a concrete box or handhole.

b. Unfinished Areas

Junction and pull boxes, located in areas shown on the Contract Drawings as "unfinished", shall be furnished with screw-on covers for boxes having any cover dimension 24 inches or less, and with hinged, bolt-on covers for boxes having any cover dimension larger than 24 inches.

E. Floor Boxes

Provide cast-steel, waterproof, adjustable floor boxes with threaded-conduit entrance hubs, and vertical adjusting rings, gaskets, brass floor plates and flush, screw-on covers. All unused conduit openings shall be closed with appropriate plugs.

F. Conduit Bodies

Provide galvanized, cast-metal, conduit bodies, of types, shapes and sizes to suit each respective location and installation; construct with threaded-conduit entrance hubs, removable covers, and stainless steel or brass screws.

G. Bushings, Locknuts and Knockout Closures

Provide corrosion-resistant knockout closures and conduit locknuts, and insulated, malleable-iron, conduit bushings and offset connectors, of types and sizes to suit each respective use and installation.

H. Supporting Devices

Provide inserts, expansion shield lugs, bolts with nuts and washers, shims or any other type of fastening devices required to secure boxes, in accordance with the Section 260529 entitled "SUPPORTING DEVICES". Unless otherwise shown on the Contract Drawings, all fasteners shall be hot-dipped galvanized and of sizes and types recommended by the equipment manufacturer and as approved by the Engineer.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

- A. Install boxes and conduit bodies at the locations shown on the Contract Drawings and as required by NFPA 70 at any other location where they are required to facilitate the pulling, supporting or connection of wires and cables.
- B. Securely mount all boxes in a manner approved by the Engineer and support the boxes independently of conduits entering them.



- C. Install boxes and conduit bodies in classified (hazardous) locations in accordance with their listing or label requirements. Conduit seal fittings shall be packed and filled only after proper operation of equipment and systems has been demonstrated and approved by the Engineer.
- D. Paint exteriors of boxes exposed in mechanical equipment rooms or in electrical rooms or closets or spaces shown as "unfinished" on the Contract Drawings, and the exteriors of boxes installed above hung or accessible ceilings, as follows:
  - 1. Emergency: Orange
  - 2. Fire Alarm: Red
  - 3. High Voltage: Red with 1-inch, white block letters reading "HIGH VOLTAGE" on each exposed face and cover.
- E. All installations shall conform to NFPA 70.
- F. Dissimilar Metals
  - 1. "Dissimilar metals" shall mean those metals which are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data.
  - 2. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.

END OF SECTION

**SECTION 260534**  
**BOXES AND FITTINGS**

**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Catalog Cuts
  - 1. All boxes and fittings.
- B. Shop Drawings
  - 1. Special boxes.
  - 2. Boxes larger than 12 inches.
  - 3. Ancillary equipment if shown on Contract Drawings.

END OF APPENDIX "A"

**DIVISION 26****SECTION 260543****UNDERGROUND CONDUIT SYSTEMS****PART 1. GENERAL****1.01 SUMMARY**

- A. This Section specifies requirements for underground conduits, manholes, handholes, vaults and accessories.
- B. Definitions
  - 1. Conduit: A single enclosed raceway for wires or cables; duct.
  - 2. Ductbank: A structure containing one or more ducts or conduits.
  - 3. Conduit System: A combination of conduit, conduits, manholes, handholes and vaults joined to form an integrated whole.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

	<u>American National Standards Institute (ANSI)</u>
ANSI C 2	National Electrical Safety Code
ANSI C 80.1	Rigid Steel Conduit - Zinc Coated
	<u>American Society for Testing and Materials (ASTM)</u>
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
	<u>Institute of Electrical and Electronics Engineers, Inc. (IEEE)</u>
IEEE 837	Standard for Qualifying Permanent Connections Used in Substation Grounding
	<u>National Electrical Manufacturers Association (NEMA)</u>
NEMA RN 1	Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	Electric Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC 14	Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code
OSHA	Occupation Safety and Health Administration
	<u>Underwriters Laboratories Inc. (UL)</u>
UL 6	Rigid Metal Conduit
UL 514B	Fittings for Conduits and Outlet Boxes
UL 467	Electrical Grounding and Bonding Equipment
UL 651	Schedule 40 and 80 Rigid PVC Conduit
UL 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

### 1.03 DESIGN AND PERFORMANCE REQUIREMENTS

The underground conduit system shall be furnished and installed in accordance with this Section and as specified on the Contract Drawings.

- A. Components of the underground conduit system manufactured, supplied, and installed shall comply with the requirements of NFPA 70, all local codes, and the requirements of OSHA.

### 1.04 QUALITY ASSURANCE

- A. The manufacturer shall have had a minimum of three years experience within the last five years in manufacturing the products of the type(s) and size(s) described in this Section. Those products shall have been satisfactorily used for purposes similar to those intended herein. The Contractor shall provide a list of installations and contracts for which the manufacturer has produced such materials.
- B. All electrical materials and equipment for which there is a nationally recognized standard, shall bear the conformance label of the nationally recognized third party inspection authority, such as Underwriters Laboratories Inc. (UL), Factory Mutual (FM) or ETL.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, protective packaging. Protective caps shall be removed immediately prior to installation of conduit.
- B. Store materials in a clean, dry space and protect them from weather.
- C. Handle in a manner to prevent damage to finished surfaces.

### 1.06 SUBMITTALS

For submittal requirements, see Appendix "A".

## **PART 2. PRODUCTS**

### 2.01 MATERIALS

- A. General
  - 1. Location, types and sizes of conduits and conduit systems are shown on the Contract Drawings.
  - 2. Conduits shall be supplied in standard lengths in accordance with applicable UL standards.
  - 3. Unless otherwise shown on the Contract Drawings, conduit or duct shall be type RGS as specified in this Section.
- B. Rigid Metal Conduit
  - 1. RGS - Galvanized steel conduit (heavy-wall) shall be hot dipped galvanized after cutting and threading and shall conform to UL 6 and ANSI C 80.1.
  - 2. RGS-PV - PVC coated, galvanized steel conduit (heavy-wall) shall be hot dipped galvanized after cutting and threading, shall be coated with 40 mils of PVC and shall conform to NEMA RN 1, Type A 40.
  - 3. All preformed elbows shall be similar in construction to and of a type designed for use with the appropriate conduit and shall conform to UL 6.

4. All fittings shall be threaded.
- C. Rigid Nonmetallic Conduit
1. PVC-T - Schedule 20 (thin-wall) polyvinyl chloride (PVC) conduit shall conform to UL 651A.
  2. PVC-H - Schedule 40 (standard-wall) polyvinyl chloride (PVC) conduit shall conform to UL 651.
  3. PVC-80 - Schedule 80 (extra heavy-wall) polyvinyl chloride (PVC) conduit and elbows shall conform to NEMA TC 2 and UL 651.
  4. Fiberglass reinforced epoxy conduit shall be glass filament wound, embedded in ultra-violet resistant epoxy. Conduit fittings and elbows shall conform to NEMA TC 14 and the following:
    - a. FGS-T - Standard-wall conduit, wall thickness shall be not less than 70 mils for all sizes. Type FGS-T conduit shall be used only where encased in concrete.
    - b. FGS-S - Heavy wall conduit, UL listed, with a wall thickness not less than 70 mils for conduits less than 4 inch trade size, not less than 90 mils for conduits 4 inch trade size and not less than 110 mils for conduits larger than 4 inch trade size. Type FGS-H shall be used where direct buried, encased in concrete, or where conduit risers extend to above grade, in accordance with the requirements of the UL listing.
    - c. FGS-E - Extra-heavy wall conduit, with a wall thickness not less than one-quarter inch. Type FGS-E conduit shall be used for exposed exterior conduit runs on bridges and elevated structures.
  5. Elbows, fittings, offsets, etc. shall be preformed and similar in materials and construction to the conduit.
  6. Couplings shall be of a type to provide a watertight installation of the conduit system.
- D. Manholes, Handholes, and Vaults
1. Precast manholes, handholes and vaults shall be as shown on the Contract Drawings. Concrete shall be in accordance with the requirements of Division 03 Section on concrete.
  2. Cast-in-place manholes, handholes and vaults conforming in size and strength to the precast manholes, handholes and vaults shown on the Contract Drawings may be substituted, subject to the approval of the Engineer.
  3. Continuous inserts shown on the Contract Drawings shall be hot-dipped galvanized steel, and shall be supplied complete with end caps and waxed cardboard closure strips. All metallic parts shall have a hot-dipped galvanized finish.
  4. Racking assemblies shall be capable of being mounted on the continuous inserts supplied in manhole, handhole and vault walls, without modification, utilizing hot-dipped galvanized spring nuts and bolts.
    - a. The racking assemblies shall, at a minimum, include supports on each wall of the manhole, handhole or vault, with arms on each support for each cable or arc-proofed cable group. Each arm shall have insulators to support each cable or cable group. Provide additional arms and insulators as shown on the Contract Drawings.
    - b. Racking assembly arms and insulators, for installation on existing supports, shall match the existing supports without modification.

5. Manhole, handhole and vault frames and covers shall be as shown on the Contract Drawings.
  6. Provide pulling hooks shall be Hubbard Co. No. 9119, or approved equal.
- E. Grounding Assemblies
1. Grounding bushings shall be plated malleable iron body, insulated type, rated 150 degrees C.
  2. Ground rods shall be minimum 3/4-inch diameter, copper-clad steel. Unless otherwise shown on the Contract Drawings, ground rods shall be 10 feet long.
  3. Unless otherwise shown on the Contract Drawings, conductors for grounding assemblies within manholes, handholes, or vaults shall be copper, minimum #4 AWG.
  4. Ground rod connections shall be either exothermic welds, or high-strength compression-crimp system conforming to the requirements of IEEE 837 and UL 467, or approved equal.
  5. Ground cable clamps shall be split-bolt, high strength, copper alloy connectors.

### **PART 3. EXECUTION**

#### **3.01 EXAMINATION**

- A. Inspect all conduit, equipment and accessories prior to installation. Replace any damaged items.

#### **3.02 PREPARATION**

- A. The Contractor shall be responsible for field verification of dimensions and existing underground utilities.

#### **3.03 INSTALLATION**

A. General

Underground conduit systems shall be installed in accordance with the requirements of ANSI C 2, NFPA 70 and as shown on the Contract Drawings.

B. Excavation and Backfill

Excavation and backfill for underground conduits, handholes, manholes and shall be in accordance with the applicable requirements of the Section entitled "EXCAVATION, BACKFILLING AND FILLING" of these Specifications.

C. Concrete Encased Conduit

1. Concrete encasement of conduit shall conform to the details shown on the Contract Drawings and the requirements of Division 03 Section on concrete.
2. The dead-ending of conduit shall be accomplished as shown on the Contract Drawings.
3. No variation from a straight line of greater than 1/2 inch in fifty feet will be permitted when installing a concrete encased conduit.

4. Reinforce junctions with existing concrete encased conduit, or existing systems, with W8 x W4 - 10 x 10 welded wire fabric, conforming to ASTM A 185, encased in four inches additional thickness of concrete around each set of conduits. The additional encasement shall extend at least four feet in each direction from the junction.
  5. Where the placing of concrete is interrupted for one hour or more, reinforce the concrete encasement at the point of interruption with W4 x W4 - 10 x 10 welded wire fabric, conforming to ASTM A 185.
  6. Preformed or precast conduit may be substituted for the field-encased type, subject to the approval of the Engineer. All precast conduit shall meet the same requirements specified herein or shown on the Contract Drawings.
  7. All conduits shall leave or enter structures perpendicularly.
  8. Changes in direction of conduits shall be made by bends having a minimum radius of 15 feet. Elbows or sweeps to equipment or foundations shall have a radius not less than 10 times the trade diameter of the conduit.
  9. Conduits shall be installed in true alignment and shall be sloped for drainage toward manholes or handholes. All free ends of empty conduits shall be sealed to prevent water entrance.
  10. Openings for conduits in manhole construction shall be sealed and made watertight in an approved manner.
  11. Transitions between conduits of different materials shall be made using the manufacturer's standard adapters.
  12. Terminations of rigid nonmetallic conduits in manholes, handholes, and other concrete structures, shall be made with end bells, set flush with the inside face of the concrete.
  13. Terminations of rigid metal conduits in manholes, handholes, vaults and other concrete structures, shall be made with insulated grounding bushings, projecting 2 inches beyond the inside face of the concrete.
- D. Direct-Buried, Rigid Nonmetallic Conduit (PVC-H or FRE)
1. Direct-buried conduits shall be laid on firmly tamped and graded stone-free sand not less than 2 inches deep. Backfill in contact with the conduits shall be sand to a minimum of 3 inches above the conduits and the remainder of the backfill shall be unfrozen, stone-free earth. Buried depth shall be as shown on the Contract Drawings.
  2. Conduit entering or exiting manholes, handholes, vaults and other concrete structures shall be a 10-foot length of rigid metal conduit protected with two coats of asphaltic paint.
  3. Terminations of conduits in manholes, handholes, vaults and other concrete structures shall be made with insulated grounding bushings projecting 2 inches beyond the inside face of the concrete.
- E. Manholes, Handholes, and Vaults
1. Set precast manholes, handholes and vaults so that they are firmly and fully bedded at required grades.
  2. Set frames and covers using mortar and masonry as required. Radially laid concrete brick shall have 1/4-inch thick vertical joints at inside perimeter. Lay all concrete brick in a full bed of mortar and completely fill all joints. Where more than one course of concrete brick is required, stagger vertical joints.

3. Set racking assemblies as required so that the unsupported length of wires or cables shall not exceed 30 inches.
- F. Vertical Adjustment of Existing Manholes, Handholes, and Vaults
  1. Adjust the top elevation of existing structures to suit new finished grades in accordance with the details shown on the Contract Drawings.
  2. Existing frames and covers shall be carefully removed, cleaned of all mortar fragments to the satisfaction of the Engineer and reset at the required elevation in accordance with the requirements shown on the Contract Drawings.
- G. Grounding
  1. Install a complete grounding system in each manhole or vault, and in selected handholes shown on the Contract Drawings. Electrically bond all arm supports, insulated grounding bushings, and ground rods together.
  2. After installation, coat all bare surfaces or connections in the grounding system with asphaltic paint.
- H. Testing
  1. Test conduits, in the presence of the Engineer, by pulling through each conduit a flexible cylindrical mandrel having an outside diameter not more than 1/4 inch smaller than the inside diameter of the conduit, but nominally 85 percent of the trade diameter, whichever is larger. Only nylon cable of adequate strength shall be used to pull the mandrel through the conduit system. The use of rope will not be permitted.
- I. Connections to Existing Conduits
  1. Where conduits installed under this Contract are connected to existing conduits, test the entire run to the nearest box, manhole, handhole, vault or equipment enclosure, including all existing conduits installed by others, that will be used under this Contract.
  2. Where any work shall be performed in conduits emanating from a manhole, handhole, vault or equipment enclosure, all existing spare conduits (conduits containing no electric wire or cable) shall be tested to the nearest manhole, handhole, vault or equipment and a pull line shall be left in place in each such conduit.
  3. Report immediately to the Engineer any defect or stoppage found in portions of the conduit system not installed under this Contract. Do not attempt to rectify any defect or stoppage found in conduit not installed under this Contract unless specifically instructed to do so by the Engineer. The Contractor's compensation for the rectifying of such defects or stoppages at the direction of the Engineer will be determined in accordance with the clause of the Contract providing compensation for Extra Work.
  4. The Engineer shall be the sole judge as to whether a defect or stoppage exists. Perform all tests required by the Engineer to enable him to make his decision.

### 3.04 ADJUSTMENTS

#### A. Conduit Cleaning

After installation of conduits, manholes, handholes, vaults, accessories and completion of all concreting operations, if any, carefully clean and clear all conduits of all obstructions and foreign matter to the satisfaction of the Engineer.

END OF SECTION



**SECTION 260543**  
**UNDERGROUND CONDUIT SYSTEMS**

**APPENDIX "A"**

**SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Shop Drawings
  - 1. Handholes
  - 2. Vaults
  - 3. Frames and covers
  - 4. Manholes, including "exploded" views with complete details as to the location of all existing and new conduits, wires and cables identified by permanent feeder numbers, racking assemblies and grounding assemblies. Manhole drawing blanks will be furnished by the Engineer.
- B. Catalog Cuts
  - 1. Conduit
  - 2. Racking assemblies
  - 3. Grounding assemblies
  - 4. Continuous inserts

END OF APPENDIX "A"

**DIVISION 26****SECTION 262716****CONTROL PANELS, ENCLOSURES/CABINETS, AND TERMINAL BOXES****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for control panels, electrical enclosures and cabinets.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

	<u>American National Standards Institute (ANSI)</u>
ANSI Z 55.1	Gray Finishes for Industrial Apparatus and Equipment
	<u>National Electrical Manufacturers Association (NEMA)</u>
NEMA ICS 1	Industrial Control and Systems. General Requirements
NEMA ICS 1.1	Industrial Control and Systems. Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control
NEMA ICS 2	Industrial Control and Systems. Controllers, Contractors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC
NEMA ICS 3	Industrial Control and Systems. Factory Built Assemblies
NEMA ICS	Industrial Control and Systems. Terminal Blocks
NEMA ICS 6	Industrial Control and Systems. Enclosures.
NEMA ICS 9	Industrial Control and Systems. Power Circuit Accessories
NEMA PB 250	Enclosures for Electrical Equipment (1000 Volts maximum)
NEMA Z 535.4	Product Safety Signs and Labels
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electric Code
	<u>Underwriters Laboratories Inc. (UL)</u>
ANSI/UL 50	Cabinets and Boxes
ANSI/UL 65	Electric Wired Cabinets
ANSI/ UL 486E	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
ANSI/UL 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors
ANSI/UL 969	Marking and Labeling systems
UL 1059	Electrical Terminal Blocks
ANSI/UL 467	Electrical Grounding and Bonding Equipment
UL 437	Key Locks
ANSI/UL 508	Electric Industrial Control Equipment

### 1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Control Panels, Enclosures/Cabinets and Terminal boxes shall be designed in accordance with applicable standards of ANSI, NEMA, NFPA, and UL.
- B. Unless otherwise shown on the Contract Drawings, enclosures/cabinets shall meet the following environmental requirements:
  - 1. Enclosures/Cabinets located in heated areas shall be NEMA Type 1.
  - 2. Enclosures/Cabinets located in unheated areas or in areas subject to dust or oil, shall be NEMA Type 12.
  - 3. Enclosures/Cabinets located in exterior areas or in areas subject to rain, dripping liquid, or hosing shall be NEMA Type 4X, stainless steel.

### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Control panels, Enclosures/Cabinets and Terminal boxes shall be delivered to the construction site complete. All electrical devices and accessories shall be in place and wired.
- B. Control panels, Enclosures/Cabinets, Terminal boxes and accessories shall be packaged to prevent damage due to vibration, jarring and the like during transportation and handling.
- C. If any electrical devices or accessories must be shipped loose they shall be delivered in the manufacturer's original unopened protective packaging and shall be identified with suitable non-corrosive tag.
- D. Store components and devices in clean and dry space, protected from weather.
- E. Where possible, maintain protective covering until installation is complete and remove such covering as part of final cleanup.
- F. Touch up any damage to finishes to match adjacent surfaces.

### 1.05 SPARE PARTS AND TOOLS

- A. One set of all special tools and wrenches required for assembly or disassembly of the panel or cabinet and the installation of devices shall be furnished.
- B. Furnish a list of recommended spare parts for each panel or cabinet. This list shall contain the prices and availability of the spare parts recommended.

### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

## **PART 2. PRODUCTS**

### 2.01 GENERAL

- A. List of acceptable manufacturers is shown on contract drawings.
- B. All Enclosures/cabinets and equipment, for which there are established UL standards, shall bear the UL label.
- C. Location of control panels and enclosures/cabinets and their approximate dimensions shall be as shown on the Contract Drawings.

- D. Each control panels, enclosures and cabinets shall be factory assembled, wired, tested and shipped as a single complete unit, with all devices, terminal blocks and internal wiring installed, unless written permission is given by the Engineer to disassemble any components or parts for shipment. Shipped loose components must fit and be ready for immediate installation in the field.
- E. Devices installed shall be grouped according to their function. 15% spare mounting space shall be provided for future alterations.
- F. All indicating devices, instruments, control switches and indicating lights shall be mounted on the door or front panel. Protection relays, if used, shall be semi-flush type with built-in test facilities wherever possible.
- G. No polyvinyl chloride (PVC) materials, insulation or products shall be used.

## 2.02 CONSTRUCTION FEATURES

### A. Interior

- 1. Control panel interior shall be designed and assembled so that individual devices, terminal blocks and other removable components and wiring may be easily accessible in order to add, remove or replace them without disturbing or removing adjacent units. All devices shall be located on two surfaces only - front and rear. No intermediate swing panels are allowed unless specified on Contract Drawings.
- 2. The distance between devices and wiring ducts and between terminal blocks and wiring ducts shall be sufficient to install and make clearly visible full wire designation, but not less than 1 inch.
- 3. All control cables shall be installed in gutters and wiring ducts with removable covers. Filling of gutters and ducts shall not exceed 50 %. Wireways shall have 0.06 square inch area for each external connection terminal point. This area shall be in addition to wireways required for internal wiring.
- 4. All internal connections to door mounted devices shall be made with extra-flexible (19 strand) wiring bundled together into the cable tie harness with sufficient slack for opening/closing of the door. The bundle shall be enveloped with a helical plastic lacing to prevent wire abrasion. The wire bundle shall be carried between supporting clamps on the door and fixed portion of the enclosure.
- 5. Devices and terminal blocks shall be mounted on a mounting panel to space them away from rear wall of the enclosure/cabinet.
- 6. Enclosures/Cabinets with terminal blocks only shall include terminal straps and brackets sized for the particular enclosure/cabinet and designed to space the terminal blocks away from rear wall of the enclosures/cabinets. Straps and brackets shall be Hoffman Engineering Co., Bulletin A-80 or approves equal.
- 7. Thermostatically controlled space heaters with mechanical guards shall be provided for all outdoor-located enclosures and for indoor enclosures if requested on the Contract Drawings. Heaters shall be rated 240 volts and operated at 120 volts, each with an individual circuit breaker of suitable rating. Heaters shall be sized to keep the air inside the cabinet above the dew point.

### B. Enclosures and Cabinets

- 1. Enclosures/Cabinets shall be fabricated of code-gauge, sheet-steel, unless hot-dipped galvanized steel or stainless steel is shown on the Contract Drawings.

2. Enclosures and Cabinets shall have a hinged door unless otherwise indicated on the Contract Drawings. Doors shall be fitted with concealed, continuous, flush piano hinges.
  3. Enclosures/Cabinets and trims shall be for surface-mounting, recessed installation or free standing (floor mounting) installation as shown on the Contract Drawings.
  4. Trim for recessed or flush-mounted enclosures/cabinets shall consist of a one-piece sheet-steel frame with hinged door, catch and lock. Frame shall extend 3/4-inch beyond each side of the cabinets and shall be set with their backs flush with the finished wall. Rolled lip around all sides of the enclosure shall be provided to exclude liquids and contaminants. Door and body stiffeners shall be provided where required to assure rigid construction.
  5. Enclosures/Cabinets for surface mounting shall be provided with the door, hinged directly to enclosures/Cabinets. Door shall be made of one piece of sheet-steel, shall have a 3/4-inch flange around all edges shaped to cover the edge of the box, and shall be provided with a catch and lock. Rolled lip around all sides of the enclosure shall be provided to exclude liquids and contaminants. Door and body stiffeners shall be provided where required to assure rigid construction.
  6. Floor mounting (freestanding) enclosures/cabinets shall be fabricated of 10-gauge steel with steel channel base to form a rigid, self-supporting structure. Heavy duty lifting eyes anchor into reinforced top shall be provided.
  7. On panels or doors weakened by excessive area punched out for device mounting, reinforcing stiffeners shall be provided for extra rigidity.
  8. Enclosures/Cabinets with through wiring shall be provided with side gutters 4 inches wide. Enclosures/Cabinets shall be provided with top and bottom gutters not less than 6 inches wide.
  9. All doors shall close against a rabbet placed all around the inside edge of the frame, with a close-fitting joint between the door and frame.
  10. Each door shall be furnished with a flush cylinder tumbler lock, with catch, and spring loaded type stainless steel door pull. Doors more than 48 inches high shall be provided with a heavy-duty, three-point latching mechanism with rollers on ends of latch rods for easy door closing. Locks shall be fitted to separate keying for each system. Furnish one key for each cabinet installed and a maximum of 20 keys per system.
  11. Fastening door screws or door clamps, where required, shall be stainless steel. Door screws shall be of the captive, tamper proof type.
  12. Collar studs shall be provided with internal mounting panel.
  13. Provide large removable print pockets, mounted inside of each enclosure/cabinet door.
- C. Wiring
1. Wiring shall be sized to the duty required. Control wires shall be # 14 AWG minimum
  2. Wiring of all relays, instruments, and other devices shall conform to the arrangement shown on approved wiring diagrams.
  3. All control wiring, including all spare contacts of all devices, shall be wired to terminal blocks. Terminals shall be arranged for consecutive connections of conductors which compose a given control circuit or connected device. Number of spare contacts in each device shall be as shown on Contract Drawings.

4. All bus wiring such as 125 V DC, 120 V AC, alarm, etc. shall be insulated wire, run from terminal block to terminal block and not rigid buses.
  5. Connections made on terminal blocks and devices shall be by means of insulated locking fork, or insulated ring type crimp terminals. All crimps shall be made with a ratchet type compression tool specifically made for this application to produce optimum mechanical and electrical performance.
  6. On devices that do not permit locking fork or ring type terminals, control wiring shall be held by tubular screw-type connectors.
  7. Internal wiring shall have no splices, nor shall more than two wires be terminated on one terminal point.
  8. Seller is solely responsible for correctness of the internal wiring and proper functioning of the equipment being connected.
- D. Terminal blocks
1. Terminal blocks shall be as shown on the Contract Drawings, as follows:
    - a. Sliding link disconnect terminal blocks shall be rated 600 volt AC and shall be UL recognized, Poweright Products Inc., series SLD-78-S, or approved equal.
    - b. Add on type terminal blocks with screw terminals and clamps, rated 600 volts, and sized to accept a wire range of #22 to #8 AWG, UL recognized and CSA certified.
    - c. Solderless tubular terminal blocks add-on type shall be rated 600 volts, and sized to accept a wire range of #22 to #8 AWG, with non-rotating clamping surfaces, UL recognized and CSA certified.
    - d. Fuse blocks shall be furnished with 600 volt rated fuses and switch-action, blown fuse indicator, pullers.
    - e. Provide terminal block accessories, including fanning strips, jumpers, marking strips and terminal covers.
  2. Terminal block housings shall be molded from flame-retardant Lexan, Nylon or Polypropylene and terminal block accessories shall be made of flame-retardant materials. All terminal blocks shall be barrier type.
  3. Each terminal block assembly shall be supported after every twelve points.
  4. Terminal blocks rated 600 volts, 30 Amps shall be provided for all external connections by purchaser, unless otherwise shown on the Contract Drawings.
  5. At least 20% uniformly distributed spare terminals shall be provided.
- E. Identification
1. All devices shall be indelibly identified with legend plates inscribed in accordance with approved schematic diagrams and layout drawings.
  2. Each Enclosure/Cabinet shall be provided with large engraved nameplate on its front. Nameplate nomenclature shall be according to a schedule approved by the Engineer.
  3. Unless otherwise shown on the Contract Drawings, fabricate nameplates from an approved type of lamacoid plastic with letters engraved on the plate in white on black background. Where letter sizes are not shown on the Contract Drawings, use 1/2-inch high letters.
  4. Secure nameplates on equipment with brass or stainless steel screws.

F. Accessories

1. Front of board test facilities shall be provided for all instrument and relay current and potential circuits that cannot be individually tested by test devices inherently built into relays or meter. Auxiliary contacts and switches shall be provided where necessary to form part of the test blocks.
2. Interior lighting with switches and receptacles, 120 volts AC, shall be provided if called for on Contract Drawings.
3. A color-coded mimic bus shall be provided if called for on Contract Drawings.
4. Internal copper ground bus, size 1/4 x 1 inch and extended throughout the structure, shall be provided in free standing enclosures/cabinets if called for on Contract Drawings. Ground bus shall be bolted, brazed or welded to the framework, side sheets, etc.

2.03 PAINTING

- A. Surfaces to be painted shall be prepared by the removal of all grease, oil, rust, scale or other foreign material and chemically treated to provide a bond between the paint and metal surface preventing the entrance of moisture and the formation of rust under the paint film.
- B. A prime coat of zinc chromate paint and two (2) finish coats of enamel paint conforming to ANSI Z 55.1 shall be applied. The gray prime and finish paints shall be a compatible finish system. In public areas the cabinets shall be painted as above, unless otherwise shown on Contract Drawings.
- C. Furnish a can of touch up paint for use after equipment is positioned.
- D. Stainless steel panels shall not be painted. Galvanized panels shall be painted if shown on the Contract Drawings.

2.04 SHOP TEST

- A. Shop tests shall be in accordance with NEMA, ANSI and IEEE specifications, including:
  1. High potential and operating tests on power equipment to demonstrate that this equipment will function correctly and in accordance with the intent of the specifications. Check rating of all protective devices (circuit breakers and fuses).
  2. Insulation resistance test for each circuit with equipment connected, except those containing electronic components, using a 1000-volt megger. The insulation resistance shall be no less than 25 megohms.
  3. Every control circuit continuity test. Use all schematic diagrams.
  4. All control devices functional performance test to determine that all devices are wired and function correctly when energized.
  5. Simulated operating test for the entire system.
- B. Information outlining the test methods and procedures to be followed shall be submitted to the Engineer for approval during the period of shop drawing submission. A copy of test forms to be used shall be furnished at the time.
- C. The Engineer shall be permitted to inspect any equipment, material or work to be furnished under this specification and shall have the right to reject any parts considered defective, unsuitable for the purposes or not in accordance with these specifications. Free entry shall be permitted to the Engineer at all times and to all parts of the works engaged in the manufacturing of this equipment.

- D. The Engineer shall be notified in writing at least two weeks before testing. This notification shall list all units to be tested. The Engineer reserves the right to require additional testing or to waive factory inspection or witnessing of tests. The Engineer will advise the Contractor which tests will be witnessed and which will be waived.
- E. Facilities for any reasonable tests that may be considered necessary in connection with any inspection shall be furnished free of charge. The shop shall provide equipment, instruments, cables, tools and personnel required and shall bear all expenses incidental to the foregoing tests, including replacement of damaged parts and material.
- F. During the witnessing of tests, all original test data shall be initiated by the Engineer, and at the conclusion of the tests he shall be furnished with one copy of all original test data. If any data was modified, the Engineer shall be apprised and such modification shall be subject to the approval of the Engineer.
- G. The accuracy of the calibration of all instruments to be employed during the tests shall be ascertained and recorded at the beginning of the tests. All readings shall be directed and visible to the Engineer.
- H. Five (5) certified copies of all test results shall be furnished to the Engineer. Certification shall be by a Professional Engineer, licensed in the State in which tests were performed and so stamped.
- I. Release of equipment shall not relieve the Contractor of the responsibility of furnishing equipment conforming to all specification requirements.

### **PART 3. EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that electrical installations, structural, mechanical and other related Work satisfy the requirements for performance of the Work of this Section in accordance with the Contract Documentation.
- B. Before delivering the equipment to the site, the Contractor shall investigate the site conditions to determine the best method of shipment, what preparatory Work, if any, will be needed to bring the equipment onto the site, and what will be the best and quickest method of unloading the equipment and setting it in place.
- C. Report immediately to the Engineer any electrical, structural or related construction defects in areas where control panels or cabinets are to be installed, and do not attempt to rectify any defect unless specifically instructed to do so by the Engineer.
- D. Before unloading the equipment it shall be inspected for damage during shipment. Any damage shall immediately be brought to the attention of the Engineer for resolution.

#### **3.02 PREPARATION**

- A. Install any channels, angles or other supports that are required to support or mount the control panels and enclosures/cabinets.
- B. Use supports and fasteners as specified in the Section of the Specifications entitled "SUPPORTING DEVICES" or as shown on the Contract Drawings.



### 3.03 INSTALLATION

- A. Surface and flush mounted enclosures/cabinets shall be installed with tops 6 feet-6 inches above the floor, unless otherwise shown on the Contract Drawings.
- B. Control panels and enclosures/cabinet shall be installed true and plumb on supporting struts and shall not be mounted directly on concrete, concrete block walls, or any other walls subject to moisture. Leave a minimum gap of 1/2 inch between the back of the enclosure/cabinet and the wall, using stainless steel hardware.
- C. Where mounting directly on the wall is unavoidable the back of the enclosure shall be painted with two coats, minimum, of a bituminous paint.
- D. Cables shall be neatly racked and bundled with nonflammable nylon ties, routed and supported within the enclosures/cabinets, cable ducts or gutters. Minimum bending radii as recommended by cable manufacturers shall not be reduced.
- E. After conduits and cables are installed, the enclosures/cabinets shall be inspected for foreign materials and shall be vacuumed clean. Prior to energization, the panels shall be tested as described below.
- F. A new set of as-built drawings, neatly bound together in plastic covers, shall be placed in the print pocket of each enclosure/cabinet.

### 3.04 FIELD TESTS

- A. Visually inspect each device in the panel and operate manually.
- B. Check all connections for tightness.
- C. Check rating of all protective devices (circuit breakers and fuses). To each pole of the circuit breakers apply current 3 times its rating, recording currents and breaker trip times. Apply rapidly increasing currents and record the value that consistently causes instantaneous tripping of the breaker. Compare these recorded times with manufacturer's time current curves.
- D. Perform each panel control wiring tests to determine that all devices are function correctly when energized and in accordance with the intent of the Contract Drawings and Specifications.
- E. Perform control system functional test. This test shall include step by step procedure to determine that entire control system (this control panel could be just part of it) operate properly.
- F. All discrepancies found by the contractor shall be brought to the attention of the Engineer.
- G. All testing shall be performed in the presence of and as directed by the Engineer. The Contractor shall notify the Engineer when the equipment is installed and ready for testing.

END OF SECTION

## **SECTION 262716**

### **CONTROL PANELS, ENCLOSURES/CABINETS, AND TERMINAL BOXES**

#### **APPENDIX "A"**

#### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

**A. Shop Drawings**

Shop drawings for each enclosure/cabinet shall include:

1. Job name
2. Item number
3. Quantity of each enclosure/cabinet configuration
4. Nameplate schedule in accordance with design drawings
5. Complete assembly drawings including plan, elevation and section views with dimensions. Show dimensioned location of all devices, terminal blocks, accessories and details for purchaser cable support. Indicate conduit entrance areas and mounting details.
6. Cabinet/Enclosure construction details, floor plan and channel base detail drawings
7. Specification for enclosure/cabinet mechanical and electrical parts, and assemblies.
8. Wiring interconnection and schematic diagrams as follows:
  - a. The elementary diagrams supplied by panel vendor shall contain
    - (1) Each device designation corresponding to panel layout drawing and wiring diagrams
    - (2) All device terminal numbers corresponding to device vendor information
    - (3) Contact development diagrams of all control, selector, and transfer switches, protection and auxiliary relays, pushbuttons, etc. Indicate connections to control panel terminal blocks
    - (4) Contact diagrams for all alarm and indication circuits. Indicate connections to control panel terminal blocks
  - b. Control panel internal connection wiring diagram shall contain
    - (1) Each device designation corresponding to panel layout drawing and elementary diagrams. All device terminals shall be identified identical to device vendor drawing and arranged in correct physical relationship.
    - (2) Sufficient information at each wire termination to locate the other termination without recourse to routing sheets, supplementary tabulations, or any other document.
    - (3) Terminal strips numbered sequentially from top to bottom and left to right. Show terminals requiring external connections. The terminal strips shall be shown on drawings spaced at least 4 inches apart, so as to permit purchaser's external wiring to be shown on the same drawings.
  - c. External connection diagram between the control panel and the equipment connected to it.

9. Bill of materials: Components shall be identified by manufacturer's catalog number, technical characteristics and settings required for the installation. Bill of materials shall correlate components to panel layout drawing and diagrams.
- B. Catalog cuts
  1. Enclosures
  2. Cabinets
  3. Terminal blocks
  4. All factory or field mounted devices and equipment shown on the Control panel or Enclosure/Cabinet drawings
- C. Schedules
  1. Nameplate nomenclature
  2. Terminal block designations
- D. As-built Documentation

END OF APPENDIX "A"

**DIVISION 26**  
**SECTION 262726**  
**WIRING DEVICES**

**PART 1. GENERAL**

1.01 SUMMARY

This Section specifies requirements for wiring devices.

1.02 REFERENCES

The wiring devices specified in this Section shall be constructed, installed and tested in accordance with requirements of the following publications:

Federal Specifications

W-C-596 Electrical Power Connector, plug, Receptacle and Cable

W-S-896 Outlet Toggle and Lock, Flush Mounted Switches

Institute of Electrical and Electronic Engineers (IEEE)

IEEE 241 Electric Power Systems in Commercial Buildings

National Electrical Manufacturers Association (NEMA)

NEMA WD 1 General Requirements for Wiring Devices

NEMA WD 6 Wiring Devices - Dimensional Requirement

National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

Underwriters Laboratories Inc. (UL)

UL 20 General Use Snap Switches

UL 498 Electrical Attachment Plugs and Receptacles

UL 917 Clock-Operated Switches

UL 943 Ground Fault Circuit Interrupters

UL 1054 Special - Use Switches

1.03 QUALITY ASSURANCE

Wiring devices, of types and ratings required, shall have been satisfactorily used for purposes similar to those intended herein for not less than three years.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, protective packaging.
- B. Store materials in clean, dry space and protect them from weather.
- C. Handle in manner to prevent damage to finished surfaces.
- D. Where possible, maintain protective coverings until installation is complete and remove such coverings as part of final cleanup.

## 1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

## PART 2. PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements of this Section, provide wiring devices of the acceptable manufacturers as shown on the Contract Drawings.
- B. All devices for wall system outlets shall be furnished by one manufacturer.
- C. All device plates shall be furnished by one manufacturer.

### 2.02 CONSTRUCTION FEATURES

#### A. General

- 1. All wiring devices shall be heavy-duty, specification grade, conforming to the NEMA configurations and requirements of NEMA WD 1 and UL 498, including the requirements for pressure-blade contacts. NEMA configurations shall be as shown on the Contract Drawings and shall match the requirements of the connected appliances.
- 2. Locations, types and sizes of wiring devices shall be as shown on the Contract Drawings.
- 3. All devices shall be one gang wide, except as required for devices rated greater than 20 Amp.
- 4. All devices shall be terminated with screw terminals or screw-driven pressure clamps. Patented spring or torsion pressure clamps shall not be used.
- 5. All electrical materials and equipment, for which there are established UL standards, shall bear the UL label.

#### B. Switches

Switches shall be silent operating type, 20 Amp, 120 - 127 Volts AC, T-rated, flush mounted, conforming to requirements of Federal Specification W-S-896 and UL 20, 917 and 1054. Single-pole or double-pole, and 3-way or 4-way devices shall be as shown on the Contract Drawings.

#### C. Receptacles

- 1. Duplex convenience receptacles shall be 125 V, straight blade, 2-pole, 3-wire grounding type units with break-off terminal ties for two-circuits application. Receptacles shall be 15 Amp or 20 Amp as shown on the Contract Drawings.
- 2. Single receptacles shall be 20 Amp, 125 V, straight blade, 2-pole, 3-wire, grounding type units.
- 3. Clock outlets shall be single recessed receptacles rated 15 Amp, 125 V, 2-pole, 3-wire grounding type with a combination plate cover and clock hanger bracket.
- 4. Floor service receptacle outlets shall be furnished with 20A, 125V, 2-pole 3-wire grounding type duplex receptacle. Where shown on the Contract Drawings, receptacle shall be flush mounted in floor box or installed in metallic above-floor service fitting.

5. Factory assembled "poke through" assembly device shall be furnished with 20A, 125v, 2-pole, 3-wire grounding receptacle and capable of maintaining floor fire rating of 3 hours.
  6. Ground fault circuit interrupter receptacle shall be 20A, 125V, 60 Hz heavy duty grounding type duplex receptacle with ground fault circuit interrupter with solid-state ground fault sensing device having 5 ( $\pm$ 1) milliampere ground-fault trip level and shall be "feed through" ready, for protecting downstream receptacles on a single circuit; suitable for installation in a 2-1/2" deep outlet box without adapter.
  7. Special purpose receptacles as shown on the Contract Drawings shall conform to requirements of NEMA WD 6.
- D. Device Plates
1. All device plates shall be 0.04" thick minimum with struck-up beveled edges and free of sharp corners and burrs. All device plates shall be one-piece sectional plates shall not be used.
  2. Unless otherwise shown on the Contract Drawings, all device plates for wall outlets shall be satin finish anodized aluminum.
  3. Device plates for wall telephone outlets shall contain a bushed hole.
  4. Device plates for exposed work shall be stamped steel.
- E. Color Selection

Wiring devices shall be available in standard white, ivory, gray, brown and black. The Engineer will select different colors for various areas and for different devices. No wiring device shall be ordered or installed until the Engineer's final color selections have been made.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

- A. Install wiring devices in accordance with manufacturer's installation procedures and applicable requirements of NFPA 70 and IEEE 241.
- B. In areas where exposed conduit is used, receptacles and switches shall be surface mounted as shown on the Contract Drawings.
- C. Receptacles and switches located in finished areas, where concealed conduits are used shall be flush-mounted and provided with approved cover plates, installed level and plumb, with all four corners and edges in contact with finish surface.

#### **3.02 FIELD TESTS**

Prior to energizing circuitry, test wiring for electrical continuity and short circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements of this Section.

#### **3.03 PROTECTION**

After receptacles and wall plates have been installed, exercise care in use of convenience outlets. Prior to final inspection, replace devices that have been damaged.

END OF SECTION

## **SECTION 262726**

### **WIRING DEVICES**

#### **APPENDIX A**

#### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Shop Drawings
  - 1. Installation details for surface mounted receptacles and switches.
  - 2. Installation details for "poke-through" assemblies.
  - 3. Installation details for floor service receptacles.
- B. Catalog Cuts
  - 1. Receptacles.
  - 2. Switches.
  - 3. Wallplates.
  - 4. Ground fault circuit interrupter receptacles.
  - 5. Poke-through assembly devices.

END OF APPENDIX "A"

**DIVISION 26****SECTION 262800****OVERCURRENT PROTECTIVE DEVICES (600 VOLTS OR LESS)****PART 1. GENERAL****1.01 SUMMARY**

- A. This Section specifies requirements for overcurrent protective devices.
- B. The types of overcurrent protective devices specified in this Section are:
  - 1. Low Voltage Power Air Circuit Breakers
  - 2. Molded Case Circuit Breakers
  - 3. Safety Switches
  - 4. Fuses

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

American National Standards Institute (ANSI)

- |              |  |
|--------------|--|
| ANSI C 37.13 | Low Voltage AC Power Circuit Breakers used in enclosures                                   |
| ANSI C 37.16 | Related Requirements and application recommendation for Low Voltage Power Circuit Breakers |
| ANSI C 37.50 | Test Procedures for Low Voltage AC Power Circuit Breakers                                  |
| ANSI C 97.1  | Low Voltage Cartridge Fuses 600 Volts or Less  |

National Electrical Manufacturers Association (NEMA)

- |           |   |
|-----------|---|
| NEMA AB-1 | Molded Case Circuit Breakers and Molded Case Switches |
| NEMA KS-1 | Enclosed Switches                                     |

National Fire Protection Association (NFPA)

- |         |                          |
|---------|--------------------------|
| NFPA 70 | National Electrical Code |
|---------|--------------------------|

Underwriters Laboratories Inc. (UL)

- |        |   |
|--------|---|
| UL 98  | Enclosed and Dead Front Switches                            |
| UL 198 | Safety Standard for Fuses                                   |
| UL 489 | Molded Case Circuit Breakers and Circuit Breaker Enclosures |
| UL 943 | Standard for Ground Fault Circuit Interrupters              |

Federal Specifications (FS)

- |              |   |
|--------------|---|
| W-C-375B/Gen | Circuit Breakers, Molded Case; Branch Circuit and Service   |
| FSW -S-865   | Covers Surface-mounted, Air-break, Box or Enclosed Switches for Ratings through 500 Volts, 1200 Amperes and 50 Horsepower |



### 1.03 DESIGN AND PERFORMANCE REQUIREMENTS

The overcurrent protective devices and associated materials shall conform to all applicable standards, and shall also conform to the requirements specified herein and shown on the Contract Drawings.

### 1.04 QUALITY ASSURANCE

Overcurrent protective devices of types and ratings required, shall have been satisfactorily used for purposes similar to those intended herein for not less than three years.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Overcurrent protective devices to be installed in an assembly, as shown on the Contract Drawings, shall be mounted in the assembly and delivered in accordance with the manufacturer's specifications for such assembly.
- B. Overcurrent protective devices to be installed in their own enclosures, as shown on the Contract Drawings, shall conform to the following requirements:
  - 1. Enclosures shall be packaged with material to prevent damage to components due to vibration, jarring and the like during transportation and handling.
  - 2. Enclosures shall be delivered in the manufacturer's original, unopened, protective packaging and shall be identified with suitable non-corrosive tags.
- C. Where possible, maintain protective coverings until installation is complete and remove such coverings as part of the final cleanup.

### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

### 1.07 SPARE PARTS

Furnish a minimum of three but not less than 10% spare fuses of each type and rating required and shown on the Contract Drawings.

## **PART 2. PRODUCTS**

### 2.01 MANUFACTURERS

- A. Subject to compliance with the requirements of this Section, provide low voltage power circuit breakers, molded case circuit breakers, safety switches and fuses of one of the manufacturers specified on the Contract Drawings.

### 2.02 MATERIALS

- A. General
  - 1. Location, types, sizes, ratings and enclosures for overcurrent protective devices are shown on the Contract Drawings.
  - 2. Overcurrent protective devices mounted in their own enclosures as shown on the Contract Drawings shall conform to the requirements of NEMA, UL, and NFPA. Enclosures shall be as specified in the Section of these Specifications entitled "PANELBOARDS".
  - 3. Overcurrent protective devices, to be installed as part of an assembly unit, shall be installed in accordance with the manufacturer's requirements for the specified assembly or as shown on the Contract Drawings.

4. Overcurrent protective devices and enclosures for which there are established UL standards, shall bear the UL label.
- B. Low Voltage Power Air Circuit Breakers
1. General
    - a. All circuit breakers shall be 3 pole, single throw, 600V AC class, 60 Hz, trip free, with stored energy closing. Controls shall be as shown on the Contract Drawings.
    - b. Circuit breakers shall be of the draw-out type with self-aligning fingers to engage the line and load primary terminals.
    - c. The draw-out mechanism shall firmly support the breaker from the fully connected to the fully disconnected positions and shall be so designed as to permit racking the breaker without opening the door in all three positions: connected, test, and disconnected.
    - d. Interlocks shall be provided to prevent racking the breaker from the connected position to the test or disconnected position, or moving the breaker into the connected position while the breaker is closed.
    - e. Required circuit breaker sizes and ratings shall be as shown on the Contract Drawings.
    - f. In addition to all contract requirements to achieve the operation indicated on the Contract Drawings and specifications, provide the following spare contacts rated 125 VDC, 20 amperes continuous.
      - (1) A minimum of two normally open and two normally closed contacts, which shall operate when the breaker is in the fully connected position.
      - (2) A minimum of one normally open and one normally closed contacts, which shall operate when the breaker is withdrawn from the fully connected position. Contacts shall be rated 125V DC, 20 amperes continuous.
    - g. Provide a position indicator visible from the front of the switchgear for each breaker to indicate whether the breaker is open, tripped or closed.
    - h. Tripping shall be through integrally mounted solid state overcurrent and short circuit trip units with adjustable settings for long time, short time and instantaneous trip unless otherwise shown on the Contract Drawings.
  2. Manually Operated Breakers
    - a. Provide manually operated circuit breakers with a front mounted handle to manually charge the stored energy closing mechanism.
    - b. Breakers shall be mechanically trip free and shall be furnished with provisions for the future addition of a control solenoid for remote closing.
    - c. Provide a mechanical trip and close button on the front of each breaker.
    - d. Provide a maintenance handle for slow closing during contact adjustment.
  3. Electrically Operated Breakers
    - a. Provide electrically operated breakers with a motor- operated, stored-energy, closing mechanism. Motor voltage shall be as shown on the Contract Drawings.
    - b. Breakers shall be electrically and mechanically trip-free and each shall be provided with an electrically operated spring release to close the breaker.
    - c. Provide a mechanical trip button on the front of each breaker.
    - d. Provided an electrical close button or control switch on the front of each breaker.

- e. Provide a maintenance handle for slow closing during contact adjustment.
  - f. Provide breakers with a shunt trip device for remote operation, arranged for both local and remote control of the closing and tripping functions.
4. Fused Circuit Breakers
- a. Where shown on the Contract Drawings, fused circuit breakers shall be provided.
  - b. The fuses shall be current limiting type and shall be integrally or separately mounted units coordinated with overcurrent trip devices so as to avoid unnecessary blowing of the fuses.
  - c. Fused breakers shall have a blown fuse indicator and lockout device. The lockout device shall trip all phases upon blowing and prevent the breaker from being closed with any fuse element blown. Operation of the breaker shall not be permitted by this device until the fuse is replaced and the lockout reset.
  - d. The blown fuse indicator shall be visible from the front of the breaker and shall indicate which fuse has blown.
  - e. When a Protective Device Coordination Study is performed, the fuse rating shall be in accordance with the requirements of the protective study.
- C. Molded Case Circuit Breakers
1. General
- a. Molded case circuit breakers for panel or individual mounting shall be molded-case type, quick-make and quick-break on manual or automatic operation. The handle mechanism shall be trip-free to prevent holding contacts closed on a fault. Tripping shall be indicated by the handle automatically assuming a position between the manual "off" and "on" positions.
  - b. Molded case circuit breaker contacts shall be of the high-pressure type and shall be made of a silver composition material. Arc shields shall be provided to confine, cool, and quench the arc drawn at interruption.
  - c. Continuous ampere ratings and number of poles shall be as shown on the Contract Drawings.
  - d. Molded case circuit breakers shall be bolt-on type. Unless otherwise shown on the Contract Drawings or as required by the system interrupting rating, all 120V or 208V circuit breakers shall have a minimum short circuit interrupting rating of not less than 10,000 amperes (RMS symmetrical) and all 277V or 480V breakers shall have a minimum short circuit interrupting rating of not less than 18,000 amperes (RMS symmetrical).
  - e. All molded case circuit breakers feeding 120V or 277V lighting circuits that are not controlled by local wall switches shall be UL approved type "SWD" circuit breakers.
  - f. Each molded case circuit breaker shall be suitable for the circuit on which it is applied and the load that it controls.
  - g. Accessories including, but not limited to, auxiliary switches, shunt trips, undervoltage trips, ground fault sensing and tripping shall be as shown on the Contract Drawings.
2. Thermal-Magnetic Circuit Breakers
- a. Circuit breakers up to, but not including 400 amperes shall be thermal magnetic trip. Electronic trip circuit breakers rated 100 amperes or higher may be provided in lieu of thermal magnetic type.

- b. Automatic operation of the molded case circuit breaker shall be obtained by means of calibrated thermal and magnetic tripping devices for each pole of the breaker. The thermal device shall provide time-delay tripping on overloads, and the magnetic device shall provide instantaneous tripping on short circuits. The instantaneous magnetic trip shall be adjustable and accessible from the front of the breaker on frame sizes above 100 amperes.
- 3. Electronic Trip Circuit Breakers
  - a. Circuit breakers rated 400 amperes and higher shall be electronic trip.
  - b. The integral trip system shall be independent of any external power source and shall contain industrial grade electronic components as a minimum.
  - c. Circuit breakers shall be equipped with back-up thermal magnetic trip system unless otherwise indicated on the Contract Drawings.
  - d. Circuit breaker trip system shall be a microprocessor based true rms sensing design.
  - e. The sensor size rating plug and adjustment positions shall be clearly marked on the face of the circuit breaker.
  - f. The following time/current adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.
    - Long time pick up
    - Long time delay
    - Short time pick up
    - Short time delay
    - Instantaneous pick up
    - Ground fault pick up
    - Ground fault delay
  - g. A means to seal the trip unit adjustments in accordance with NEC shall be provided.
  - h. Local visual trip indication for overload short circuit and ground fault trip occurrences shall be provided.
- D. Safety Switches
  - 1. Safety switches shall conform to NEMA KS-1, UL 98 and FSW-S-865.
  - 2. Safety switches shall conform to the NEMA classification and shall be rated, as shown on the Contract Drawings.
  - 3. Safety switches utilized for service entrance shall include a groundable insulated neutral.
  - 4. Safety switches shall be of the quick-make, quick-break type with terminals suitable for copper conductors, shall be padlockable in the "off" position and shall be equipped with defeatable door interlocks.
- E. Fuses
  - 1. Fuses shall be of the class, size and ratings (current, voltage, interrupting capacity, type, NEMA class) as shown on the Contract Drawings.
  - 2. Fuses shall conform to UL 198 and ANSI C97.1 for low voltage fuses.
  - 3. Unless otherwise shown on the Contract Drawings, fuses used in conjunction with motor protection shall be current limiting, dual element, time-delay type.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

##### **A. General**

Unless otherwise shown on the Contract Drawings, overcurrent protective devices shall be installed in conformance with NFPA 70, and UL 98, in accordance with the manufacturer's instructions and in accordance with the requirements of this Section.

##### **B. Fuses**

1. All fuses rendered inoperative during the Work shall be replaced before the issuance of the Certificate of Final Completion.
2. All replacement fuses shall be provided in addition to the spare fuses specified in 1.07 herein.

END OF SECTION

## **SECTION 262800**

### **OVERCURRENT PROTECTIVE DEVICES (600 VOLTS OR LESS)**

#### **APPENDIX "A"**

##### **SUBMITTALS**

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Attachment C - Scope of Work and Engineering Technical Specifications:

- A. Shop Drawings
  - 1. Fuses; time-current and current-limiting curves for both melting and clearing.
  - 2. Circuit breakers; time-current curves.
  - 3. Fused circuit breakers - time current curves.
- B. Catalog Cuts
  - 1. Low Voltage Power Air Circuit Breakers.
  - 2. Molded case circuit breakers.
  - 3. Safety Switches.
  - 4. Fuses.

END OF APPENDIX "A"

## ATTACHMENT D – COST PROPOSAL FORM

Item	Lump Sum Amount
1. SDS Support and Equipment:	
a. Equipment	\$
b. Pre and Post Installation Surveys	\$
c. Design Reviews and Meetings	\$
d. Testing & Commissioning	\$
e. Training	\$
f. 3-Year Warranty	\$
2. Engineering Design Services	\$
3. Electrical Installation	\$
4. Architectural Installation	\$
5. Preinstallation Acceptance Testing	\$
6. Performance Verification Testing & Acceptance	\$
7. Maintenance Program	\$
<b>Total Estimated Contract Price:</b>	<b>\$</b>

All costs shall be all-inclusive to include, but not be limited to, material and labor costs, travel costs, any salaries, health benefits and other benefits, overhead and profits.

## ATTACHMENT E – PROPOSER REFERENCE FORM

Name of Proposer: \_\_\_\_\_

Please provide a list of references on the firm's performance of similar work within the last five years, including all current contracts. Use additional sheets as necessary.

Include the following information for each reference:

Customer Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Name and Title: \_\_\_\_\_

Phone and Fax Numbers of Contact: \_\_\_\_\_

Contract date(s): \_\_\_\_\_

Contract cost: \_\_\_\_\_

Description of work:

---

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Customer Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Name and Title: \_\_\_\_\_

Phone and Fax Numbers of Contact: \_\_\_\_\_

Contract date(s): \_\_\_\_\_

Contract cost: \_\_\_\_\_

Description of Work:

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Customer Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Name and Title: \_\_\_\_\_

Phone and Fax Numbers of Contact: \_\_\_\_\_

Contract date (s): \_\_\_\_\_

Contract cost: \_\_\_\_\_

Description of work: \_\_\_\_\_



## **ATTACHMENT F – STATEMENT OF SUBCONTRACTOR PAYMENTS**

### **INSTRUCTIONS FOR STATEMENT OF SUBCONTRACTOR PAYMENT**

Attached is the Statement of Subcontractors Payment Form, PA3968, which is also accessible at <http://www.panynj.gov/business-opportunities/pdf/pa3968.doc>. This completed form shall be submitted with every invoice to be used in conjunction with the MBE/WBE Participation Plan.



## PA3968 / 03-09

**Instructions for Statement of Subcontractor Payment:** To be submitted with every invoice to be used in conjunction with the MBE/WBE Participation Plan.

Date of Invoice:

Committed MBE/WBE Goals:	M	W
--------------------------	---	---

Award Date:

Completion Date: \_\_\_\_\_

MBE/WBE Participation to Date:	M	W
--------------------------------	---	---

Subcontractor's Name	Address & Phone #	Description of Work Performed or Materials Supplied	MBE/WBE Status	Total Contract Amount Awarded	Total Previous Requests	Amount Paid to Date	Amount of This Request

In connection with the above-captioned contract: I HEREBY DECLARE AND AFFIRM that I am a duly authorized representative of this company, and that the following Minority and Women Business Enterprises have been contracted with and have furnished, or are furnishing and preparing materials for, and have done or are doing labor on the above captioned contract; that there is due and to become due them, respectively, the amounts set opposite their names for materials or labor as stated; and that this is a full, true, and complete statement of all such MBEs/WBEs and of the amounts paid, due, and to become due to them.

Date \_\_\_\_\_

## **ATTACHMENT G – CERTIFIED ENVIRONMENTALLY PREFERABLE PRODUCTS/PRACTICES**

**Proposer Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

In line with the Port Authority's efforts to promote products and practices which reduce our impact on the environment and human health, Proposers are encouraged to provide information regarding their environmentally preferable/sustainable business practices as they relate to this contract wherever possible. Proposers **must** complete this form and submit it with their response, if appropriate. Proposers **must** submit appropriate documentation to support the items for which the Proposer indicates a "Yes" and present this documentation in the proper sequence of this Attachment.

### **1. Packaging**

Has the Proposer implemented any of the following environmental initiatives? (A checkmark indicates "Yes")

- \_\_\_\_\_ Use of corrugated materials that exceed the EPA recommended post-consumer recycled content
- \_\_\_\_\_ Use of other packaging materials that contain recycled content and are recyclable in most local programs
- \_\_\_\_\_ Promotes waste prevention and source reduction by reducing the extent of the packaging and/or offering packaging take-back services, or shipping carton return
- \_\_\_\_\_ Reduces or eliminates materials which have been bleached with chlorine or chlorine derivatives
- \_\_\_\_\_ Eliminates any packaging that may contain polyvinyl chloride (PVC), or polystyrene or heavy metals

**If yes, a description of the practices being followed must be included with the submission.**

### **2. Business Practices / Operations / Manufacturing**

Does the Proposer engage in practices that serve to reduce or minimize an impact to the environment, including, but not necessarily limited to, the following items? (A checkmark indicates "Yes")

- \_\_\_\_\_ Recycles materials in the warehouse or other operations
- \_\_\_\_\_ Use of alternative fuel vehicles or vehicles equipped with diesel emission control devices for delivery or transportation purposes
- \_\_\_\_\_ Use of energy efficient office equipment or signage or the incorporation of green building design elements
- \_\_\_\_\_ Use of recycled paper (that meets federal specifications) in their marketing and/or resource materials
- \_\_\_\_\_ Other sustainable initiative

**If yes, a description of the practices being followed must be included with the submission.**

### **3. Training and Education**

Does the Proposer conduct/offer a program to train or inform customers and employees of the environmental benefits of the products to be offered under this contract, and/or does the Proposer conduct environmental training of its own staff?

☐ Yes      ☐ No      If yes, Proposer must attach a description of the training offered and the specific criteria targeted by the training.

### **4. Certifications**

Has the Proposer or any of its manufacturers and/or subcontractors obtained any of the following product / industry certifications? (A checkmark indicates "Yes")

- \_\_\_\_\_ ISO 14000 or adopted some other equivalent environmental management system
- \_\_\_\_\_ Other industry environmental standards (where applicable), such as the CERES principles, LEED Certification, C2C Protocol, Responsible Care Codes of Practice or other similar standards
- \_\_\_\_\_ Third Party product certifications such as Green Seal, Scientific Certification Systems, Smartwood, etc.

**If yes, Proposers must attach copies of the certificates obtained.**

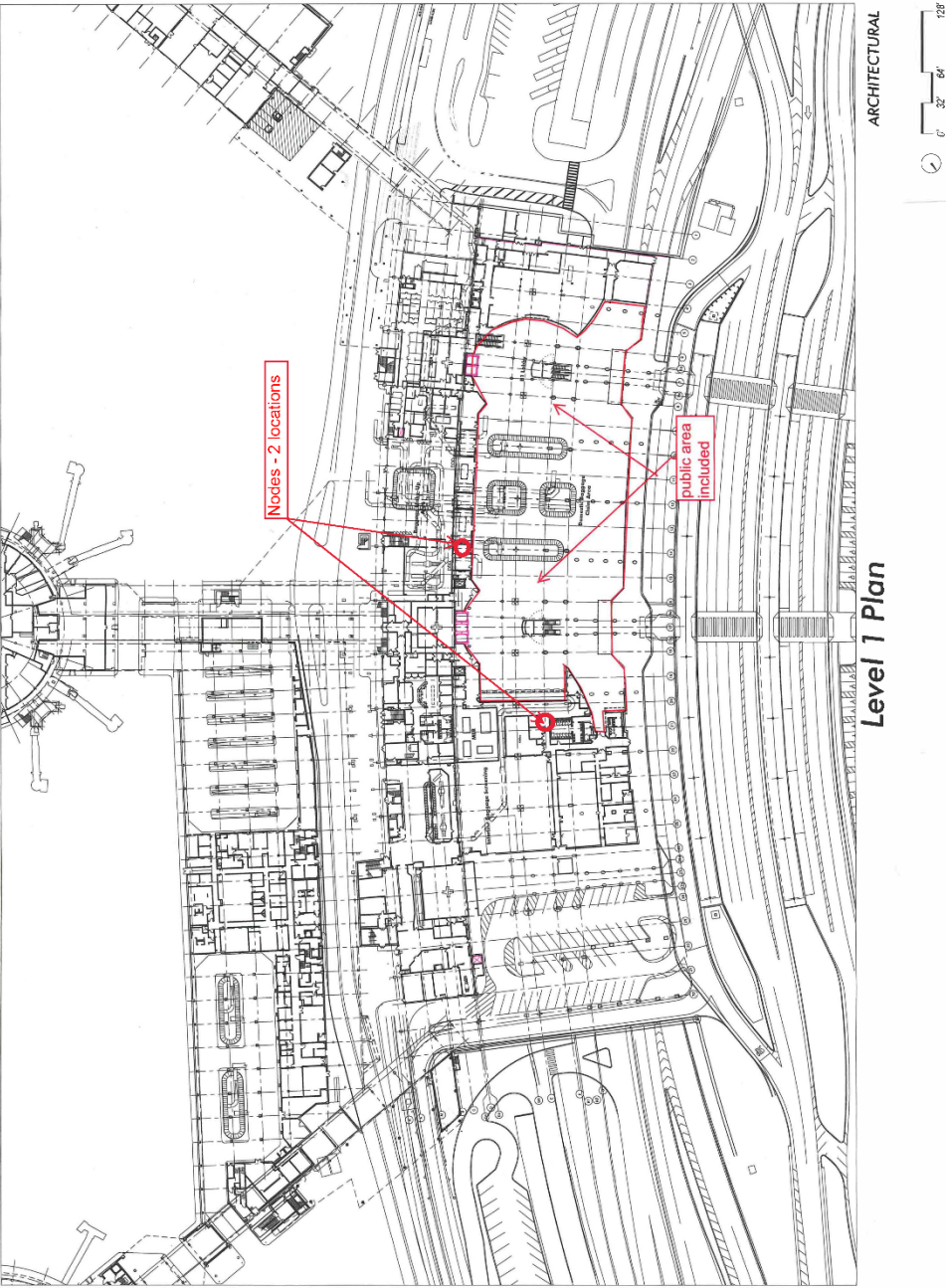
### **5. Other Environmental Criteria**

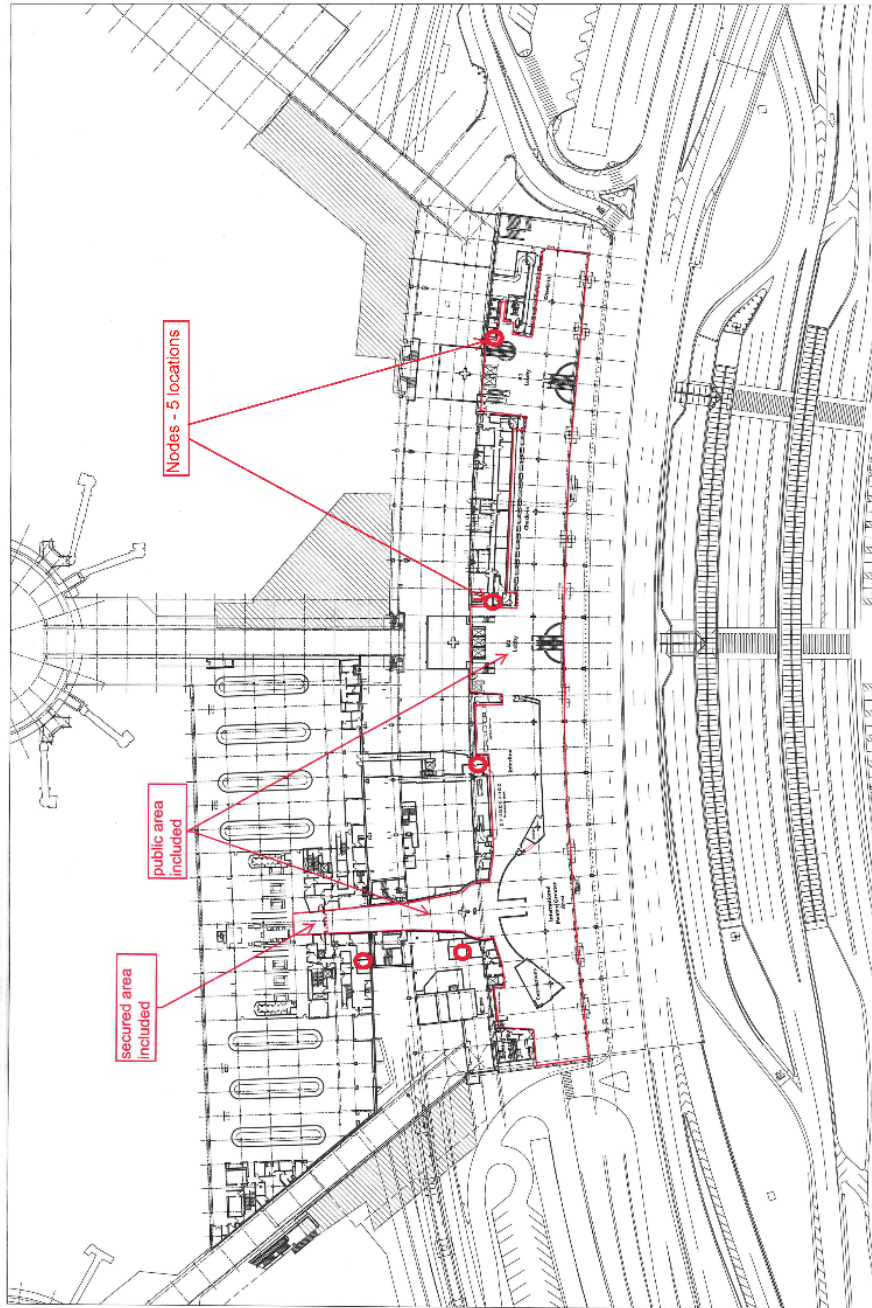
Proposers are encouraged to respond to criteria specifically indicated in this RFP as "Management Approach" (and attach the appropriate documentation) to receive consideration in the evaluation.

I hereby certify, under penalty of the law that the above statements are true and correct.

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

ATTACHMENT H – MAPS/PLANS OF THE COVERAGE AREAS AT EWR



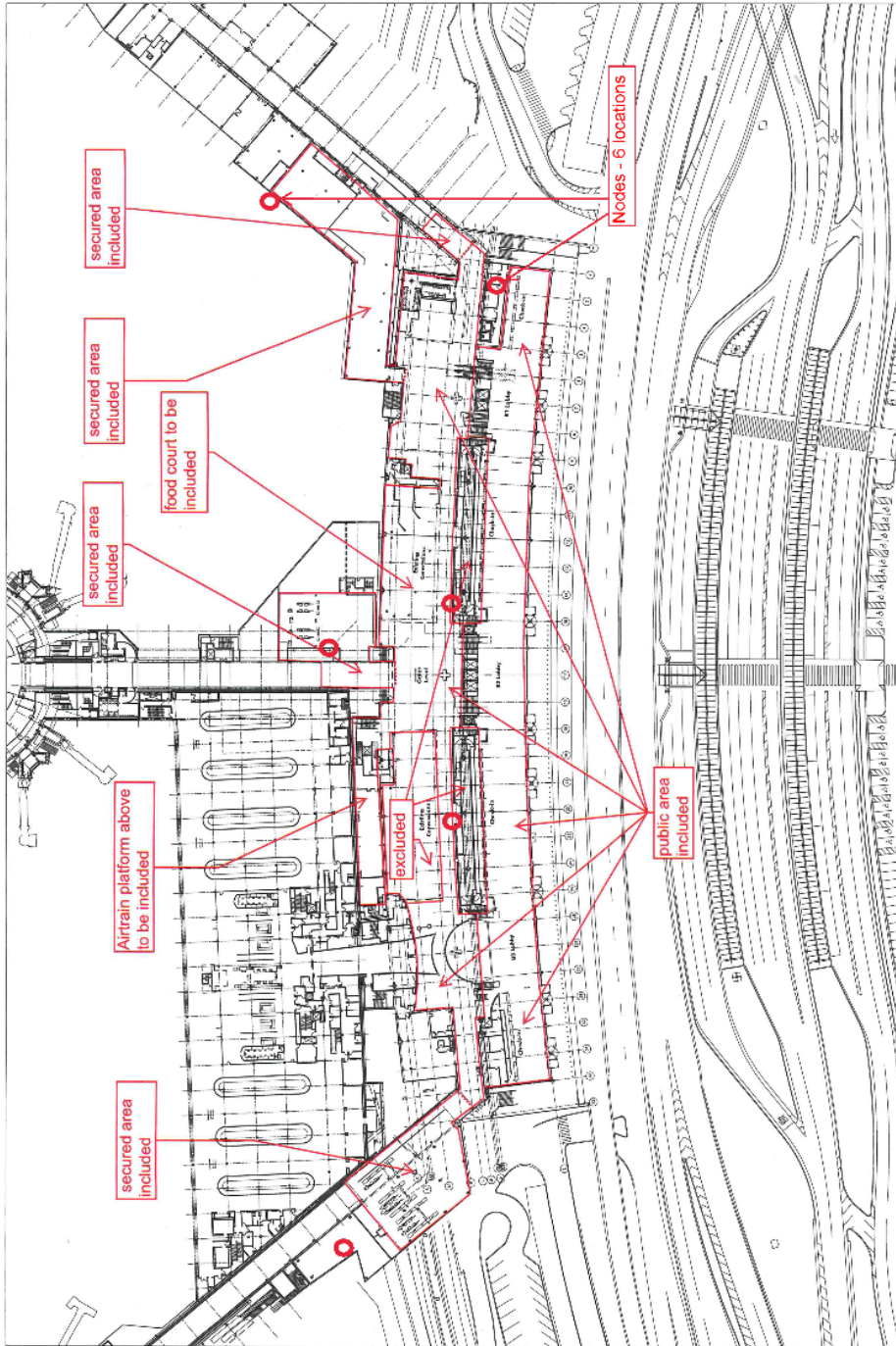


ARCHITECTURAL

Level 2 Plan







Level 3/Gates Level Plan



**ATTACHMENT I – PORT AUTHORITY TECHNOLOGY STANDARDS AND GUIDELINES**

**Technology Department**

# **TECHNOLOGY STANDARDS OVERVIEW FOR THE PORT AUTHORITY**

**Revised May 2018**

**THE PORT AUTHORITY** OF NY & NJ



FOR REFS

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## 1 Introduction

The purpose of this document is to provide an overview of standards established by the Technology Department (TEC) for Information Technology (IT) solutions deployed at The Port Authority of New York & New Jersey (PANYNJ), the Agency.

To that end, this standards overview is intended to help RFP Submitters do the following:

- a. Implement computing and networking solutions to ensure the utmost reliability, availability, and security.
- b. Procure<sup>1</sup> hardware and software that advances business needs in a manner compatible in an ever-changing IT environment that enables departments to work with each other more effectively.
- c. Create solutions that facilitates The Port Authority communication and information exchange in a cost effective and scalable manner.
- d. Achieve greater systems integration so that the application will be interoperable, resulting in cost effectiveness and quality control.
- e. Adherence to these standards ensures that IT investments achieve Enterprise connectivity, interoperability, consistency, and will enhance performance in a cost-effective way.

## 2 The Port Authority Wide Area Network (PAWANET)

### 2.1 PAWANET Overview

The Port Authority has a modern distributed computing network, called the Port Authority Wide Area Network (PAWANET), which is managed as an enterprise resource. It connects all the various Port Authority facilities and transportation systems using high-speed voice, data, and video lines or links.

This network is crucial to all Port Authority businesses because it provides connections for applications, such as e-Mail, Internet, Intranet, Enterprise Applications, and more.

PAWANET consists of a Managed Fiber Optic Dense Wave Division Multiplexed (DWDM) Network, provided by Verizon Select Services, as an Integrated Optical Service (IOS) network. This network consists of eleven separate and distinct (1) Gbps lightwave networks, each interconnecting with the Port Authority's data centers. Site-to-Site interconnectivity is achieved via the "hub and spoke" topology through the data centers. Additional high-speed Ethernet Private Lines (EPL) have been deployed to support key Port Authority off-ring facilities.

Remote locations are linked using redundant high-speed dedicated point-to-point leased communication lines. Wireless connectivity also supported when hardwired connections are not practical.

The network consists of state-of-the-art Cisco Systems equipment and services. The Port Authority uses a managed Network Monitoring Services to monitor PAWANET, and Cisco Systems SMARTnet hardware/software maintenance services, and Cisco's Technical Assistance Center (TAC) to support and maintain the network. The Authority has also deployed network performance monitoring products to provide performance data on end user workstations and systems.

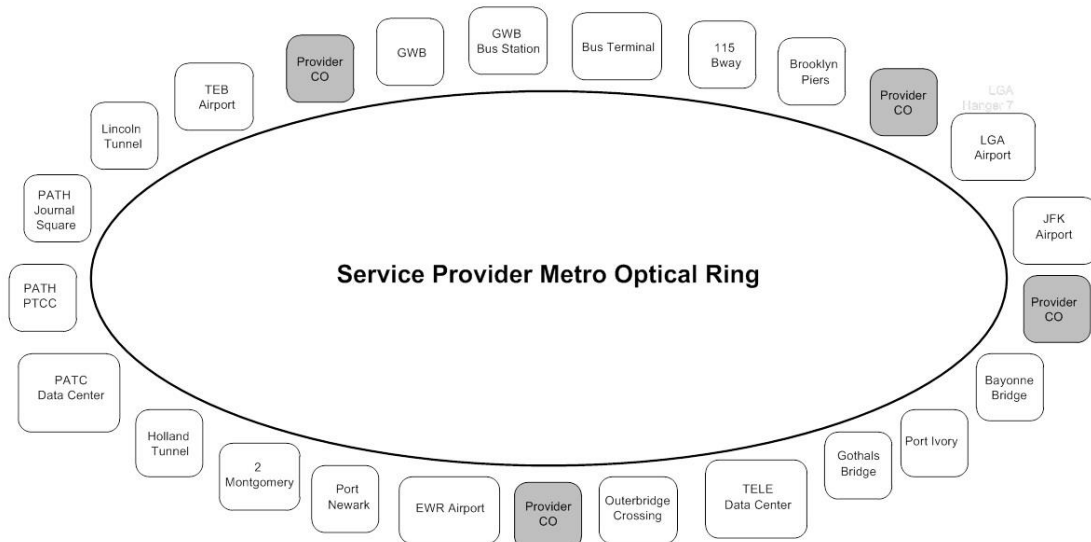
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<sup>1</sup> With the assistance of the Technology Department.

## 2.2 PAWANET Circuit Diagram

The current PAWANET network is being upgraded.

### Provider-Managed Metro Optical Network



## 2.3 Inter-site Services Providers

The Technology Department has contracted with a variety of companies to provide inter-site services. Companies providing communications services for the Wide Area Network are listed below.

AT&T Local Services

Verizon

## 2.4 PAWANET Functions

Currently, PAWANET is used to transport the following:

Data	Supports the low and high-volume transfer of data used for applications and for network communications, such as e-mail. Provides a data path for off-site, data backup of file, print and application servers. Enables the use of Storage Area Network (SAN) for network storage of user files and routing jobs to shared network printers.
Video	The transfer of Closed Circuit TV (CCTV) data is supported across the entire network to provide visibility to the Port Authority's key facilities.
Voice/VoIP	The network provides the hardware capabilities for voice and VoIP transmission. Voice over Internet Protocol (VoIP), which currently serves the majority of Port Authority users, is in the process of being implemented to replace the legacy Nortel system.

Videoconferencing	The network switches and transmission lines are used for videoconferencing to enable diversely located staff participate in meetings across large geographic area.
-------------------	--

## 2.5 Features of PAWANET

PAWANET provides a high performance, resilient, and reliable fail-safe communications network. These are its key features:

- a. Alternate paths of communication
- b. Internet access
- c. Support of high volume traffic
- d. Cisco switches at all the major sites
- e. Cisco high performance router family products with redundant power supplies

## 2.6 Supported Protocols

The network supports the following network protocols, allowing dissimilar platforms to communicate within PAWANET:

TCP/IP:	TCP/IP is the universal protocol that allows communications between all systems within the Port Authority's network, as well as other networks.
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## 2.7 PAWANET Switches and Routers

The current standard switches and routers used on PAWANET change from time to time. Contractors must consult with the Technology Department before project / solution implementation to obtain current standards.

## 2.8 Approved Servers

Only IBM servers may be connected to PAWANET.

This includes turnkey, distributed systems, where Application servers are being used. Any replacement servers must be IBM servers. Deviation from this policy will not be allowed without prior approval of the Chief Technology Officer (CTO) or their designee.

## 2.9 Enterprise Addressing Scheme (including IP addressing)

The Port Authority's enterprise network is a TCP/IP Class B network allowing for a maximum of 255 subnet assignments. Subnets are assigned on a geographical basis according to the number of resources required. Workstations are configured for dynamic assignment of IP addresses via Dynamic Host Configuration Protocol (DHCP).

The Technology Department will assign static IP addresses for servers, printers, faxes and/or IP enabled device (e.g. CCTV Cameras etc.) that are to be connected to PAWANET.

## 2.10 Enterprise Network Monitoring Software

The Port Authority has a managed Network Monitoring Services to continually provide real time monitoring of PAWANET, and its data and voice link availability.

## 3 Network Resources

### 3.1 Network Overview

The Port Authority has a modern distributed computing network, which is managed as an Enterprise resource. The network connects all individual PCs, servers, printers, and other devices in a unified computing infrastructure that makes it possible for the Port Authority to conduct its business.

The Enterprise Network consists of the PAWANET (see Section 1.1) and connected Local Area Networks (LAN's). The line of demarcation between the cable and wiring is the responsibility of the carrier and the Port Authority's area of responsibility is usually a wiring closet.

The Port Authority's Enterprise Network consists of, but not limited to, the following components on the Port Authority side of demarcation:

- a. Enterprise Devices
- b. Cabling
- c. Routers
- d. Switches
- e. Wiring Closets
- f. Communications Equipment Racks
- g. Server Racks
- h. File and Print Servers
- i. Application Servers
- j. Storage Area Networks (SAN)
- k. Network Printers

Security Devices (Video Encoders, IP Cameras, ACS Panels)

- l. LAN Devices
  - i. Desktop PCs
  - ii. Workstations
  - iii. Voice Over IP Phones
  - iv. Laptops
  - v. Video Conference Units
  - vi. Local Printers
  - vii. Scanners
  - viii. Copiers
  - ix. PC Peripherals

### 3.2 Enterprise Network Architecture

The Port Authority operates an extensive network of Enterprise file, print, and application servers. These devices are linked to an Enterprise Wide Area Network. The flexibility provided by multiple servers, server clusters and Storage Area Networks (SAN) offers users improved network response, greater reliability, increased data security and reduced operating cost. Adherence to the standards outlined in this section allows the Port Authority to manage their systems, applications and data in a way that best meets our business needs while maintaining interoperability and safeguarding Port Authority's information assets.

### 3.3 Server Operating System and Software

All Enterprise servers in the Port Authority are currently based on the Windows operating system. However, Linux<sup>2</sup> servers are also supported as application servers when required for functionality.

In addition to the base operating system, all Enterprise and application servers must include the following components:

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<sup>2</sup> Red Hat distribution



- a. Virus Protection
- b. Network Security
- c. Remote Monitoring and Management
- d. Intrusion Detection
- e. Systems Backup
- f. Uninterrupted Power Supply (If central UPS is not installed at the location)
- g. Current Service Packs and security patches<sup>3</sup>

These components are needed to ensure a consistent management framework for all operating system instances running the The Port Authority's business applications.

Note: All standard operating system and server software will be provided and configured, by the Technology Department.

### **3.3.1 Configuration**

All network devices--including servers, workstations, network printers, and network faxes--must use IP addresses which conform to the standards outlined in sections, 2.9 Enterprise Addressing Scheme, and 2.3.1, Server Names.

#### **3.3.1.1 Drive Mapping Conventions and Organization**

Mapping of workstation drive pointers to SAN or server disk volumes or folders is accomplished through a Windows Active Directory Login Scripts. There are drive letters which are reserved for the The Port Authority's use. Contractors must consult with the Technology Department before project / solution implementation to obtain an appropriate mapped drive.

This will ensure consistent naming conventions and security permissions are appropriately applied.

#### **3.3.1.2 Connecting LAN Devices to the Enterprise Network**

The Technology Department is responsible for connecting all LAN devices to the Enterprise Network (PAWANET) provided they meet the Port Authority's standards.

Contractors must consult with the Technology Department during the solution design phase to ensure device compatibility and security needs.

### **3.3.2 Network Resources Security**

#### **3.3.2.1 Server Physical Security**

All servers and communication equipment must be located in locked rooms secured with a cable and lock or secured with access control technology to prevent tampering and unauthorized usage.

#### **3.3.2.2 Server Logical Security**

To safeguard the Port Authority's Information Technology (IT) systems and data, Technology Department has implemented a number of processes and procedures, including the requirement that all users accessing the Port Authority's networks authenticate to the network using the Enterprise Directory Platform Service.

This Directory Platform Service is the central repository for all computing accounts and provides a common authentication datastore for all identities.

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<sup>3</sup> Including the "governance" to manage monthly Operating System security patches by leveraging the Agency's centralize operations console.

The Technology Department is responsible for providing all enterprise servers with the following protection of their logical resources:

- a. Guard against unauthorized access.
- b. Perform daily incremental backups of servers and authorized workstations and full backups weekly.
- c. Store all monthly backups off site at a secure location and secure daily and weekly backups on-site in a locked area.
- d. Test recovery procedures annually.
- e. Use system and application passwords that conform to the Technology Department standards.
- f. Provide Dual-Factor Authentication Services to protect identities.
- g. Control all remote access using the Port Authority's Remote Access System.
- h. Maintain current patch levels and critical security updates.

### **3.3.3 Network Access and User Account Security**

#### **3.3.3.1 Account Creation**

User accounts are created and managed in the Enterprise Directory Platform Service. The creation of user accounts and authority for access is managed (on-boarding / off-boarding) by the Customer Service Unit within the TEC Department.

#### **3.3.3.2 Modems and Switches**

Staff and Contractors are prohibited from connecting dial-up modems and network switches including wireless access points (e.g. Linksys wireless switches) to workstations that are simultaneously connected to PAWANET or another internal communication networks unless approved by the Technology Department. This will ensure better network and information security management practices.

Where modems have been approved, users must not leave modems and/or switches connected to personal computers in auto answer mode, such that they are able to receive in-coming dial-up calls.

### **3.3.4 Remote Access System**

The use of local modems to establish direct dial connections to devices on the Port Authority's network is prohibited. Exceptions to this policy require the approval of the Technology Department's Chief Technology Officer.

The approved mechanism for remote access to the Port Authority network is through the Remote Access System (RAS). The Remote Access System utilizes an Internet-based Virtual Private Network (VPN) tunnel established over the Internet linking remote users to the Port Authority Wide Area Network (PAWANET). It is designed to provide authorized Port Authority users with secure access to corporate applications and to files available on their departmental file servers. Once connected to the PAWANET, users with Port Authority-supplied laptops will have access to computing resources as if connected directly to the network. For users using non-Port Authority remote desktops/laptops, once connected to the network, access to applications and resources is delivered through an Application Virtualization Platform Service.

The Port Authority also supports corporate site-to-site VPN connections and utilizes Cisco equipment for these connections, as appropriate.

Remote access is authorized on a case-by-case basis by the Chief Technology Officer.

### 3.3.5 Hardware Standards Overview

The Technology Department's Enterprise Architecture team is responsible for setting the The Port Authority hardware standards. Contractors must consult with the Technology Department before project / solution implementation to obtain the then current hardware standard.

## 3.4 Network Naming Conventions

### 3.4.1 Server Names

The Port Authority employs a naming convention for all servers within PAWANET. That convention will be discussed during a solution implementation phase with the Technology Department.

## 3.5 Directory Services and Structure

The Port Authority uses an Enterprise Directory Platform Service to manage network resources and user access. Port Authority departments are designated as organizational units (OU). Workstations, servers and users are directory objects contained within a given OU.

## 3.6 System Backup and Recovery

The Port Authority uses an Enterprise Backup Platform Service to perform scheduled server backups.

Backup data is stored on disk storage for prompt backup and restore. Encrypted tape backup is stored remotely at a secure facility, and is required to assure off-site disaster recovery data storage. All backup media and records must be treated with the same level of security and confidentiality as the original data.

The System Administrator is responsible for verifying that system backups, both local and remote backups, can be used to restore the data. Tests of the ability to successfully restore from both backup systems should be performed annually. It is recommended that:

- a. Tests of the ability to restore system and application files will be performed on a non-production server.
- b. When incremental or differential backups are routinely used, the test restore procedure should incorporate both.
- c. Immediately prior to performing the test restore procedure, do a special full back up on the directories being tested.

The use of system backup and periodic testing ensures The Port Authority has the ability to support a business continuity event.

### 3.6.1 Backup Logs

The System Administrator will maintain the following logs for a period of three years:

- a. Back-up activity
- b. Rotation of back-ups
- c. Usage/rotation of back-up media
- d. Off-site data storage

### 3.6.2 Backup Scheduling

The System Administrator is responsible for performing back-ups of data, application and system files. This must be as follows:

- a. Weekly full back up of each server. A full back-up is a backup of all files on the server.

- b. Daily differential, incremental or full back up of each server or server cluster. The type of back-up performed is dependent on time constraints and the amount of data to be backed up. Incremental backups are back-ups of all files changed since the last back up. Differential backups are back-ups of all files changed since the last full back-up.
- c. A Grandfather, Father, Son (GFS) scheme based on a 33-tape rotation should be used to ensure complete back-up, recovery and BCP protection.

### 3.7 Business Resumption Plan

Contractors, providing IT services to the Port Authority, shall work with the Technology Department to develop a disaster recovery and contingency plan. The System Administrator will participate in the planning, design, implementation, testing, updating and documentation of the plan. [Appendix 1](#) shows a recommended outline for such a plan. The Business Resumption Plan shall be updated and tested at least annually and more frequently based on the critical nature of the business function supporting the business. This will ensure a timely recovery should the need arise.

### 3.8 Telecommunications Standards Overview for Enterprise Network Resources

Please refer to attached appendices for the following telecommunications components

- [Appendix 2](#) - Communication Rooms/Closets Standards
- [Appendix 3](#) - Standard Cabling Schemes
- [Appendix 4](#) - Unified Wiring Specifications
- [Appendix 5](#) - Telephone Closet / IDF Termination Blocks
- [Appendix 6](#) - Workstation Jacks
- [Appendix 7](#) - Standard Switches
- [Appendix 8](#) - Workstation and Lateral Cable Identification Management
- [Appendix 9](#) - Fiber Optics Specifications for Network Services - PAWANET

#### 3.8.1 Closet and Telecommunications Room Access

The following standards must be followed regarding access to closets and communication rooms:

- a. All telecommunications rooms must be physically secured. Remote locations, which are not secured, by a guard or within line of sight of personnel, must be secured by a card access system and/or video cameras.
- b. The Network Connections (NC) group is responsible for installing routers and station drops. They also patch connections and troubleshoot LAN cabling.
- c. System Administrators requiring routine maintenance of data communications equipment should call the Customer Support Desk when new devices or reconfigurations are required.

#### 3.8.2 Telecommunications Installation Contractor's Responsibilities

- a. Adherence to all of the above specifications
- b. Assurance of labor harmony
- c. The contractor must supply all cable, blocks, brackets, connectors, jacks, housings, face plates, special tools, etc., as necessary to perform an installation which is satisfactory to the Port Authority.
- d. The contractor must label every workstation (jack faceplate) and the corresponding cross connect point (punch down block or patch panel) in accordance with the cable identification management plan, as previously described.
- e. Install all Category 5e/6 cabling in the proper manner, with the appropriate number of twists, to maintain Category 5e/6 integrity and capabilities, as outlined in the TIA/EIA 568-B.2 standard.
- f. The contractor must ensure that cable connections are in accordance with standard telecommunications practices and that all cabling maintains normal connectivity and continuity.
- g. All materials must be agreed upon by the Port Authority Network Services prior to the start of installation.
- h. All computer or network communication rooms and closets are to be isolated, locked, and secured. No other equipment, storage area, or smoking area are to be located in this room. This room must provide appropriate cooling and ventilation. Access to this room will be reserved to the Technology Department staff and an agreed upon Facility Manager or designee of the site where the PAWANET equipment is located. This procedure is to ensure the security and the integrity of the Port Authority's computer network and its users.

### 3.8.3 Electrical Requirements

The following power and receptacles should be installed to support different equipment requirements such as:

- a. Standard 110/120 volt power receptacles
- b. Standard and/or NEMA L6-30P 220/240 volt 30 amp power receptacles
- c. Dedicated circuit breaker per AC feed, with alternate power source.
- d. Server rack electrical requirements are specified in the appropriate design document.

Currently, services obtained through the Port Authority's contract are required to have the APC (American Power Conversion) UPS included in the delivered service.

### 3.8.4 Telephone Company Interface

The following items are needed for the telephone company interface, if needed for a specific Contractor solution:

- a. Install a dedicated wallboard for Telco demarcs (if none available for implementation)
- b. Standard Telco demarcs:
  - i. P66 Block
  - ii. Network Termination Unit (Rj48 interface) Smartjacks
  - iii. Network Termination Unit (DB15-pin female interface)
  - iv. Network Termination Unit (V.35/V.36 female interface)
  - v. Digital Signal X-connect (DSX)
  - vi. Basic T1 CSU/DSU
  - vii. Basic DS3 handoff coax/HSSI unit
  - viii. High-speed dialup modems for network trouble-shooting when needed

## 3.9 Documentation

It is the responsibility of the System Administrator to update and maintain a library of all documentation designated as standard by the Port Authority. These include archived system files and system backups. Contractors will be provided our "Guide to Systems Administration" during the implementation phase of a project. The "Guide to Systems Administration" covers the provisioning and setup of computing &

networking resources to successfully implement a project within the Port Authority. Contractors will work with the Technology Department during implementation to ensure proper setup, configuration and connectivity to PAWANET.

## **4 Virus Scanning & Management**

### **4.1 Overview**

This section describes the standards for the prevention, detection and removal of computer viruses, (malware). Its purpose is to minimize the risk and negative impact of computer virus infections in the work environment by establishing clearly defined roles, responsibilities and procedures for the effective management of computer viruses. All computing transactions are processed using the Port Authority approved desktops and servers connected to PAWANET. To protect them against viruses and Trojan horses and/or other malicious software, Antivirus and AntiSpyWare is installed. In addition, software restriction policies fully integrated with software policy is applied on all desktops to prevent unauthorized of installation of applications not approved by the Port Authority.

### **4.2 Standard Software**

Standard virus protection software must be installed on all network servers and personal computers, and updated on a regular basis. The Port Authority currently uses an industry-leading Enterprise Anti-Virus and End-Point Security Solution to manage, monitor and maintain end-points. The standard virus protection software protects the integrity and confidentiality of information technology assets and resources communicating over the Port Authority network.

### **4.3 Acquisition and Installation**

The Technology Department maintains current versions of standard virus protection software and virus detection files including configuration-specific instructions for downloading and installing software on network servers and desktops.

## **5 Electronic Mail**

### **5.1 E-Mail Overview**

The Port Authority's Electronic Mail System (E-Mail) is designed to facilitate business communication among employees, job shoppers, contractors, consultants, and outside business associates. This E-Mail system is comprised of an industry-leading Cloud-based E-mail Subscription Service. This solution also includes group calendaring and workgroup collaboration. The Port Authority Electronic Mail System include cyber security protect tools to protect against spams and web attack detection and blocking tools.

### **5.2 Port Authority Email System**

#### **5.2.1 Requesting SMTP Services**

Contractors will request SMTP services from and coordinate its work with the Technology Department.

## **6 Intranet**

### **6.1 Intranet Overview**

The Port Authority Employee Net (eNet) is intended to provide timely information and resources to employees via the web browser on their desktops. eNet is a decentralized collection of web pages, data lookup services and applications that are managed as if they were a centralized enterprise resource. It is accessible to all personal computer workstations on the Port Authority Wide-Area Network (PAWANET). eNet is housed on servers at our Data Centers.

Examples of business information hosted on eNet include, but not limited to:

- a. Departmental Websites
- b. Directories
- c. Corporate Announcements
- d. Reference Materials
- e. Document Collections
- f. Library Services
- g. News Displays
- h. Enterprise and Departmental Applications

#### **6.1.1 Accessibility Standards**

The Technology Department is committed to making all eNet content accessible to persons with disabilities. In order to ensure that all eNet web content is in compliance with accessibility standards and applicable legal requirements, contact the Technology Department before project / solution implementation to ensure solution is ADA (Americans With Disabilities Act) compliant.

## **7 Workstation Hardware and Operating System Software**

### **7.1 Overview**

The Port Authority makes extensive use of computers (workstations) networked into an Enterprise Wide Area Network to accomplish its business objectives. For the purpose of this section, the term computer and/or workstation will be used to reference desktop, laptop and Computer Aided Design (CAD) computing devices. To ensure compatibility with the Port Authority's enterprise network and to make optimal use of its resources, this section defines the standards governing workstations and their configuration and use.

### **7.2 Workstation Operating System Standard**

The Port Authority's standard operating system for workstations are supported versions of Microsoft's Windows Operating System.

### **7.3 Workstation Configuration**

#### **7.3.1 Workstation Naming Conventions**

All departmental workstations must contain a unique computer name.

Contractors must consult with the Technology Department before project / solution implementation to obtain the appropriate naming convention to ensure standardization within the environment.

### **7.3.2 Automated Software Distribution for Computers**

The Port Authority currently uses an industry-leading Enterprise Software Configuration and Operations Management Platform to, at a minimum, perform the following:

- a. Install new, or upgrade existing software on the Port Authority desktop, laptop, and CAD computers.
- b. Create packages to automate system tasks
- c. Patch End-Points

### **7.3.3 Drive Mappings**

Computer drive mappings are automatically accomplished using a login script(s). The script is executed upon successful login to the Port Authority's domain.

### **7.3.4 Standard Workstation Hardware Configurations**

The Technology Department is responsible for setting the computer hardware standards. Standards are typically set annually, or as exceptions to meet business requirements. The standards specify the approved hardware components required by the Port Authority for a specific computing platform (e.g. desktop, laptop, CAD).

Contractors must consult with the Technology Department before project / solution implementation to obtain the then current hardware configuration.

### **7.3.5 Standard Workstation Software**

The Technology Department is responsible for setting the software standards. Standards are typically set, as needed, to support business applications.

Contractors must consult with the Technology Department before project / solution implementation to obtain the then current software standard and/or software exception.

## **7.4 Workstation Security**

Workstation users and their managers are responsible for the security of computer equipment and safeguarding critical corporate data and access to Port Authority network resources. This includes both physically securing equipment as well as logical safeguarding equipment and data. There are other security software deploy to workstations, such as anti-virus, and workstation policies to ensure consistent computing experience.

### **7.4.1 Physical Security**

The method of control should be based on the value of the equipment, the sensitivity of the data, its portability and the degree of exposure to theft. The department's Business Manager should make the appropriate determination of physical security required based on their best business judgment. All servers, UPS, mainframes and network assets are secured with adequate ventilation and restricted access through access control readers, keypad, lock etc.

In all cases, laptops must be secured with a Lock/Cable product (e.g., Kensington).

### **7.4.2 Logical Security**

The Technology Department is responsible for providing for the security of computer resources and devices, such as:

- a. Workstations security mechanisms.
- b. Screen saver passwords are implemented.



- c. All critical data on a network drives are backed up nightly network-based storage.
- d. Hard Drive encryption
- e. File & Folder access permissions<sup>4</sup>

## 8 Distributed Systems Environment

### 8.1 Overview

A number of enterprise servers provide critical application and system services. Different operating systems and configurations may be required for specific applications. This section provides information on the standards for supported systems within the Port Authority.

### 8.2 Microsoft Windows Servers

The standard for general-purpose application servers and File and Print Services is IBM servers. Microsoft Windows<sup>5</sup> is the supported Operating Systems for these servers.

#### 8.2.1 Virtual Environment

The standard for Virtualization Computing is IBM host servers. The Port Authority will provide an industry-leading Hypervisor Platform Service to operate all Contractor-provided applications software.

All applications software must be capable of operating in a virtual environment, unless performance or other requirements mandate a dedicated system.

#### 8.2.2 Windows Data Encryption

For those applications that require additional data security measures, the Technology Department provides additional tools that provide encryption services to protect the data stored in the application's database and file and print devices. All data at rest must be encrypted.

#### 8.2.3 Backup

Critical system backup must be performed regularly (daily and/or weekly) utilizing the Port Authority's centralized backup service and associated tools. Extra copy of backup is kept offsite, at a secure location, for business continuity purposes.

### 8.3 Unix

Red Hat Linux is an optionally supported UNIX operating system for infrastructure and corporate servers.

#### 8.3.1 Unix Security

Red Hat Linux servers must be physically and logically secured from unauthorized access. Operating system logical security is defined by the Technology Department using industry best practices and "harden" operating system configuration<sup>6</sup>.

#### 8.3.2 Data Encryption

For those applications that require additional data security measures, Contractor shall provide encryption services to protect the data stored in the application's database and file and print devices. All data at rest

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<sup>4</sup> "Authenticated Users" and "Everyone" groups are minimized to support business functions.

<sup>5</sup> Currently supported Microsoft Server Operating System. End-of-life Microsoft Operating Systems are not supported.

<sup>6</sup> See current [Red Hat documentation](https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/pdf/security_guide/Red_Hat_Enterprise_Linux-7-Security_Guide-en-US.pdf) at: [https://access.redhat.com/documentation/en-us/red\\_hat\\_enterprise\\_linux/7/pdf/security\\_guide/Red\\_Hat\\_Enterprise\\_Linux-7-Security\\_Guide-en-US.pdf](https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/pdf/security_guide/Red_Hat_Enterprise_Linux-7-Security_Guide-en-US.pdf)

must be encrypted.

### **8.3.3 Backup**

Critical system backup must be performed regularly (daily and/or weekly) utilizing the Port Authority's centralized backup service and associated tools. Extra copy of backup is kept offsite, at a secure location, for business continuity purposes.

## **8.4 Databases**

Oracle and Microsoft SQL Server are the supported database platforms for Port Authority systems. Auditing trail must be enabled for all database accounts with administrator privileges.

## **8.5 Geographic Information System**

Geographic Information is built on the Port Authority's Enterprise Geographic Information System (GIS) Platform which is based on an industry-leading software solution.

## **8.6 Application Security**

The Technology Department recognizes the critical importance of application security and maintains a management approach of implementing manufacturers and/or National Institute of Standards and Technology (NIST) best practices to ensure security controls are in place to safeguard information based on application data classifications.

## **8.7 Server Physical Security**

All servers and communication equipment must be located in secured locked rooms with the keyboard secured to prevent tampering and unauthorized usage. The Business System Manager is responsible for determining the appropriate access control method (e.g., metal key lock, magnetic card door locks, etc.) This person must also maintain a list of persons authorized to enter secured areas. Technology Department staff is available to provide technical assistance in making this determination.

## **8.8 Load Balancing – Failover Architecture**

Depending on requirements of the application, load balancing and failover architectures are supported. Contractors must review failover architectures with the Technology Department for approval.

# **9 Cloud Distributed System Standards Overview**

The Port Authority has adopted the Microsoft Azure suite of offerings to support its cloud-based compute, storage, networking and services to support application requirements. The suite of Azure services available to the Port Authority include, but not limited to:

- a. Infrastructure as a Service (IaaS)
- b. Platform as a Service (PaaS)
- c. Software as a Service (SaaS)
- d. Web + Mobile Services
- e. Container Services
- f. Data & Analytics Services
- g. AI and Cognitive Services
- h. Internet of Things Services

- i. Enterprise Integration Services
- j. Security and Identity Services
- k. Developer Tools Services
- l. Monitoring and Management Services

The Port Authority's Cloud Framework consists of components and/or controls that must be implemented when deploying applications and/or services into Azure. The elements in this standard are dynamic and will evolve over time to ensure a secure and robust Cloud Computing environment for the Port Authority's business to ensure information assets are secure and that security and privacy are maintained using de-facto best practices aligned with Federal Information Processing Standards (FIPS) as well as NIST Publications. Those best practices include, but not limited to:

- a. [NIST 800-144](#): Guidelines on Security and Privacy in Public Cloud Computing
- b. [FIPS 199](#): Standards for Security Categorization of Federal Information and Information System
- c. [FIPS 200](#): Minimum Security Requirements for Federal Information and Information Systems
- d. [NIST 800-53](#): Recommended Security Controls for Federal Information Systems and Organizations
- e. [NIST 800-146](#): Cloud Computing Synopsis and Recommendations
- f. [Cloud Security Alliance](#): Cloud Controls Matrix Version 3.0 (CCMv3)

The use of cloud services should be considered for new/new deployments (subject to application data classification review) or as hybrid deployments (components running in both the Port Authority's datacenters and Azure).

## 10 Business Intelligence (BI) & Enterprise Reporting Standards Overview

The Port Authority Business Intelligence (BI) Platform provides enterprise data warehousing, data analytics, and enterprise reporting solutions to the Port Authority's Departments and end-users via a robust standardized multi-tiered suite of products. Many Departmental and Enterprise software packages include built-in reporting solutions that are optimized for Reporting upon data elements and information within the scope of the application. In such cases, the use of an application-based reporting tools are supported.

However, whenever reporting needs reach beyond the scope of a specific application's User community, span to data sets either residing in multiple disparate sources (such as other enterprise applications), or are highly complex the Enterprise Reporting Platform shall be utilized.

Core System Capabilities of the Business Intelligence Platform include but are not limited to:

- a. Delivery of standardized reports, dashboards and data to support consistent views of Port Authority-wide data sources.
- b. Data integration technologies and data warehousing solutions when appropriate.
- c. A semantic business layer for reliable end-user access to data via ad-hoc reporting and analysis tools.
- d. Distribution of reports efficiently to large groups of users inside or outside the organization.
- e. Enterprise-level security, management, and distribution features.

Departmental resources can develop hierarchical structured reporting architectures consisting of reports to support their business function. The Business Intelligence Service may also leverage Microsoft PowerBI services.

## 11 Contractor Provided Dedicated Systems

### 11.1 Overview

Contractor provided dedicated systems refers to application software, and possibly computer hardware, that may be furnished and/or installed by the contractor. These systems are usually procured through either a Request for Proposal (RFP), or a “Low Bid” contract and are specifically engineered to support a dedicated application.

On all technology related projects, a representative from the Technology Department will be assigned as a single point of contact for technology oversight, accountability, adhering to standards and systems integration. This alignment will ensure a successful project implementation.

The collaboration between Contractor and the Technology Department, provide the following benefits

- a. Leveraging large discounts negotiated in the various requirements contracts.
- b. Ensuring seamless integration of equipment with other existing systems.
- c. Ensuring long-term maintenance and systems administration contracts are focused on the same product lines.
- d. Ensuring relevant sections of the Technology Standards are included in either, the basic design of a low bid contract or as requirements in an RFP. Responses to RFP’s shall be reviewed for their compliance with the Technology Standards.
- e. Ensuring deployments, integration, and testing will not adversely affect existing systems, and to integrate new systems under existing maintenance contracts where applicable.

In cases where a specific system is so specialized that it normally cannot adhere to the hardware, software, infrastructure and operations standards of the Technology Standards, the Contractor shall be directed to work with the Technology Department in exploring all options. If an exception is required, the Contractor will work with the Technology Department to prepare the necessary business case scenarios to receive written concurrence from the Chief Technology Officer.

## 12 Physical Security Technology Standards Overview

### 12.1 The Port Authority Standard for Digital Video Recording, Access Control and Alarm Monitoring

The Port Authority has implemented and operates industry-standard commercial-off-the-shelf (COTS) software platforms to support the mission to manage access control and alarm monitoring and CCTV and Digital Video recording technologies.

The Port Authority has long recognized the need for a corporate architecture for its security systems that would allow us to integrate digital video and access control recording compatible technologies the Port Authority-wide. Using these standards will improve our security posture and will permit us to leverage additional operations and business benefits while keeping our operations resources, maintenance and support costs at a minimum.

The standard will also improve:

- a. Access to and the sharing of information from a centralized location
- b. Centralized monitoring of all facilities from an Emergency Operations Center
- c. The operational and cost-effectiveness of adding a variety of modular features to the core systems, such as paging, e-mail, fire systems, facility management, etc.
- d. Alarm notification, response, and acknowledgement
- e. Operational flexibility for facility and Public Safety staff

- f. Single learning curve
- g. Reduce the cost for maintenance and system administration

## 12.2 Situational Awareness Platform Software

A Situational Awareness Software platform has also been implemented using industry-based COTS applications. This platform is a software application that allows multiple, independently manufactured and installed security, life safety, and building systems to all interoperate under a single, common operating picture, giving a user access to information spreading across multiple systems as if they were all one single system. This “common view” is made even more valuable by the incorporation of powerful, rules-based tools within the system, which allows intelligent linking of seemingly unrelated events into “Situations” that represent patterns of activity that pose a threat to security or site-wide operations.

The objective is to monitor the identity and event data from the various systems, identify incidents and anomalies, and detect trends that could be a threat to our facilities. This platform turns data into actionable intelligence when an incident is detected. The platform has the capability to automatically alert the security operations staff and push the information to security control centers and first responders.

This solution:

- a. Provides a software platform to enable integrating the various electronic systems across all Port Authority sites.
- b. Provides a single software perform solution for situational awareness.
- c. Provides a single system database for reports
- d. Transparent notification of security related events for all Port Authority security systems.

## 13 Communications Infrastructure Standards Overview

The Port Authority Standard for Communications Infrastructure is Cisco. This applies to all future systems, as well as, upgrades to existing systems. This standard ensures the interoperability of all deployed systems and permits the full integration of systems into PAWANET. In addition, all Cisco equipment either designed in a low bid contract or specified in an RFP must be purchased through the Port Authority’s existing contract, which is administered by the Technology Department and permits the purchase equipment, maintenance and support services.

This standard applies but is not limited to:

- a. Layer 2 and 3 Ethernet switches,
- b. Routers,
- c. Wireless Access Points (WAP),
- d. Mobile Access Routers (MAR),
- e. GIG E (Gigabit Ethernet) switching and networking and
- f. SONET (Synchronous Optical NETwork) equipment.

Deviation from this standard requires the written approval of the CTO.

## 14 Wireless Technologies Overview

### 14.1 Wireless Standards

#### 14.1.1 Purpose and Scope

This section references the standard policies and procedures for all wireless devices and technologies

including voice and data capabilities that store, process, transmit or access data. This includes but is not limited to commercial and unlicensed wireless networks and laptops, cellular devices, scanning devices, messaging devices (email devices) and PDAs.

### **14.1.2 General Policy**

Employees will only use Port Authority owned wireless devices to store, process, transmit or access Agency data. Mobile computing devices such as notebooks, iPhones and other handheld computing devices, laptops, special care must be taken to ensure that information is not compromised. Approval is contingent on satisfaction of the requirements for physical protection, access controls, cryptographic techniques, back-ups, virus protection and the rules associated with connecting to wireless networks.

### **14.1.3 Personal Area Networks - PAN**

PAN technologies are prohibited for transmitting information without encryption.

Bluetooth security alone is unacceptable because it is not encrypted and does not use Federal Information Processing Standardization (FIPS) 140-1/2.

### **14.1.4 Wireless Local Area Networks – WLANs**

#### **14.1.4.1 Overview**

Business requirements have arisen throughout various Port Authority locations for the improved use of Wireless LAN technology to facilitate local user mobility. Research performed on the different technologies support the use of Cisco as opposed to various wireless vendors in an attempt to produce a standard that will provide the Port Authority with a secure, robust and scalable solution as WLAN's continue to grow.

In summary, the current Port Authority Wireless LAN standards are based upon IEEE 802.11n draft 2.0 technologies (802.11n is backwards-compatible with existing 802.11a/b/g network adapters.).

The physical infrastructure is now based upon a centralized WLAN architecture that relies upon Cisco wireless bridges, access points, mesh routers, and newly implemented controllers.

Wireless LAN technology is continually developing with rapidly evolving industry standards, government regulations, and vendor products. As a result, the WLAN Standard presented in this document will likely be superseded in the future as the technology and products change.

Contractors must consult with the Technology Department before project / solution implementation to obtain the then current standards for wireless technologies.

#### **14.1.4.2 Best Practice**

The following information is industry best practices for wireless hardware implementation used for the Port Authority's deployments, not for wireless device configuration practices.

WLAN Best Practices Add-ons:

- a. Ensure that the Port Authority maintains an up-to-date wireless hardware inventory.
- b. Identify rogue wireless devices via wireless intrusion prevention systems ( IPS ).
- c. Enable automatic alerts on the wireless IPS.
- d. Perform stateful inspection of connections.
- e. Augment the firewall with a wireless IPS.

- f. Mount AP in location that do not permit easy physical access.
- g. Secure handheld devices with strong passwords.
- h. Enable WPA and WPA2 under ENTERPRISE mode.
- i. Synchronize the AP's clocks to match networking equipment.
- j. Manage remote physical locations of all access points which support an isolated network that needs access to PAWANET for server farms and internet access.
- k. Maintain cryptographic strength range from 128-bits to 256-bits with matching symmetric algorithms AES-128 to AES-256.

Contractors must consult with the Technology Department before project / solution implementation to obtain the then current best practices for wireless technologies.

#### ***14.1.4.3 Portable Electronic Devices (PEDs) – Cell Phones, PDAs, messaging devices, laptops and tablets***

If a device receives information via a wireless technology, and that device allows that information to be placed directly into the corporate network at the workstation level, then all perimeters and host-based security devices have been bypassed. Therefore, the following procedures apply:

- a. PEDs connected directly to a Port Authority wired network via a hot sync connection to a workstation is not permitted to operate wirelessly at the same time. Wireless solutions could create backgrounds into corporate networks.
- b. IR, Bluetooth and 802.11 peer to peer should be set to "off" as the default setting. Mobile code should be downloaded only from trusted sources over assured channels.
- c. Anti-virus software are required on devices and workstations that are used to synchronize/transmit data, if available. Where not available on a device, disable the synchronization capability or provide server or workstation based handheld anti-virus protection.
- d. PEDs are easily lost or stolen therefore approved file system/data store encryption software is required.
- e. PEDs need to be capable of being erased or overwritten to protect data. If the device is no longer needed and cannot be erased or overwritten, it must be physically destroyed.

#### ***14.1.4.4 Cellular and Wireless Email***

Cellular and wireless e-mail devices are subject to several vulnerabilities (e.g. interception, scanning, remote command to transmit mode, etc.). Therefore, the following procedures apply:

- a. Must have end-to-end encryption.
- b. PC based redirectors are not allowed as it requires the PC to be active at all times only server based redirectors will be used.
- c. The use of LANS and Wireless transmitters, i.e. Bluetooth etc. by Port Authority personnel using Port Authority equipment is strictly prohibited

#### ***14.1.4.5 Responsibilities of Technology Department***

- a. Monitor and provide oversight of all Port Authority wireless activities, insure interoperability of wireless capabilities across the Port Authority.
- b. Develop appropriate technical standards for secure wireless and handheld solutions.
- c. Establish a formal coordination process to ensure protection of Port Authority information systems employing wireless technologies.
- d. Review and evaluate wireless technologies, products, solutions that meet Port Authority requirements.
- e. Identify approved monitoring mechanisms for wireless devices to ensure compliance with policy.
- f. Periodically review approved wireless technology standards and procedures to ensure products and solutions remain compliant.
- g. Support risk management activities associated with evaluating wireless services



- h. Act as central coordination point and final approval authority for any exceptions to this policy.
- i. Define or approve acceptable wireless devices, products, services and usage.
- j. Provide immediate consultation to Port Authority units.
- k. Adhere to wireless procedures and standards, establish procedure for reviewing and approving requests for using wireless devices to store, process, or transmit information.
- l. Establish procedures for periodically reviewing approved wireless devices and services to ensure that the business requirement for device/service/system is still valid and meet current Port Authority guidance.
- m. Establish procedures for inventory and control of wireless devices and equipment.
- n. Establish procedures and implementation plans for auditing wireless connections to the network.
- o. Provide user training.

#### **14.1.4.6 Responsibilities of Wireless and Handheld Device Users**

- a. Coordinate all requests through Technology Department...
- b. Read and follow standards.
- c. Access information systems using only approved wireless hardware, software, solutions and connections.
- d. Take appropriate measures to protect information, network access, passwords and equipment.
- e. Use approved password policy and bypass automatic password saving features.
- f. Use extreme caution when accessing Port Authority information in open areas where non-authorized persons may see Port Authority information (airport lounge, hotel lobby).
- g. Protect Port Authority equipment and information from loss or theft at all times, especially when traveling.
- h. Keep current anti-virus software on devices.
- i. Use appropriate Internet behavior (e.g. approved downloads).
- j. Exercise good judgments in efficient cooperative uses of these resources and comply with current and future standards of acceptable use and conduct at all times.
- k. Report any misuse of wireless devices, services or systems to management.

### **14.2 Cellular Phone & Wireless Modem**

The Port Authority obtains cellular service under governmental contracts. All orders for cellular service or equipment must be placed under those contracts. If the contract service provider cannot meet the requirements, a memorandum requesting approval to obtain cellular service outside of the contracts must be sent to the CTO.

### **14.3 Technology Mobile Device Policy**

#### **14.3.1 Introduction**

Mobile devices are a class of handheld computers that currently offer limited functionality with compact size and portability.

To better serve the Port Authority, and to limit the expense of supporting a wide variety of Mobile device hardware and software, the Technology Department supports the use of Apple IOS devices and alternatively, Google Android devices when business functions cannot be satisfied with Apple's iOS platform. All portable computing resources and information media is secured to prevent compromise of confidentiality or integrity while off the Port Authority premises. No computer device may store or transmit non-public information without suitable protective measures being implemented and approved by the Chief Technology Officer.



### **14.3.2 Software**

The current version of Apple IOS and Google Android software are supported.

Any software found to interfere with normal operation must be uninstalled in order to receive support from the Technology Department.

### **14.3.3 Support**

Support for Mobile devices hardware and software is provided by the Technology Department through the Customer Support Desk. The Technology Department will support the physical hardware connection and software to support this connection. No software can be added to company owned mobile devices without Technology Department's assistance and Chief Technology Officer approval.

### **14.3.4 Acquisition**

The Port Authority will purchase Mobile devices for employees with a business need for the mobile device. Employees are responsible for obtaining management approval. The Technology Department also recommends that a protective case (preferably a zippered case) be purchased to reduce damage to the units.

When an employee leaves the Port Authority, the device is returned to the Director's office of their department.

### **14.3.5 Personal Acquisition**

Employees, who purchase their own mobile devices, will not be allowed to connect to the Port Authority corporate network or equipment, unless approved by the Technology Department.

Customer Support Desk personnel will support all Port Authority owned and authorized mobile devices.

### **14.3.6 Data Security Considerations**

Users should carefully consider what type of information they store on their mobile. Extreme caution should be taken when using company confidential data on the mobile units. The risk of unauthorized disclosure of highly sensitive data is very high when data are stored on individual-use electronic devices and media, since these items are easily stolen. The Port Authority policy strictly limits the use of mobile devices under which highly sensitive data may be stored. It further mandates that strict security requirements be met when highly sensitive data must unavoidably be stored on individual-use electronic devices or electronic media.

All mobile devices accessing corporate resources are to be password protected.

### **14.3.7 Backup**

Though it does not happen often, it is possible to lose or damage data that resides on mobile devices. The Technology Department will provide assistance in attempting to recover lost or damage files.

## 15 Appendices

### 15.1 Appendix 1 -- Business Resumption Plan (BRP) Document Format

#### I. PURPOSE

- a. Goals and objectives of plan
- b. Benefits obtained if plan properly implemented

#### II. SCOPE OF PLAN

- a. Planning assumptions
- b. Facilities and resources included in plan

#### III. NOMENCLATURE

- a. Recovery terms
- b. Definitions and acronyms

#### IV. DISASTER SEVERITY DEFINITION

Define level of potential disaster based on impact to critical functions. Explain what degree of operational disruption would constitute each level of disaster:

- a. catastrophic
- b. serious
- c. major
- d. limited

#### V. OPERATIONS RECOVERY PROCEDURES (Procedures for recovering services)

1. Indicate time frames in which essential operational/business functions must be resumed.
2. Specify sequence of operations recovery events and individuals responsible for activity. Note any specific activities required for particular levels of disaster severity. For example:
  - a. Notifications
  - b. Preliminary evaluation
  - c. Activate operations recovery personnel
  - d. Coordinate with emergency personnel
  - e. Evaluate recovery options and issue directive which details:
    - i. Assigned tasks
    - ii. Project schedule/time frame
    - iii. Coordination required
    - iv. Identify relocation activities, if required
    - v. External/internal status updates

3. Identify items required for backup of critical functions. For example:

- a. Alternate work site
- b. Hardware/software
- c. Personal computers
- d. Necessary software packages
- e. Documentation
- f. Peripherals (printers, modems, etc.)
- g. Databases
- h. Emergency equipment
- i. Communications
- j. Transportation
- k. Supplies
- l. Security
- m. Operations and procedures manuals

VI. OFFICE/FACILITY BUSINESS SITE RESTORATION PROCEDURES  
(Procedures for restoring physical facilities)

- a. Identify restoration responsibilities
- b. Assess damage
- c. Develop restoration plan/time frames

VII. BRP UPDATE PROCEDURES

- a. Specify responsibility for updating and communicating BRP changes
- b. Indicate frequency of review/update

## 15.2 Appendix 2 -- Communication Rooms/Closets Standards

All data communication rooms must be designed with required and estimated space to meet immediate requirements, as well as, future growth.

### ENVIRONMENTAL

The following conditions must be met:

- a. Doorways/Entrances must be designed to support at least the minimum space requirements of 90"H x 72" W x 60" D.
- b. The room's cooling capabilities must be sufficient to support the heat dissipation requirements for the equipment. This requirement will be measured in minimum and maximum BTUs powered by AC-powered systems. Equipment specs will be supplied by the Technology Department upon request.
- c. Backup UPS systems are necessary to avoid equipment damage in case of site power failure.
- d. Telco demarcs must be located in a central location with sufficient space to house Telco termination equipment.
- e. The room should be designed with the appropriate fire safety regulations.
- f. Cables trays must also be installed in the communications room ceiling where appropriate, to support the routing of data communications and Telco cables.
- g. Basic 24"W/30"D/84"H cabinets with 19" racks must be installed to house communications equipment such as: routers, switches, hubs, DSUs/CSUs and monitors.
- h. To create more wall space the use of wall mount racks can be installed, however, all wall cabinets must support rear access to the equipment. Appropriate sized plywood must be installed prior to mounting racks.
- i. Category 5e/6 cable must be terminated in wall/rack mounted patch panel.
- j. Fiber patch panel must be installed in fiber IDF panel with SC female interface.
- k. The fiber must be neatly tie wrapped and enclosed in flexible inner-duct.
- l. Telephone access must be installed in the appropriate location to provide for basic troubleshooting and vendor support.
- m. All communications equipment and cabinets must have ample room for easy access and proper ventilation.

### **15.3 Appendix 3 – Standard Cabling Schemes**

- a. Teflon-coated cables will be installed per fire code regulations.
- b. Overhead cable trays and drop post must be installed for cable routing.
- c. Cabling scheme must be used to label and identify all cables. All cables must be neatly tie-wrapped.

## 15.4 Appendix 4 -- Unified Wiring Plan

To satisfy existing and future voice and data communications requirements, while minimizing the need for wiring changes and additions, the Port Authority has adopted the following lateral wiring specifications for all workstations being constructed. This plan is applicable to all Port Authority locations, except when specifically noted.

### LATERAL CABLE:

Voice and data telecommunications requirements for each workstation will be provided by a combination of three individual cables, installed between the workstation and the serving telephone closet / intermediate distribution frame (IDF), in a "home run" configuration. All cabling installed will be of plenum type, fire retardant (FEP) rated.

Cable specifications:

Three (3) Cables capable of supporting Category 5e/6 capabilities as outlined in the TIA/EIA-568-B.2 standard. Specifically:

- a. Gauge: 24 AWG Pair
- b. Size: 4
- c. Insulation: Plenum, fire code rating (FEP)

Cable allocations will be as following:

Cable #1: Voice<sup>7</sup>

Cable #2: Data<sup>8</sup>

Cable #3: Data<sup>9</sup>

Technical specs for the Cat 5e/6 cable is as follows.

Frequency	Attenuation dB/100 m max.	Next dB	Attenuation dB/100 m max.	Next dB
1	2	62.3	2.4	62.3
4	4.1	53.2	4.9	53.2
10	6.5	47.3	7.8	47.3
16	8.2	44.2	9.8	44.2
20	9.3	42.7	11.1	42.7
31.25	11.7	39.8	14.1	39.8

<sup>7</sup> Cable #1 is to be split in the workstation to support 2 telephones.

<sup>8</sup> 100.0MHz is the speed the PA wants to deliver to the desktop

<sup>9</sup> 100.0MHz is the speed the PA wants to deliver to the desktop

62.5	17	34.3	20.4	34.3
100	22	32.3	26.4	32.3

	CMR	CMP	CM (Patch)*
Conductor diameter-in. (mm)	.020 (0.52)	020 (0.52)	024 (0.61)
Cable diameter-in. (mm)	.195 (5.0)	165 (4.2)	215 (5.5)
Nominal cable weight-lb./kft. (kg/km)	21 (31)	21 (31)	23 (34.2)
Max. installation tension-lb. (N)	25 (110)	25 (110)	25 (110)
Min. bend radius-in. (mm)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
* Patch cables utilize stranded tinned copper conductors			

Mutual Capacitance	4.6 nF/100 m nom.	5.6 nF/100 m nom.
DC resistance	9.38 Ohms/100 m Max.	9.09 Ohms/100 m max.
Skew	45 ns/100 m max.	45 ns/100 m max.
	72% nom. Non Plenum	72% nom.
Propagation	72% nom. Plenum	
Input Impedance	100 + 15% 0.7772-100 MHz	100 + 15% 0.772-100MHz
	ISO/IEC 11801	

Pair 1	White/Blue	Blue	Installation	0 degrees C to +50 degrees C
Pair 2	White/Orange	Orange	Operation	-10 degrees C to +60 degrees C
Pair 3	White/Green	Green		
Pair 4	White/Brown	Brown		

## **15.5 Appendix 5 -- Telephone Closet / IDF Termination Blocks**

Lateral Data cabling serving each workstation will be terminated on a CAT5e/6 patch panel (RJ45 face, 110 punch rear) in the telephone closet. For analog phone service, termination is to be on 110 blocks in telephone closet, allowing access to the telephone riser. For data, a patch cord is installed between patch panel and IT device. The patch panel can be mounted on the wall with a wall mount kit or in a rack if one is needed and should be appropriately numbered with the workstation number. The patch panel must be capable of supporting Category 5e/6 the TIA/EIA-568-B.2 standard. The patch panel shall have a swing away faceplate or rack mountable.

NOTE: The Category 5e/6 patch panel should be equivalent to the AMP SL series 110Connect Category 5e/6 patch panel or approved Category 6 patch panel. The number of ports may vary.

Each workstation shall be assigned a unique station identification number.



## **15.6 Appendix 6 -- Workstation Jacks**

Workstations will be equipped with various components of the AMP Communications Outlet system (AMP equivalent can be used with Technology Department's approval). Each workstation will be installed with (1) double-gang jack housing box and matching face plate, capable of securely mounting three Category 5e cables or Category 6 and four modular data connectors, maintaining the integrity of category 5e/ Category 6 capabilities as outlined in the TIA/EIA-568-B.2 standard. All workstation jacks will be wired in accordance with the TIA/EIA-568-B.2 standard. All modular jacks are to be labeled in accordance with the Technology Department number schema.

## **15.7 Appendix 7 -- Standard Switches Inside the Department**

Any switches in the following Cisco series are acceptable (Contractors will consult with the Technology Department to determine the appropriate switch configuration at the time of proposal submission):

- a. Cisco 3000 series – low capacity
- b. Cisco 4000 series – medium capacity
- c. Cisco 5000 series – medium capacity
- d. Cisco 6000 series – high capacity
- e. Cisco Nexus 7000 series – high capacity
- f. Cisco Nexus 9000 series – medium and/or high capacity

## **15.8 Appendix 8 -- Workstation and Lateral Cable Identification Management**

### **WORKSTATION AND LATERAL CABLE IDENTIFICATION/MANAGEMENT (Facility)**

All lateral cabling installed to workstations at the Port Authority Facilities must be designated in accordance with the Port Authority's workstation and lateral cable identification code: This code consists of two elements, as follows:

- a. Room number or department name (acronyms are acceptable).
- b. Workstations (3 numeric digits)

The cable identification code for Workstation 10 in room 3801 at LGA CTB is 3801-010. The cable identification code for Workstation 15 in the Port Authority Automotive shop is Auto-015

## 15.9 Appendix 9 – Fiber Optic Specification for Network Services – PAWANET

### General Scope of Work:

- a. Conduct a walk thru based on the specific Scope of Work for the job in question.
- b. Note that all diagrams and or sketches that may be provided are approximates and not to scale.
- c. All fiber optic cable is to be installed in rigid conduit or, where applicable, in plenum rated flexible inner duct.
- d. Contractor shall furnish and install fiber optic cable as designated in the specific Scope of Work.
- e. Fiber optic cable type for interoffice use shall be loose tube, with aramid yarn water block:
- f. Single mode Fiber – 8.3/125/250-micron diameter (core/cladding/coating) manufactured by General Cable or approved equal.
- g. Fiber optic cable attenuation from the factory, before installation, shall not exceed:
- h. Single mode – 4db per km @ 1310nm/.3 db per km @ 1550nm
- i. All fiber optic cable is to be labeled on each end and at any junction or patch panel with, 28 gauge, 2" wide embossed with ¼" high letters. The labels are to be fastened to the fiber optic cable using sealed wrap around labels or pliable Velcro ties.
- j. Fiber optic cable shall be installed in accordance with the manufacturer's specifications. Any portion of the cable damaged during installation will be repaired or replaced by the contractor without any additional cost to the Port Authority of New York New Jersey.

### Fiber Optic Terminations:

- a. Fiber optic terminations will use **SC** connectors unless otherwise specified in the Scope of Work.
- b. Fiber optic terminations shall not yield more than 1db per mated (at the bulkhead) connector.

### Fiber Optic Testing:

- a. Fiber optic testing shall be performed by the contractor and certified fiber optic technicians.

Fiber optic technicians will be prepared to complete test procedures with the following equipment:

- i. Source and power meter testing to provide optical loss measurements.
  - ii. Reference test cables and mating adapters that match the cables to be tested.
  - iii. Cleaning materials – lint free cleaning wipes and pure alcohol.
  - iv. OTDR test set with the proper launch cables and adapter types.
  - v. Power loss testing from both ends.
- b. Fiber optic technicians will perform OTDR test on all terminated fibers unless otherwise noted in the Scope of Work.
  - c. Fiber optic test results shall be recorded, and reports provided to the Port Authority in hardcopy and via a readable txt file (PDF or RTF is acceptable).

## 15.10 Appendix 10 -- Public Telephone Ordering Standards

Technology Department staff is responsible for the management of the permit for public telephone service are available to answer any questions and provide direction for any matter relating to public telephones.

### **General Standards:**

All public telephone requests – that is both coin and non-coin in any Port Authority space or any area of the tenant space – both “public” and “club” locations will be coordinated by the Port Authority to cover both New York and New Jersey.

### **Process:**

When the Facility, Property Manager, tenant or their representative (e.g. designer, architect, general contractor) has a public telephone requirement, they will contact the Technology Department whom will review the request and provide coordination with the appropriate service provider.

**ATTACHMENT J**

**GENERAL CONTRACT PROVISIONS**

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# GENERAL CONTRACT PROVISIONS

## 1. GENERAL AGREEMENT

The undersigned (hereinafter referred to as the "Contractor" or "you") agrees to provide, and The Port Authority of New York and New Jersey (hereinafter referred to as the "Authority") agrees to accept to provide all the necessary supervision, personnel, equipment, materials and all other things necessary to perform the Services required by this Contract as more fully set forth in the Contract Documents. The Contract Documents require the doing of all things necessary or proper for or incidental to the requirements as set forth in such Contract Documents. All things not expressly mentioned in the Contract Documents but involved in carrying out their intent are required by the Contract Documents and the Contractor shall perform the same as though they were specifically mentioned, described and delineated.

## 2. DEFINITIONS

To avoid undue repetition, the following terms, as used in this Agreement, shall be construed as follows:

Authority or Port Authority - means the Port Authority of New York and New Jersey.

Contract, Document or Agreement - mean the writings setting forth the scope, terms, conditions and Specifications for the procurement of Goods and/or Services, as defined hereunder and shall include, but not be limited to: Request for Proposal (RFP), Purchase Order (PO), Cost Proposal with Contract costs inserted, as accepted by the Authority, General Contract Provisions, Contract Specific Terms and Conditions, and all Attachments and Exhibits, or drawings, the Authority's acceptance and any written addenda issued by an authorized member of the Procurement Department.

Contract Documents – means, collectively, the Scope of Work, all Attachments, all Exhibits, and all other documents that comprise the Contract.

Days or Calendar Days - mean consecutive calendar days, Saturdays, Sundays, and holidays, included.

Director - means the Director of the Department which operates the facility of the Port Authority at which the services hereunder are to be performed, for the time being, his/her successor, or his/her duly authorized representatives acting within the scope of the particular authority vested in duties for.

Engineer of Record (EOR) - means the Contractor's licensed professional engineer, acting either personally or through his duly authorized representative acting within the scope of the particular authority vested in them.

Facility – means Terminal B at Newark Liberty International Airport (EWR) and such other Port Authority facilities at which services may be required from time to time.

Contract Manager (or Manager) - means the individuals with day-to-day responsibility for managing the project on behalf of the Port Authority. The Contract Managers will be the Resident Engineer

and the Manager of Airport Security at EWR, as defined in the Scope of Work for their specific responsibilities of the Work.

No person shall be deemed a representative of the Director or Manager except to the extent specifically authorized in an express written notice to the Contractor signed by the Director or Manager, as the case may be. Further, no person shall be deemed a successor in duties of the Director unless the Contractor is so notified in writing signed by the Procurement Department. No person shall be deemed a successor in duties of the Manager unless the Contractor is so notified in a writing signed by the Director.

Resident Engineer - means the designated Resident Engineer for the Facility at which the Work is being performed or his successor in duties, acting personally.

Resident Engineer's Office (REO) - means the designated Resident Engineer for the facility, at which the Work is being performed or his successor in duties, acting personally.

Services or Work - mean all services, equipment and materials (including materials and equipment, if any, furnished by the Authority) and other facilities and all other things necessary or proper for, or incidental to the services to be performed or goods to be furnished in connection with the service to be provided hereunder, as set forth in the Contract Documents.

Specifications- mean all requirements of this Contract, technical and otherwise, for the performance of the Scope of Work and services hereunder.

Holidays: The following legal holidays will be observed at Port Authority offices and facilities:

New Year's Day	Columbus Day
Martin Luther King, Jr. Day	Veteran's Day
Presidents Day	Thanksgiving Day
Memorial Day	Day After Thanksgiving
Independence Day	Christmas Day
Labor Day	

No Work shall be performed on a Holiday without approval of Port Authority's Manager.

Minority Business Enterprise (MBE) - means a business entity which is at least fifty-one percent (51%) owned and controlled by one or more members of one or more minority groups, or, in the case of a publicly held corporation, at least fifty-one percent (51%) of the stock of which is owned by one or more minority groups, and whose management and daily business operations are controlled by one or more such individuals who are citizens or permanent resident aliens.

"Minority Group" means any of the following racial or ethnic groups:

- (a) Black persons having origins in any of the Black African racial groups not of Hispanic origin;
- (b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American culture or origin, regardless of race;

- (c) Asian and Pacific Islander persons having origins in any of the original peoples of the Far East, Southeast Asia, The Indian Subcontinent, or the Pacific Islands;
- (d) Native American or Alaskan native persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification.

Month - unless otherwise specified, means a calendar month.

Site of the Work - or words of similar import shall mean the Facilities and all buildings and properties associated therewith as described in this Contract.

Small Business Enterprise (SBE) - The criteria for a Small Business Enterprise are:

- The principal place of business must be located in New York or New Jersey;
- The firm must have been in business for at least three years with activity;
- Average gross income limitations by industry as established by the Port Authority.

Subcontractor - mean anyone who performs work (other than or in addition to the furnishing of materials, plant or equipment) in connection with the services to be provided hereunder, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of contract with the Contractor), but shall not include any person who furnished merely his own personal labor or his own personal services. "Subcontractor", however, shall exclude the Contractor or any subsidiary or parent of the Contractor or any person, firm or corporation which has a substantial interest in the Contractor or in which the Contractor or the parent or the subsidiary of the Contractor, or an officer or principal of the Contractor or of the parent of the subsidiary of the Contractor has a substantial interest, provided, however, that for the purpose of the clause hereof entitled "Assignments and Subcontracts" the exclusion in this paragraph shall not apply to anyone but the Contractor itself.

Week - unless otherwise specified, means seven (7) consecutive calendar days, Saturdays, Sundays, and holidays.

Women-owned Business Enterprise (WBE) - shall mean a business enterprise which is at least fifty-one percent (51%) owned by one or more women, or, in the case of a publicly held corporation, at least fifty-one percent (51%) of the stock of which is owned by one or more women and whose management and daily business operations are controlled by one or more women who are citizens or permanent or resident aliens.

Work Day- unless otherwise specified, means a day between Monday and Friday with Monday and Friday included.

### **3. GENERAL PROVISIONS**

- A. Under no circumstances shall you or your subcontractors communicate in any way with any department, board, agency, commission, or other organization or any person whether governmental or private in connection with the services to be performed hereunder except upon prior written approval and instructions of the Director, provided, however, that data from manufacturers and suppliers of materials, devices and equipment shall be obtained by you when you find such data necessary unless otherwise instructed by the Authority.
- B. Any services performed for the benefit of the Authority at any time by you or on your behalf, even if expressly and duly authorized by the Authority, shall be deemed to be rendered under

and subject to this Agreement (unless referable to another expressly written, duly executed agreement by the same parties), whether such additional services are performed prior to, during or subsequent to the services described herein, and no rights or obligations shall arise out of such additional services except as provided under this Agreement.

- C. The Contractor shall observe and obey (and compel its officers, employees, guests, invitees, and those doing business with it, to observe and obey) the rules and regulations of the Port Authority now in effect, and such further rules and regulations which may from time to time during the effective period of this Contract, be promulgated by the Port Authority for reasons of safety, health, preservation of property, or maintenance of a good and orderly appearance of the Facilities, or for the safe and efficient operation of the Facilities. The Port Authority agrees that, except in cases of emergency, it shall give notice to the Contractor of every rule and regulation hereafter adopted by it.
- D. This Contract does not constitute the Contractor as an agent or representative of the Port Authority for any purpose whatsoever. The Contractor shall perform all services hereunder as an independent contractor and the Contractor, its officers, and employees shall not be deemed to be agents, servants, or employees of the Port Authority.

#### **4. INTELLECTUAL PROPERTY**

- A. Except as provided below: as between the Port Authority and the Contractor all process flows, codes including, but not limited to scripts, configurations, programs, routines, processes, work flows, procedures, documentation, estimates, reports, records, data, charts, documents, models, designs, renderings, drawings, specifications, photographs, computations, computer tapes or discs, and other documentation of any type whatsoever, whether electronic or in the form of writing, figures or delineations, which are prepared or compiled in connection with this Agreement, shall become the exclusive property of the Authority, and the Authority shall have the exclusive right to use or permit the use of them and any ideas or methods represented by them for any purpose and at any time without other compensation than that specifically provided for herein. With regard to training manuals or any other knowledge transfer documentation, communication or presentation prepared under this Agreement the Authority shall expressly have the right to use, alter and reproduce including electronically, said manuals for its internal business purposes. The Contractor hereby warrants and represents that the Authority will have at all times the ownership and rights provided for in the immediately preceding sentence free and clear of all claims of third persons whether presently existing or arising in the future and whether presently known to either of the parties to this Agreement or not. Any information given to the Port Authority before, with or after this Agreement on Terms of Discussion (“Agreement”), either orally or in writing, is not given in confidence. Such information may be used, or disclosed to others, for any purpose at any time without obligation or compensation and without liability of any kind whatsoever. Any statement which is inconsistent with this Agreement, whether made as part of or in connection with this Agreement, shall be void and of no effect. This Agreement is not intended, however, to grant to the Port Authority rights to any matter, which is the subject of valid existing or potential letters patent.

The right to use all patented materials, appliances, processes of manufacture or types of construction, trade and service marks, copyrights and trade secrets, collectively hereinafter referred to as “Intellectual Property Rights”, in the performance of the work, shall be obtained by the Contractor without separate or additional compensation. Where the services under this Agreement require the Contractor to provide materials, equipment or software for the use of the Port Authority or its employees or agents, the Port Authority

shall be provided with the Intellectual Property Rights required for such use without further compensation than is provided for under this Agreement.

- B. All preexisting information or documentation including computer programs or code including source code, of the Contractor, utilized by the Contractor hereunder in the performance of his services hereunder shall be deemed licensed to the Authority for the duration and purposes of this Agreement, but shall remain the property of the Contractor.
- C. Third party software not specially prepared for the purpose of this Agreement but utilized by the Contractor hereunder in the performance of his services hereunder shall be licensed to the Contractor and the Authority for the duration and purposes of this Agreement but shall remain the property of said third party.
- D. The above-described software shall be furnished by the Contractor without additional compensation.

## **5. PROPRIETARY RIGHTS IN SUBJECT MATTER NOT WITHIN THE INTELLECTUAL PROPERTY CLAUSE**

If in accordance with this Contract the Contractor furnishes research, development or consultative services in connection with the performance of the Work and if in the course of such research, development, or consultation patentable or copyrightable subject matter or trade secrets or other proprietary matter is produced by the Contractor, its officers, agents, employees, subcontractors, or suppliers, which is not custom software, and not covered under clause 4 entitled Intellectual Property, the Authority shall have, without cost or expense to it, an irrevocable, non-exclusive, royalty-free license to make, have made, and use, either itself or by anyone on its behalf, such subject matter in connection with any activity now or hereafter engaged in or permitted by the Authority. Promptly upon request by the Authority, the Contractor shall furnish or obtain from the appropriate person a form of license satisfactory to the Authority, but it is expressly understood and agreed that as between the Contractor and the Authority the license herein provided for shall nevertheless arise for the benefit of the Authority immediately upon the production of said subject matter and shall not await formal exemplification in a written license agreement as provided for above. Such license may be transferred by the Authority to its successors, immediate or otherwise, in the operations of or ownership of any facility now or hereafter operated by the Authority but such license shall not be otherwise transferable.

The right of the Authority as well as the Contractor to use all patented material, compositions of matter, manufactures, apparatus, appliances, processes of manufacture or types of construction as well as any copyrightable matter, trade secrets or other proprietary matters, shall be obtained by the Contractor without separate or additional compensation whether the same is patented or copyrighted before, during or after the performance of the Work.

## **6. INDEMNITY IN REGARD TO INFRINGEMENT MATTER**

The Contractor shall indemnify the Authority against and save it harmless from all loss and expense incurred in the defense, settlement or satisfaction of any claims in the nature of patent, copyright, or other proprietary rights infringement arising out of or in connection with the Authority's use, in accordance with the preceding clause of such patentable subject matter or patented material, compositions of matter, manufactures, apparatus, appliances, processes of manufacture or types of construction, or copyrighted matter or other matter protected as intellectual property. If so directed, the Contractor shall at its own expense defend any suit based upon any such claim or demand, even if such suit, claim or demand is groundless, false or fraudulent, and in handling such shall not, without obtaining express advance permission from the General Counsel of the Port Authority

and/or Counsel for PATH, raise any defense involving in any way the jurisdiction of the tribunal over the person of the Port Authority and/or PATH, the immunity of the Port Authority and/or PATH, their Commissioners, Directors, Superintendents, officers, agents or employees, the governmental nature of the Port Authority and/or PATH or the provision of any statutes respecting suits against the Port Authority and/or PATH. If the Authority be enjoined from using any of the facilities which form the subject matter of this Contract, and as to which the Contractor is to indemnify the Authority against proprietary rights claims, the Authority may, at its option and without thereby limiting any other right it may have hereunder or at law or in equity, require the Contractor to supply, temporarily or permanently, facilities not subject to such injunction and not infringing any proprietary rights and if the Contractor shall fail to do so, the Contractor shall, at its expense, remove all such facilities and refund the cost thereof to the Authority and otherwise equitably adjust compensation and take such steps as may be necessary to ensure compliance by the Authority with such injunction, to the satisfaction of the Authority.

The Contractor shall promptly and fully inform the Director of any claims or disputes for infringement or otherwise, whether existing or potential, of which it has knowledge relating to any Intellectual Property used, developed or licensed in connection with the performance of the Work or otherwise in connection with this Contract.

## **7. CONTRACT RECORDS AND DOCUMENTS, PASSWORDS AND CODES**

When the performance of the contract services requires the Contractor to produce, compile or maintain records, data, drawings, or documents of any kind, regardless of the media utilized, then all such records, drawings, data and documents which are produced, prepared or compiled in connection with this Contract, shall become the property of the Port Authority, and the Port Authority shall have the right to use or permit the use of them and any ideas or methods represented by them for any purpose and at any time without other compensation than that specifically provided herein.

When the performance of the contract services requires the Contractor to produce, compile or maintain process flows, work flows, configurations, codes including, but not limited to scripts, programs, routines, processes, procedures, documentation, estimates, reports, records, data, charts, documents, models, designs, renderings, drawings, specifications, photographs, computations, computer tapes or discs, and other documentation of any type whatsoever, whether electronic or in the form of writing, figures or delineations, the Contractor shall make all such materials available to the Authority, and, as requested by the Authority, shall deposit same into an Authority-designated repository.

When in the performance of the contract services the Contractor utilizes passwords or codes for any purpose, at any time during or after the performance of such services, upon written request by the Authority, the Contractor shall make available to the designated Authority representative all such passwords and codes.

## **8. COMPLIANCE WITH WEB SITE TERMS OF USE AND PRIVACY POLICIES**

Subject to all of the provisions of this Contract including, without limitation, the obligations of the Contractor under the section hereof entitled "Indemnification and Risks Assumed by the Contractor," the Contractor shall, and shall compel its employees, agents and subcontractors, to strictly abide by and comply with the policies established by the Authority governing the use of the Authority's web sites as set forth in the Authority web sites Terms of Use and Privacy Statement as

the same may be supplemented or amended. The Contractor shall immediately implement all procedures in connection with such policies and in furtherance thereof as directed by the Authority.

## **9. TIME IS OF THE ESSENCE**

The Contractor's obligations for the performance and completion of all work within the time or times provided for in this Contract are of the essence of this Contract.

## **10. FINAL PAYMENT**

After satisfactory completion of all services required hereunder, and upon receipt from the Contractor of such information as may be required, the Director shall certify in writing to the Contractor the total compensation earned by the Contractor.

If so required, the Contractor shall thereupon furnish to the Authority a detailed sworn statement of all claims, just and unjust, of subcontractors, materialmen and other third persons then outstanding which the Contractor has reason to believe may thereafter be made on account of the services provided under this Agreement.

Within thirty days after issuance of such certificate of total compensation earned (or within thirty days after receipt of the documents provided for in the immediately preceding paragraph, if required and if such date is later), the Port Authority shall pay to the Contractor the amount stated in said certificate, less all other payments and advances whatsoever to or for the account of the Contractor. All prior estimates and payments shall be subject to correction in this payment, which is throughout this Agreement called the Final Payment.

The acceptance by the Contractor, or by anyone claiming by or through him, of the Final Payment shall be and shall operate as a release to the Authority of all claims and of all liability to the Contractor for all things done or furnished in connection with this Contract and for every act and neglect of the Authority and others relating to or arising out of this Contract, including claims arising out of breach of the Contract and claims based on claims of third persons.

The Contractor's release as provided in the immediately preceding paragraph shall be deemed to be based upon the consideration forming part of this Contract as a whole and not to be gratuitous; but in any event even if deemed gratuitous and without consideration, such release as provided in the immediately preceding paragraph shall nevertheless be effective. Such release shall include all claims, whether or not in litigation and even though still under consideration by the Authority. Such release shall be effective notwithstanding any purported reservation of right by the Contractor to preserve such claim. The acceptance of any check designated as "Final Payment" or bearing any similar designation shall be conclusively presumed to demonstrate the intent of the Contractor that such payment was intended to be accepted as final, with the consequences provided in this numbered clause, notwithstanding any purported reservation of rights.

The Contractor agrees that it shall not be entitled to, and hereby waives any right it might otherwise have to, and shall not seek any judgment whether under this Contract or otherwise for any such Final Payment or for an amount equivalent thereto or based thereon, or for any part thereof, if such judgment would have the effect of varying, setting aside, disregarding or making inapplicable the terms of this numbered clause or have the effect in any way of entitling the Contractor to accept such Final Payment or an amount equivalent thereto or based thereon or any part thereof other than in the same fashion as a voluntary acceptance of a Final Payment subject to all the terms of this Contract including this numbered clause, unless and until the Contractor should obtain a judgment on any claim arising out of or in connection with this Contract (including a claim based on breach of contract) for an amount not included in said Final Payment.

## **11. DEFAULT, REVOCATION OR SUSPENSION OF CONTRACT**

### **A. If one or more of the following events shall occur:**

1. If fire or other event shall destroy all or a substantial part of any Facility, asset or infrastructure necessary to perform the work required by the Contract Documents; or
2. If any governmental agency shall condemn or take a temporary or permanent interest in all or a substantial part of any Facility, or all of a part of the Port Authority's interest herein

then upon the occurrence of such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right on twenty-four (24) hours written notice to the Contractor to revoke this Contract, such revocation to be effective upon the date and time specified in such notice.

In such event this Contract shall cease and expire on the effective date of revocation as if said date were the date of the expiration of this Contract. Such revocation shall not, however, relieve the Contractor of any liabilities or obligations hereunder which shall have accrued on or prior to the effective date of revocation.

### **B. If one or more of the following events shall occur:**

1. The Contractor shall become insolvent, or shall take the benefit of any present or future insolvency statute, or shall make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy or a petition or answer seeking an arrangement or its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any other law or statute of the United States or of any State thereof, or consent to the appointment of a receiver, trustee, or liquidator of all or substantially all its property; or
2. By order or decree of a court the Contractor shall be adjudged bankrupt or an order shall be made approving a petition filed by any of the creditors, or, if the Contractor is a corporation, by any of the stockholders of the Contractor, seeking its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any law or statute of the United States or of any State thereof; or
3. A petition under any part of the federal bankruptcy laws or an action under any present or future insolvency law or statute shall be filed against the Contractor and shall not be dismissed within thirty (30) days after the filing thereof; or
4. The interest of the Contractor under this Contract shall be transferred to, passed to or devolve upon, by operation of law or otherwise, any other person, firm or corporation; or
5. The Contractor, if a corporation, shall, without the prior written approval of the Port Authority, become a surviving or merged corporation in a merger, a constituent corporation in a consolidation, or a corporation in dissolution; or
6. If the Contractor is a partnership, and the said partnership shall be dissolved as the result of any act or omission of its copartners or any of them, or by operation of law or the order or decree of any court having jurisdiction, or for any other reason whatsoever; or



7. By or pursuant to, or under authority of any legislative act, resolution or rule, or any order or decree of any court or governmental board, agency or officer having jurisdiction, a receiver, trustee, or liquidator shall take possession or control of all or substantially all of the property of the Contractor and such possession or control of all or substantially all of the property of the Contractor and shall continue in effect for a period of fifteen (15) days

then upon the occurrence of any such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right upon five (5) days' notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder; termination to be effective upon the date and time specified in such notice as if said date were the date of the expiration of this Contract. Termination shall not relieve the Contractor of any liabilities or obligations hereunder which have accrued on or prior to the effective date of termination.

C. If any of the following shall occur:

1. The Contractor shall cease, abandon any part of the service, desert, stop or discontinue its services in the premises for any reason whatsoever and regardless of the fault of the Contractor; or
2. The Contractor shall fail to keep, perform and observe each and every other promise, covenant and agreement set forth in this Contract on its part to be kept, performed or observed, within five (5) days after receipt of notice of default thereunder from the Port Authority (except where fulfillment of its obligations requires activity over a greater period of time, and the Contractor shall have commenced to perform whatever may be required for fulfillment within five (5) days after receipt of notice and continues such performance without interruption except for causes beyond its control);

then upon the occurrence of any such event or during the continuance thereof, the Port Authority shall have the right on twenty-four (24) hours' notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder, termination to be effective upon the date and time specified in such notice. Termination shall not relieve the Contractor of any liabilities, which shall have accrued on or prior to the effective date of termination.

D. If any of the events enumerated in this section shall occur prior to commencement date of this Contract the Port Authority upon the occurrence of any such event or any time thereafter during the continuance thereof by twenty-four (24) hours' notice may terminate or suspend this Contract and the rights of the Contractor hereunder, such termination or suspension to be effective upon the date specified in such notice.

E. No payment by the Port Authority of any monies to the Contractor for any period or periods after default of any of the terms, covenants or conditions hereof to be performed, kept and observed by the Contractor and no act or thing done or omitted to be done by the Port Authority shall be deemed to be a waiver of the right of the Port Authority to terminate this Contract or of any other right or remedies to which the Port Authority may be entitled because of any breach thereof. No waiver by the Port Authority of any default on the part of the Contractor in the performance of any of the terms, covenants and conditions hereof to be performed, kept or observed by the Contractor shall be or be construed to be a waiver by the Port Authority of any other subsequent default in the performance of any of the said terms, covenants and conditions.

F. In addition to all other rights of revocation or termination hereunder and notwithstanding any other provision of this Contract the Port Authority may terminate this Contract and the rights of the Contractor hereunder without cause at any time upon five (5) days written notice to the Contractor and in such event this Contract shall cease and expire on the date

set forth in the notice of termination as fully and completely as though such dates were the original expiration date hereof and if such effective date of termination is other than the last day of the month, the amount of the compensation due to the Contractor from the Port Authority shall be prorated when applicable on a daily basis. Such cancellation shall be without prejudice to the rights and obligations of the parties arising out of portions already performed but no allowance shall be made for anticipated profits.

- G. Any right of termination contained in this paragraph, shall be in addition to and not in lieu of any and all rights and remedies that the Port Authority shall have at law or in equity consequent upon the Contractor's breach of this Contract and shall be without prejudice to any and all such other rights and remedies. It is hereby specifically agreed and understood that the exercise by the Port Authority of any right of termination set forth in this paragraph shall not be or be deemed to be an exercise by the Port Authority of an election of remedies so as to preclude the Port Authority from any right to money damages it may have for the period prior to the effective date of termination to the original expiration date of the Contract, and this provision shall be deemed to survive the termination of this Contract as aforesaid.

## **12. WITHHOLDING OF PAYMENT**

- A. If (1) the Contractor fails to perform any of its obligations under this Contract or any other agreement between the Authority and the Contractor (including his obligation to the Authority to pay any claim lawfully made against him by any materialman, subcontractor or workman or other person which arises out of or in connection with the performance of this Contract or any other agreement with the Authority) or (2) any claim (just or unjust) which arises out of or in connection with this Contract or any other agreement between the Authority and the Contractor is made against the Authority or (3) any subcontractor under this Contract or any other agreement between the Authority and the Contractor fails to pay any claims lawfully made against him by any materialman, subcontractor, workman or other third person which arises out of or in connection with this Contract or any other agreement between the Authority and the Contractor or if in the opinion of the Authority any of the aforesaid contingencies is likely to arise, then the Authority shall have the right, in its discretion, to withhold out of any payment (final or otherwise and even though such payment has already been certified as due) such sums as the Authority may deem ample to protect it against delay or loss or to assure the payment of just claims of third persons, and to apply such sums in such manner as the Port Authority may deem proper to protect it against delay or loss or to satisfy such claims. All sums so applied shall be deducted from the Contractor's compensation. Omission by the Authority to withhold out of any payment, final or otherwise, a sum for any of the above contingencies, even though such contingency has occurred at the time of such payment, shall not be deemed to indicate that the Authority does not intend to exercise its right with respect to such contingency. Neither the above provisions for rights of the Authority to withhold and apply monies nor any exercise or attempted exercise of, or omission to exercise, such rights by the Authority shall create any obligation of any kind to such materialman, subcontractors, workman or other third persons. If, however, the payment of any amount due the Contractor shall be improperly delayed, the Port Authority shall pay the Contractor interest

thereon at the rate of 6% per annum for the period of the delay, it being agreed that such interest shall be in lieu of and in liquidation of any damages to the Contractor because of such delay.

Until actual payment to the Contractor, its right to any amount to be paid under this Contract (even though such amount has already been certified as due) shall be subordinate to the rights of the Authority under this clause.

- B. If the Port Authority has paid any sum or has incurred any obligation or expense which the Contractor has agreed to pay or reimburse the Port Authority, or if the Port Authority is required or elects to pay any sum or sums or incurs any obligations or expense by reason of the failure, neglect or refusal of the Contractor to perform or fulfill any one or more of the conditions, covenants, or agreements contained in this Contract, or as a result of an act of omission of the Contractor contrary to the said conditions, covenants and agreements, the Contractor shall pay to the Port Authority the sum or sums so paid or expense so incurred, including all interests, costs and damages, promptly upon the receipt of the Port Authority's statement therefore. The Port Authority may, however, in its discretion, elect to deduct said sum or sums from any payment payable by it to the Contractor.
- C. If the Port Authority pays any installment to the Contractor without reducing said installment as provided in this Contract, it may reduce any succeeding installment by the proper amount, or it may bill the Contractor for the amount by which the installment paid should have been reduced and the Contractor shall pay to the Port Authority any such amount promptly upon receipt of the Port Authority's statement therefore.
- D. The Port Authority shall also have the rights set forth above in the event the Contractor shall become insolvent or bankrupt or if its affairs are placed in the hands of a receiver, trustee or assignee for the benefit of creditors.

### **13. CONTRACTOR PERSONNEL STANDARDS OF PERFORMANCE**

The Contractor shall furnish sufficiently trained management, supervisory, technical and operating personnel to perform the services required of the Contractor under this Contract. If, in the opinion of the Director, any of the Contractor's personnel are not satisfactory in the performance of services to be furnished hereunder, the Contractor shall remove such personnel and replace them with personnel satisfactory to the Director.

At the time the Contractor is carrying out its operations there may be other persons working physically in the vicinity or in the same logical or technical infrastructure. The Contractor shall so conduct its operations as to work in harmony and not endanger, interfere with or delay the operations of others, all to the best interests of the Authority and others and as may be directed by the Director.

### **14. DESIGNATED SECURE AREAS**

Services under the Contract may be required in designated secure areas, as the same may be designated by the Manager from time to time ("Secure Areas"). The Port Authority shall require the observance of certain security procedures with respect to Secure Areas, which may include the escort to, at, and/or from said high security areas by security personnel for employees designated by

the Contractor, or any subcontractor's personnel required to work therein. All personnel that require access to designated secure areas who are not under positive escort by an authorized individual will be required to undergo background screening and personal identity verification.

Prior to the proposed performance of any work in a Secure Area, the Contractor shall notify the Manager. The Contractor shall conform to the procedures as may be established by the Manager from time to time and at any time for access to Secure Areas and the escorting of personnel hereunder. Prior to the start of work, the Contractor shall request a description from the Manager of the Secure Areas which will be in effect on the commencement date. The description of Secure Areas may be changed from time to time and at any time by the Manager during the term of the Contract.

## **15. NOTIFICATION OF SECURITY REQUIREMENTS**

The Authority has the responsibility of ensuring safe, reliable and secure transportation facilities, systems, and projects to maintain the well-being and economic competitiveness of the region. Therefore, the Authority reserves the right to deny access to certain documents, sensitive security construction sites and facilities (including rental spaces) to any person that declines to abide by Port Authority security procedures and protocols, any person with a criminal record with respect to certain crimes or who may otherwise pose a threat to the construction site or facility security. The Authority reserves the right to impose multiple layers of security requirements on the Contractor, its staff and subcontractors and their staffs depending upon the level of security required, or may make any amendments with respect to such requirements as determined by the Authority.

These security requirements may include but are not limited to the following:

- Execution of Port Authority Approved Non-Disclosure and Confidentiality Agreements and Acknowledgements

At the direction of the Port Authority, the Contractor shall be required to have its principals, staff and/or subcontractor(s) and their staff, execute Port Authority-approved Non-Disclosure and Confidentiality Agreements and Acknowledgments.

- Contractor/ Subcontractor identity checks and background screening

The Port Authority's designated background screening provider may require inspection of not less than two forms of valid/current government issued identification (at least one having an official photograph) to verify staff's name and residence; screening of federal, state, and/or local criminal justice agency information databases and files; screening of any terrorist identification files; access identification, to include some form of biometric security methodology such as fingerprint, facial or iris scanning.

The Contractor may be required to have its staff, and any subcontractor's staff, material-men, visitors or others over whom the Contractor/ subcontractor has control, authorize the Port Authority or its designee to perform background checks, and a personal identity verification check. Such authorization shall be in a form acceptable to the Port Authority. The Contractor and subcontractors may also be required to use an organization designated by the Port Authority to perform the background checks.

In accordance with the Port Authority's Information Security Handbook, background screening is required when a person has an established need to know or has access to any one of the following types of information or physical locations:

- 1) Confidential Privileged Information

- 2) Confidential Information related to a security project and/or task
- 3) Secure Area of an Authority or PATH facility
- 4) Mission critical system

The Contractor shall perform background checks through the Port Authority's personnel assurance program provider. The Secure Worker Access Consortium (S.W.A.C.) is the only Port Authority approved provider to be used to conduct background screening and personal identity verification, except as otherwise required by federal law and/or regulation (such as Security Identification Display Area (SIDA), the federal regulatory requirements for personnel performing Work at aviation facilities.). Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers is located at <http://www.secureworker.com>, or S.W.A.C. may be contacted directly at (877) 522-7922 for more information and the latest pricing. The cost for said background checks for staff that pass and are granted a credential may be reimbursable to the Contractor (and its subcontractors) as an out-of-pocket expense as provided herein. Costs for background checks for staff that are rejected for a credential for any reason are not reimbursable.

- Issuance of Photo Identification Credential

No person shall be permitted on or about the Port Authority construction sites or facilities (including rental spaces) without a facility-specific photo identification credential approved by the Port Authority. If the Port Authority requires facility-specific identification credentials for the Contractor and the subcontractor's staff, the Port Authority will supply such identification at no cost to the Contractor or its subcontractors. Such facility-specific identification credential shall remain the property of the Port Authority and shall be returned to the Port Authority at the completion or upon request prior to completion of the individual's assignment at the specific facility. It is the responsibility of the appropriate Contractor or subcontractors to immediately report to the Port Authority the loss of any staff member's individual facility-specific identification credential. The Contractor or subcontractor will be billed for the cost of the replacement identification credential. Contractor's and subcontractor's staff shall display identification badges in a conspicuous and clearly visible manner, when entering, working or leaving a Port Authority construction site or facility.

Employees may be required to produce not less than two forms of valid/current government issued identification having an official photograph and an original, unlaminated social security card for identity and SSN verification.

Where applicable, for sensitive security construction sites or facilities, successful completion of the application, screening and identify verification for all employees of the Contractor and subcontractor shall be completed prior to being provided a photo identification credential by the personnel assurance program provider.

If any questions should arise as to when a Personnel Assurance Program background check is required, the Port Authority Manager or contract administrator should be contacted for assistance.

- Access control, inspection, and monitoring by security guards

The Authority may provide for Authority construction site or facility (including rental spaces) access control, inspection and monitoring by Port Authority Police or Authority retained contractor security guards. However, this provision shall not relieve the Contractor of its responsibility to secure its equipment and work and that of its subconsultants/subcontractors

and service suppliers at the Authority construction site or facility (including rental spaces). In addition, the Contractor, subcontractor or service provider is not permitted to take photographs, digital images, or make electronic copies and/or electronic transmissions or video recordings or make sketches on any other medium at the Authority construction sites or facilities (including rental spaces), except when necessary to perform the Work under this Contract, without prior written permission from the Authority. Upon request, any photograph, digital images, video recording or sketches made of the Authority construction site or facility shall be submitted to the Authority to determine compliance with this paragraph, which submission shall be conclusive and binding on the submitting entity.

- Compliance with the Port Authority Information Security Handbook

The Contract may require access to Port Authority information considered Protected Information ("PI") as defined in the Port Authority Information Security Handbook ("Handbook"), dated October, 2008, revised as of April 2, 2018, and as may be further amended. The Handbook and its requirements are hereby incorporated into this agreement and will govern the possession, distribution and use of PI if at any point during the lifecycle of the project or solicitation it becomes necessary for the Contractor to have access to PI. Protecting sensitive information requires the application of uniform safeguarding measures to prevent unauthorized disclosure and to control any authorized disclosure of this information within the Port Authority or when released by the Port Authority to outside entities. The Handbook can be obtained at: <http://www.panynj.gov/business-opportunities/pdf/Corporate-Information-Security-Handbook.pdf>.

- Audits for Compliance with Security Requirements

The Port Authority may conduct random or scheduled examinations of business practices under this section entitled "NOTIFICATION OF SECURITY REQUIREMENTS" and the Handbook in order to assess the extent of compliance with security requirements, Protected Information procedures, protocols and practices, which may include, but not be limited to, verification of background check status, confirmation of completion of specified training, and/or a site visit to view material storage locations and protocols.

## **16. INSURANCE PROCURED BY THE CONTRACTOR**

Refer to the Request for Proposal, Attachment B – Contract Specific Terms and Conditions.

## **17. ASSIGNMENTS AND SUBCONTRACTS**

Any assignment or other transfer by the Contractor of this Contract or any part hereof or of any of its rights hereunder or of any monies due or to become due hereunder and any delegation of any of its duties hereunder without the express written consent of the Director shall be void and of no effect as to the Authority, provided, however, that the Contractor may subcontract portions of the Work to such persons as the Director, may, from time to time, expressly approve in writing. For each individual, partnership or corporation proposed by the Contractor as a subcontractor, the Contractor shall submit to the Authority a certification or, if a certification cannot be made, a statement by such person, partnership or corporation to the same effect as the certification or statement required from the Contractor pursuant to the clauses of the "Contractor's Integrity Provisions" Section entitled "Certification of No Investigation (criminal or civil-antitrust) Indictment, Conviction, Debarment Suspension, Disqualification and Disclosure of Other Information and "Non-Collusive Bidding and Code of Ethics Certification; Certification of No Solicitation Based on Commission, Percentage, Brokerage Contingent or Other Fee". All further subcontracting by any subcontractor shall also be subject to such approval of the Director

No consent to any assignment or other transfer, and no approval of any subcontractor, shall under any circumstances operate to relieve the Contractor of any of his obligations; no subcontract, no approval of any subcontractor and no act or omission of the Authority or the Director shall create any rights in favor of such subcontractor and against the Authority; and as between the Authority and the Contractor, all assignees, subcontractors, and other transferees shall for all purposes be deemed to be agents of the Contractor. Moreover, all subcontractors and all approvals of subcontractors, regardless of their form, shall be deemed to be conditioned upon performance by the subcontractor in accordance with this Contract; and if any subcontractor shall fail to perform the Contract to the satisfaction of the Director, the Director shall have the absolute right to rescind his approval forthwith and to require the performance of the Contract by the Contractor personally or through other approved subcontractors.

## **18. CERTAIN CONTRACTOR'S WARRANTIES**

The Contractor represents and warrants:

- A. That it is financially responsible and experienced in, and competent to perform this Contract; that no representation, promise or statement, oral or in writing, has induced it to submit its Proposal, saving only those contained in the papers expressly made part of this Contract; that the facts stated or shown in any papers submitted or referred to in connection with his Proposal are true; and, if the Contractor be a corporation, that it is authorized to perform this Contract;
- B. That it has carefully examined and analyzed the provisions and requirements of this Contract, that from its own investigations it has satisfied itself as to the nature of all things needed for the performance of this Contract, the general and local conditions and all other matters which in any way affect this Contract or its performance, and that the time available to it for such examination, analysis, inspection and investigations was adequate;
- C. That the Contract is feasible of performance in accordance with all its provisions and requirements and that it can and will perform it in strict accordance with such provisions and requirements;
- D. That no Commissioner, officer, agent or employee of the Authority is personally interested directly or indirectly in this Contract or the compensation to be paid hereunder;
- E. That, except only for those representations, statements or promises expressly contained in this Contract, no representation, statement or promise, oral or in writing, of any kind whatsoever by the Authority, its Commissioners, officers, agents, employees or consultants has induced the Contractor to enter into this Contract or has been relied upon by the Contractor, including any with reference to: (1) the meaning, correctness, suitability or completeness of any provisions or requirements of this Contract; (2) the nature, existence or location of materials, structures, obstructions, utilities or conditions, which may be encountered at the installation sites; (3) the nature, quantity, quality or size of the materials, equipment, labor and other facilities needed for the performance of this Contract; (4) the general or local conditions which may in any way affect this Contract or its performance; (5) the price of the Contract; or (6) any other matters, whether similar to or different from those referred to in (1) through (5) immediately above, affecting or having any connection with this Contract, the proposing thereon, any discussions thereof, the performance thereof or those employed therein or connected or concerned therewith.
- F. That, notwithstanding any requirements of this Contract, any inspection or approval of the Contractor's services by the Authority, or the existence of any patent or trade name, the Contractor nevertheless warrants and represents that the services and any intellectual property supplied to the Authority hereunder shall be of the best quality and shall be fully fit for the purpose for which they are to be used. The Contractor unconditionally guarantees against defects or failures of any kind, including defects or failures in design, workmanship and

materials, excepting solely defects or failures which the Contractor demonstrates to the satisfaction of the Authority have arisen solely from accident, abuse or fault of the Authority occurring after issuance of Final Payment hereunder and not due to fault on the Contractor's part. In the event of defects or failures in said services, or any part thereof, then upon receipt of notice thereof from the Authority, the Contractor shall correct such defects or failures as may be necessary or desirable, in the sole opinion of the Authority, to comply with the above guaranty.

Moreover, the Contractor accepts the conditions at the sites of work as they may eventually be found to exist and warrants and represents that it can and will perform the Contract under such conditions and that all materials, equipment, labor and other facilities required because of any unforeseen conditions (physical or otherwise) shall be wholly at its own cost and expense, anything in this Contract to the contrary notwithstanding.

Nothing in the Scope of Work or any other part of the Contract is intended as or shall constitute a representation by the Authority as to the feasibility of performance of this Contract or any part thereof. Moreover, the Authority does not warrant or represent either by issuance of the Scope of Work or by any provision of this Contract as to time for performance or completion or otherwise that the Contract may be performed or completed by the times required herein or by any other times.

The Contractor further represents and warrants that it was given ample opportunity and time and by means of this paragraph was requested by the Authority to review thoroughly all documents forming this Contract prior to execution of this Contract in order that it might request inclusion in this Contract of any statement, representation, promise or provision which it desired or on which it wished to place reliance; that it did so review said documents; that either every such statement, representation, promise or provision has been included in this Contract or else, if omitted, that it expressly relinquishes the benefit of any such omitted statement, representation, promise or provision and is willing to perform this Contract without claiming reliance thereon or making any other claim on account of such omission.

The Contractor further recognizes that the provisions of this clause (though not only such provisions) are essential to the Authority's consent to enter into this Contract and that without such provisions; the Authority would not have entered into this Contract.

## **19. RIGHTS AND REMEDIES OF THE AUTHORITY**

The Authority shall have the following rights in the event the Director shall deem the Contractor guilty of a breach of any term whatsoever of this Contract:

- a) The right to take over and complete the Work or any part thereof as agent for and at the expense of the Contractor, either directly or through other contractors;
- b) The right to cancel this Contract as to any or all of the Work yet to be performed;
- c) The right to specific performance, an injunction or any other appropriate equitable remedy; and
- d) The right to money damages.

For the purpose of this Contract, breach shall include but not be limited to the following, whether or not the time has yet arrived for performance of an obligation under this Contract: a statement by the Contractor to any representative of the Authority indicating that it cannot or will not perform any one or more of its obligations under this Contract; any act or omission of the Contractor or any other occurrence which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract; any suspension of or failure to proceed with any part of the Work



by the Contractor which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract; any false certification at any time by the Contractor as to any material item certified pursuant to the clauses hereof entitled "Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Required Information" and "Non-Collusive Bidding and Code of Ethics Certification; Certification of No Solicitation Based on Commission, Percentage, Brokerage, Contingent or Other Fee", or the willful or fraudulent submission of any signed statement pursuant to such clauses which is false in any material respect; or the Contractor's incomplete or inaccurate representation of its status with respect to the circumstances provided for in such clauses.

The enumeration in this numbered clause or elsewhere in this Contract of specific rights and remedies of the Authority shall not be deemed to limit any other rights or remedies which the Authority would have in the absence of such enumeration; and no exercise by the Authority of any right or remedy shall operate as a waiver of any other of its rights or remedies not inconsistent therewith or to stop it from exercising such other rights or remedies.

Neither the acceptance of the work or any part thereof, nor any payment therefor, nor any order or certificate issued under this Agreement or otherwise issued by the Authority, or any Commissioner, Director, officer, agent or employee of the Authority, nor any permission or direction to continue with the performance of work, nor any performance by the Authority of any of the Contractor's duties or obligations, nor any aid provided to the Contractor by the Authority in his performance of such duties or obligations, nor any other thing done or omitted to be done by the Authority, its Commissioners, Directors, officers, agents or employees shall be deemed to be a waiver of any provision of this Agreement or of any rights or remedies to which the Authority may be entitled because of any breach hereof, excepting only a resolution of its Commissioners, providing expressly for such waiver. No cancellation, rescission or annulment hereof, in whole or as to any part of the work, because of any breach hereof, shall be deemed a waiver of any money damages to which the Authority may be entitled because of such breach. Moreover, no waiver by the Authority of any breach of this Agreement shall be deemed to be a waiver of any other or any subsequent breach.

## **20. RIGHTS AND REMEDIES OF THE CONTRACTOR**

Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract which may be committed by the Authority, the Contractor expressly agrees that no default, act or omission of the Authority shall constitute a material breach of this Contract, entitling him to cancel or rescind it or (unless the Director shall so direct) to suspend or abandon performance.

## **21. TAX EXEMPTIONS**

Purchases of services and tangible personal property by the Port Authority are exempt from New York and New Jersey state and local sales and compensating use taxes (Sales Taxes). Therefore, the Port Authority's purchase of the Contractor's services under this Contract is exempt from Sales Taxes. Accordingly, the Contractor must not include Sales Taxes in the price charged to the Port Authority for the Contractor's services under this Contract.

## **22. TITLE TO EQUIPMENT**

Title to all equipment to be furnished hereunder by the Contractor shall be transferred to the Authority upon its delivery to the installation site.

The Contractor shall furnish such bills of sale and affidavits of title as the Authority shall reasonably request.

## 23. NOTICE REQUIREMENTS

No claim against the Authority shall be made or asserted in any action or proceeding at law or in equity, and the Contractor shall not be entitled to allowance of such claim, unless the Contractor shall have complied with all requirements relating to the giving of written notice and of information with respect to such claim as provided in this clause. The failure of the Contractor to give such written notice and information as to any claim shall be conclusively deemed to be a waiver by the Contractor of such claim, such written notice and information being conditions precedent to such claim. As used herein "claim" shall include any claim arising out of this Agreement (including claims in the nature of breach of contract or fraud or misrepresentation before or subsequent to execution of this Agreement and claims of a type which are barred by the provisions of this Agreement) for damages, payment or compensation of any nature or for performance of any part of this Agreement.

The requirements as to the giving of written notice and information with respect to claims shall be as follows:

- A. In the case of any claims for which requirements are set forth elsewhere in this Agreement as to notice and information, such requirements shall apply.
- B. In the case of all other types of claims, notice shall have been given to the Director, as soon as practicable, and in any case within forty-eight (48) hours after occurrence of the act, omission, or other circumstances upon which the claim is or will be based, stating as fully as practicable at the time all information relating thereto. Such information shall be supplemented with any further information as soon as practicable after it becomes or should become known to the Contractor, including daily records showing all costs which the Contractor may be incurring or all other circumstances which will affect any claim to be made which records shall be submitted to the Authority.

The above requirements for notices and information are for the purpose of enabling the Authority to avoid waste of public funds by affording it promptly the opportunity to cancel or revise any order, change its plans, mitigate or remedy the effects of circumstances giving rise to a claim or take such other action as may seem desirable and to verify any claimed expense or circumstance as they occur and the requirements herein for such notice and information are essential to this Agreement and are in addition to any notice required by statute with respect to suits against the Authority.

The above referred to notices and information are required whether or not the Authority is aware of the existence of any circumstances which might constitute a basis for a claim and whether or not the Authority has indicated it will consider a claim.

No, act, omission or statement of any kind shall be regarded as a waiver of any of the provisions of this clause or may be relied upon as such waiver except only either a written statement signed by the Executive Director of the Authority or a resolution of the Commissioners of the Authority expressly stating that a waiver is intended as to any particular provision of this clause, and more particularly, no discussion, negotiation, consideration, correspondence or requests for information with respect to a claim by any Commissioner, officer, employees or agent of the Authority shall be construed as a waiver of any provision of this clause or as authority or apparent authority to effect such a waiver.

Since merely oral notice or information may cause disputes as to the existence or substance thereof, and since notice, even if written, to other than the Authority representative above designated to receive it may not be sufficient to come to the attention of the representative of the Authority with the knowledge and responsibility of dealing with the situation, only notice

and information complying with the express provisions of this clause shall be deemed to fulfill the Contractor's obligation under this Agreement.

## **24. SERVICE OF NOTICES ON THE CONTRACTOR**

Whenever provision is made in this Contract for the giving of any notice to the Contractor, its deposit in any post office box, enclosed in a postpaid wrapper addressed to the Contractor at his/her office, or its delivery to his/her office, shall be sufficient service thereof as of the date of such deposit or delivery, except to the extent, if any, otherwise provided in the clause entitled "Submission to Jurisdiction". Until further notice to the Authority the Contractor's office will be that stated in its Proposal. Notices may also be served personally upon the Contractor; or if a corporation, upon any officer, director or managing or general agent; or if a partnership upon any partner.

## **25. NO THIRD PARTY RIGHTS**

Nothing contained in this Agreement is intended for the benefit of third persons, except to the extent that the Agreement specifically provides otherwise by use of the words "benefit" or "direct right of action".

## **26. INDEMNIFICATION AND RISKS ASSUMED BY THE CONTRACTOR**

To the extent permitted by law, the Contractor shall indemnify and hold harmless the Port Authority and all of its related entities including, but not limited to, PATH, and its and their Commissioners, Directors, Superintendents, agents, servants, officers, representatives and employees (the "Port Authority Indemnitees") from and against all claims and demands, just or unjust, of third persons (including Contractor's agents, servants, directors, officers, representatives and employees) arising out of or in any way connected to or alleged to arise out of or alleged to be in any way connected with the Contract and all other services and activities of the Contractor under this Contract and for all expenses incurred by it and by them in the defense, settlement or satisfaction thereof, including without limitation thereto, claims and demands for death, for personal injury or for property damage, direct or consequential, whether they arise out of or are in any way connected to the Contractor's operations or to its performance of work under this Contract, or arise out of the acts, omissions or negligence of the Contractor, the Port Authority, PATH, their Commissioners, Directors, Superintendents, agents, servants, officers, representatives or employees, third persons (including Contractor's agents, servants, officers, representatives and employees), or from the acts of God or the public enemy, or otherwise, including claims and demands of any local jurisdiction against the Port Authority Indemnitees in connection with this Contract.

The Contractor assumes the following risks, whether such risks arise out of or are in any way connected to the Contractor's operations or to its performance of work under this Contract, or arise out of acts or omissions (negligent or not) of the Contractor, the Port Authority, PATH or third persons (including agents, servants, officers, representatives, Commissioners, Directors, Superintendents, and employees of the Port Authority and/or PATH and the Contractor) or from any other cause, excepting only risks occasioned solely by affirmative willful acts of the Port Authority and/or PATH done subsequent to the opening of proposals on this Contract, and shall to the extent permitted by law indemnify the Port Authority Indemnitees for all loss or damage incurred in connection with such risks:

- a. The risk of any and all loss or damage to Port Authority property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions, on or

off the premises, the loss or damage of which shall arise out of the Contractor's operations hereunder. The Contractor shall if so directed by the Port Authority, repair, replace or rebuild to the satisfaction of the Port Authority, any and all parts of the premises or the Facility which may be damaged or destroyed by the acts or omissions (negligent or not) of the Contractor, its officers, agents, or employees and if the Contractor shall fail so to repair, replace, or rebuild with due diligence the Port Authority may, at its option, perform any of the foregoing work and the Contractor shall pay to the Port Authority the cost thereof.

b. The risk of any and all loss or damage of the Contractor's property, equipment (including but not limited to automotive and/or mobile equipment) materials and possessions on the Facility.

c. The risk of claims, whether made against the Contractor or the Port Authority, for any and all loss or damages occurring to any property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions of the Contractor's agents, employees, materialmen and others performing work hereunder.

d. The risk of claims for injuries, damage or loss of any kind whether just or unjust of third persons (including agents, servants, officers, representatives, Commissioners, directors and employees of the Port Authority and the Contractor) arising or alleged to arise out of or in connection with the Contractor's operations or its performance of work hereunder, whether such claims are made against the Contractor or the Port Authority.

If so directed, the Contractor shall at its own expense defend any suit based upon any such claim or demand, even if such suit, claim or demand is groundless, false or fraudulent, and in handling such shall not, without obtaining express advance permission from the General Counsel of the Port Authority and/or Counsel of PATH, raise any defense involving in any way the jurisdiction of the tribunal over the person of the Port Authority and/or PATH, the immunity of the Port Authority and/or PATH, their Commissioners, Directors, Superintendents, officers, agents or employees, the governmental nature of the Port Authority and/or PATH or the provision of any statutes respecting suits against the Port Authority and/or PATH.

Neither the requirements of the Port Authority under this Contract, nor of the Port Authority of the methods of performance hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of performance hereunder nor the failure of the Port Authority to direct the Contractor to take any particular precaution or other action or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

## **27. APPROVAL OF METHODS**

Neither the approval of the Port Authority of the methods of furnishing services hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of furnishing services hereunder, nor the failure of the Port Authority to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall relieve the Contractor of its liability for any injuries to persons or damage to property or environmental impairment arising out of its operations.

## **28. PORT AUTHORITY STANDARDS AND GUIDELINES**

The Contractor and all of its subcontractors shall follow all Port Authority required guidelines whether such guidelines are currently existing or are developed in the future, as the same may be updated, amended, or modified from time to time.

## **29. SUBMISSION TO JURISDICTION**

The Contractor hereby irrevocably submits itself to the jurisdiction of the Courts of the State of New York and New Jersey, in regard to any controversy arising out of, connected with, or in any way concerning this Contract.

The Contractor agrees that the service of process on the Contractor in relation to such jurisdiction may be made, at the option of the Port Authority, either by registered or certified mail addressed to it at the address of the Contractor indicated on the signature sheet, or by actual personal delivery to the Contractor, if the Contractor is an individual, to any partner if the Contractor be a partnership or to any officer, director or managing or general agent if the Contractor be a corporation.

Such service shall be deemed to be sufficient when jurisdiction would not lie because of the lack of basis to serve process in the manner otherwise provided by law. In any case, however, process may be served as stated above whether or not it might otherwise have been served in a different manner.

## **30. APPLICABLE LAW**

This Contract shall be construed in accordance with the laws of the State of New York. The Contractor hereby consents to the exercise by the courts of the States of New York and New Jersey of jurisdiction in personam over it with respect to any matter arising out of or in connection with this Contract and waives any objection to such jurisdiction which it might otherwise have; and the Contractor agrees that mailing of process by registered mail addressed to it at the address of the Contractor set forth in the Proposal, shall have the same effect as personal service within the States of New York or New Jersey upon a domestic corporation of said State.

## **31. AUTHORITY OF THE DIRECTOR**

Inasmuch as the public interest requires that the project to which this Contract relates shall be performed in the manner which the Authority, acting through the Director deems best, the Director shall have absolute authority to determine what is or is not necessary or proper for or incidental thereto and the Specifications shall be deemed merely the Director's present determination on this point. In the exercise of this authority, the Director shall have power to alter the Specifications, to require the performance of Work not required by them in their present form, even though of a totally different character from that not required, and to vary, increase and diminish the character, quantity and quality of, or to countermand any Work now or hereafter required. If at any time it shall be, from the viewpoint of the Authority, impracticable or undesirable in the judgment of the Director to proceed with or continue the performance of the Contract or any part thereof, whether or not for reasons beyond the control of the Authority, the Director shall have authority to suspend performance of any part or all of the Contract until such time as the Director may deem it practicable or desirable to proceed. Moreover, if at any time it shall be, from the viewpoint of the Authority impracticable or undesirable in the judgment of the Director to proceed with or continue the performance of the Contract or any part thereof for reasons within or beyond the control of the Authority, the Director shall have authority to cancel this Contract as to any or all portions not yet performed and as to any materials not yet installed even though delivered. Such cancellation shall be without prejudice to the rights and obligations of the parties arising out of portions already satisfactorily performed, but no allowance shall be made for anticipated profits. To resolve all disputes and to prevent litigation, the parties to this Contract authorize the Director to decide all

questions of any nature whatsoever arising out of, under, or in connection with, or in any way related to or on account of, this Contract (including claims in the nature of breach of contract or fraud or misrepresentation before or subsequent to acceptance of the Contractor's Proposal and claims of a type which are barred by the provisions of this Contract) and such decision shall be conclusive, final and binding on the parties. The Director's decision may be based on such assistance as she may find desirable. The effect of the decision shall not be impaired or waived by any negotiation or settlement offers in connection with the question decided, whether or not the Director participated therein, or by any prior decision of the Director or others, which prior decisions shall be deemed subject to review, or by any termination or cancellation of this Contract.

All such questions shall be submitted in writing by the Contractor to the Director for a decision together with all evidence and other pertinent information in regard to such questions, in order that a fair and impartial decision may be made. In any action against the Authority relating to any such question the Contractor must allege in the complaint and prove such submission, which shall be a condition precedent to any such action. No evidence or information shall be introduced or relied upon in such an action that has not been so presented to the Director.

In the performance of the Contract, the Contractor shall conform to all orders, directions and requirements of the Director and shall perform the Contract to the Director's satisfaction at such times and places, by such methods and such manner and sequence as the Director may require, and the Contract shall at all stages be subject to the Director's inspection. The Contractor shall employ no equipment, materials, methods or men to which the Director objects, and shall remove no materials, equipment or other facilities from the Authority site without permission. Upon request, the Director shall confirm in writing any oral order, direction, requirements or determination.

The enumeration herein or elsewhere of particular instances in which the opinion, judgment, discretion or determination of the Director shall control or in which the Contract shall be performed to the Director's satisfaction or subject to the Director's inspection, shall not imply that only the matters of a nature similar to those enumerated shall be so governed and performed, but without exception the entire Contract shall be so governed and performed.

### **32. APPROVALS BY THE DIRECTOR**

The approval by the Director of any service required hereunder, shall be construed merely to mean that at that time the Director knows of no good reason for objecting thereto and no such approval shall release the Contractor from its full responsibility for the satisfactory performance of the services to be supplied. "Approved equal" shall mean approved by the Director.

### **33. CONTRACT REVIEW AND COMPLIANCE AUDITS**

The Contractor, and any subcontractors, shall provide system access and reasonable assistance to the Authority's External and Internal Audit staff or its consultants in their performance of work under the contract, including producing specific requested information, extraction of data and reports. The Contractor, and any subcontractors, shall support requests related to audits of the agreement and administration tasks and functions covered by this Contract.

The Authority reserves the right to use and load security and system software to evaluate the level of security and vulnerabilities in all systems which control, collect, dispense, contain, manage, administer, or monitor revenue "owned" by the Port Authority.

The Authority reserves the right to use as required and load security and system software to evaluate the level of security and vulnerabilities in any applicable environment-covered under this Contract. If such right is exercised, then both parties shall work in good faith to ensure there is no access or potential access to third party proprietary data within the applicable environment or access to other systems not covered under this Contract.

### **34. AUTHORITY ACCESS TO RECORDS**

The Authority shall have access during normal business hours to all records and documents of the Contractor relating to any service provided under this Agreement, amounts for which it has been compensated, or claims it should be compensated, by the Authority above those included in the lump sum compensation set forth elsewhere herein. All Contractor records shall be kept in the Port District. The Contractor shall obtain for the Authority similar access to similar records and documents of subcontractors. Such access shall be given or obtained both before and within a period of three (3) years after Final Payment to the Contractor, provided, however, that if within the aforesaid three (3) year period the Authority has notified the Contractor in writing of a pending claim by the Authority under or in connection with this Contract to which any of the aforesaid records and documents of the Contractor or of his subcontractors relate either directly or indirectly, then the period of such right of access shall be extended to the expiration of six (6) years from the date of Final Payment with respect to the records and documents involved.

Upon request of the Port Authority, the Contractor shall furnish or provide access to the federal Form I-9 (Employment Eligibility Verification) for each individual performing work under this Contract. This includes citizens and noncitizens.

The Contractor shall provide, at no cost to the Authority, access for and reasonable assistance to such auditors from the Authority or the Authority's external auditors that may, from time to time, be designated to audit detail records which support Contractor charges to the Authority. The Authority shall have access to the detail records that support Contractor charges to the Authority for up to three (3) years following the termination of the Contract.

No provision in this Contract giving the Authority a right of access to records and documents is intended to impair or affect any right of access to records and documents that the Authority would have in the absence of such provision.

### **35. HARMONY**

- a. The Contractor shall not employ any persons or use any labor, or use or have any equipment, or permit any condition to exist which shall or may cause or be conducive to any labor complaints, troubles, disputes or controversies at the Facility which interfere or are likely to interfere with the operation of the Port Authority or with the operations of lessees, licensees or other users of the Facility or with the operations of the Contractor under this Contract.

The Contractor shall immediately give notice to the Port Authority (to be followed by written notices and reports) of any and all impending or existing labor complaints, troubles, disputes or controversies and the progress thereof. The Contractor shall use its best efforts to resolve any such complaint, trouble, dispute or controversy. If any type of strike, boycott, picketing, work stoppage, slowdown or other labor activity is directed against the Contractor at the Facility or against any operations of the Contractor under this Contract, whether or not caused by the employees of the Contractor, and if any of the foregoing, in the opinion of the Port Authority, results or is likely to result in any curtailment or diminution of the services to be performed hereunder or to interfere with or affect the operations of the Port Authority, or to interfere with or affect the operations of lessees, licensees, or other users of the Facility or in the event of any other cessation or stoppage of operations by the Contractor hereunder for any reason whatsoever, the Port Authority shall have the right at any time during the continuance thereof to suspend the operations of the Contractor under this Contract, and during the period of the suspension the Contractor shall not perform its services hereunder and the Port Authority shall have the right during said period to itself or by any third person or persons selected by it to perform said services of the Contractor using

the equipment which is used by the Contractor in its operations hereunder as the Port Authority deems necessary and without cost to the Port Authority. During such time of suspension, the Contractor shall not be entitled to any compensation. Any flat fees, including management fees, shall be prorated. Prior to the exercise of such right by the Port Authority, it shall give the Contractor notice thereof, which notice may be oral. No exercise by the Port Authority of the rights granted to it in the above subparagraph shall be or be deemed to be a waiver of any rights of termination or revocation contained in this Contract or a waiver of any rights or remedies which may be available to the Port Authority under this Contract or otherwise.

- b. During the time that the Contractor is performing the Contract, other persons may be engaged in other operations on or about the worksite including Facility operations, pedestrian, bus and vehicular traffic and other contractors performing at the worksite, all of which shall remain uninterrupted.

The Contractor shall so plan and conduct its operations as to work in harmony with others engaged at the site and not to delay, endanger or interfere with the operation of others (whether or not specifically mentioned above), all to the best interests of the Port Authority and the public as may be directed by the Port Authority.

### **36. CLAIMS OF THIRD PERSONS**

The Contractor undertakes to pay all claims lawfully made against it by subcontractors, materialmen and workmen, and all claims lawfully made against it by other third persons arising out of or in connection with or because of the performance of this Contract and to cause all subcontractors to pay all such claims lawfully made against them.

### **37. NON-DISCRIMINATION REQUIREMENTS**

The Contractor shall take all necessary and reasonable steps to ensure non-discrimination in the performance and administration of all aspects of this Contract.

- A. Contractor hereby agrees that no person on the ground of race, color, national origin, creed/religion, sex, age or handicap/disability shall be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the furnishing of goods or services or in the selection and retention of subcontractors and/or vendors under this Contract. Contractor shall also ascertain and comply with all applicable federal, state and local laws, ordinances, rules, regulations, and orders that pertain to equal employment opportunity, affirmative action, and non-discrimination in employment.
- B. Contractor agrees that these “Non-Discrimination Requirements” are a binding part of this Contract. Without limiting the generality of any other term or provision of this Contract, in the event the Authority, or a state or federal agency finds that the Contractor or any of its subcontractors or vendors has not complied with these “Non-Discrimination Requirements”, the Authority may cancel, terminate or suspend this Contract in accordance with Section 11 of these General Contract Provisions entitled “Default, Revocation, or Suspension of Contract.”
- C. Contractor agrees to cooperate fully with the Authority’s investigation of allegations of discrimination. Cooperation includes, but is not limited to, allowing the Authority to question employees during the investigation of allegations of discrimination, and complying with directives that the Authority or the State or Federal government deem essential to ensure compliance with these “Non-Discrimination Requirements.”



## **38. CONTRACTOR'S INTEGRITY PROVISIONS**

### **1. Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information**

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that the Bidder and each parent and/or affiliate of the Bidder has not

- a. been indicted or convicted in any jurisdiction;
- b. been suspended, debarred, found not responsible or otherwise disqualified from entering into any contract with any governmental agency or been denied a government contract for failure to meet standards related to the integrity of the Bidder;
- c. received a less than satisfactory rating on a public or government contract;
- d. had a contract terminated by any governmental agency for breach of contract or for any cause based in whole or in part on an indictment or conviction;
- e. ever used a name, trade name or abbreviated name, or an Employer Identification Number different from those inserted in the Bid;
- f. had any business or professional license suspended or revoked or, within the five years prior to bid opening, had any sanction imposed in excess of fifty thousand dollars (\$50,000) as a result of any judicial or administrative proceeding with respect to any license held or with respect to any violation of a federal, state or local environmental law, rule or regulation;
- g. had any sanction imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust regardless of the dollar amount of the sanctions or the date of their imposition; and
- h. been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or a civil anti-trust investigation by any federal, state or local prosecuting or investigative agency, including an inspector general of a governmental agency or public authority.

### **2. Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees**

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that

- a. the prices in its bid have been arrived at independently without collusion, consultation, communication or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

- b. the prices quoted in its bid have not been and will not be knowingly disclosed directly or indirectly by the Bidder prior to the official opening of such bid to any other bidder or to any competitor;
- c. no attempt has been made and none will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition;
- d. this organization has not made any offers or agreements or taken any other action with respect to any Authority employee or former employee or immediate family member of either which would constitute a breach of ethical standards under the Code of Ethics dated March 11, 2014, or as may be revised, (a copy of which is available upon request) nor does this organization have any knowledge of any act on the part of an Authority employee or former Authority employee relating either directly or indirectly to this organization which constitutes a breach of the ethical standards set forth in said Code;
- e. no person or selling agency other than a bona fide employee or bona fide established commercial or selling agency maintained by the Bidder for the purpose of securing business, has been employed or retained by the Bidder to solicit or secure this Contract on the understanding that a commission, percentage, brokerage, contingent, or other fee would be paid to such person or selling agency;
- f. the Bidder has not offered, promised or given, demanded or accepted, any undue advantage, directly or indirectly, to or from a public official or employee, political candidate, party or party official, or any private sector employee (including a person who directs or works for a private sector enterprise in any capacity), in order to obtain, retain, or direct business or to secure any other improper advantage in connection with this Contract; and
- g. no person or organization has been retained, employed or designated on behalf of the Bidder to impact any Port Authority determination with respect to (i) the solicitation, evaluation or award of this Contract, or (ii) the preparation of specifications or request for submissions in connection with this Contract.

The foregoing certifications in this Section 38, Sections 1 and 2, shall be deemed to have been made by the Bidder as follows:

- \* if the Bidder is a corporation, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each parent, affiliate, director, and officer of the Bidder, as well as, to the best of the certifier's knowledge and belief, each stockholder of the Bidder with an ownership interest in excess of 10%;
- \* if the Bidder is a partnership, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each partner.

Moreover, the foregoing certifications, if made by a corporate Bidder, shall be deemed to have been authorized by the Board of Directors of the Bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of such certification as the act and deed of the corporation.

In any case where the Bidder cannot make the foregoing certifications, the Bidder shall so state and shall furnish with the signed bid a signed statement which sets forth in detail the reasons therefor. If the Bidder is uncertain as to whether it can make the foregoing certifications, it shall so indicate in a signed statement furnished with its bid, setting forth in such statement the reasons for its uncertainty. With respect to the foregoing certification in paragraph “2g”, if the Bidder cannot make the certification, it shall provide, in writing, with the signed bid: (i) a list of the name(s), address(es), telephone number(s), and place(s) of principal employment of each such individual or organization; and (ii) a statement as to whether such individual or organization has a “financial interest” in this Contract, as described in the Procurement Disclosure Policy of the Authority (a copy of which is available upon request to the Chief Procurement Officer of the Procurement Department of the Authority). Such disclosure is to be updated as necessary. As a result of such disclosure, the Port Authority shall take appropriate action up to and including a finding of non-responsibility.

Failure to make the required disclosures shall lead to administrative actions up to and including a finding of non-responsiveness or non-responsibility.

Notwithstanding that the Bidder may be able to make the foregoing certifications at the time the bid is submitted, the Bidder shall immediately notify the Authority in writing during the period of irrevocability of bids and the term of the Contract, if Bidder is awarded the Contract, of any change of circumstances which might under this clause make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure. The foregoing certifications or signed statement shall be deemed to have been made by the Bidder with full knowledge that they would become a part of the records of the Authority and that the Authority will rely on their truth and accuracy in awarding and continuing this Contract. In the event that the Authority should determine at any time prior or subsequent to the award of this Contract that the Bidder has falsely certified as to any material item in the foregoing certifications, has failed to immediately notify the Port Authority of any change in circumstances which might make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure, or has willfully or fraudulently furnished a signed statement which is false in any material respect, or has not fully and accurately represented any circumstance with respect to any item in the foregoing certifications required to be disclosed, the Authority may determine that the Bidder is not a responsible Bidder with respect to its bid on the Contract or with respect to future bids on Authority contracts and may exercise such other remedies as are provided to it by the Contract with respect to these matters. In addition, Bidders are advised that knowingly providing a false certification or statement pursuant hereto may be the basis for prosecution for offering a false instrument for filing (see e.g. New York Penal Law, Section 175.30 et seq.). Bidders are also advised that the inability to make such certification will not in and of itself disqualify a Bidder, and that in each instance the Authority will evaluate the reasons therefor provided by the Bidder. Under certain circumstances the Bidder may be required as a condition of Contract award to enter into a Monitoring Agreement under which it will be required to take certain specified actions, including compensating an independent Monitor to be selected by the Port Authority, said Monitor to be charged with, among other things, auditing the actions of the Bidder to determine whether its business practices and relationships indicate a level of integrity sufficient to permit it to continue business with the Port Authority.

### **3. Bidder Eligibility for Award of Contracts - Determination by an Agency of the State of New York or New Jersey Concerning Eligibility to Receive Public Contracts**

Bidders are advised that the Authority has adopted a policy to the effect that in awarding its contracts it will honor any determination by an agency of the State of New York or New Jersey that a Bidder is not eligible to bid on or be awarded public contracts because the Bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing rate of wage legislation.

The policy permits a Bidder whose ineligibility has been so determined by an agency of the State of New York or New Jersey to submit a bid on a Port Authority contract and then to establish that it is eligible to be awarded a contract on which it has bid because (i) the state agency determination relied upon does not apply to the Bidder, or (ii) the state agency determination relied upon was made without affording the Bidder the notice and hearing to which the Bidder was entitled by the requirements of due process of law, or (iii) the state agency determination was clearly erroneous or (iv) the state determination relied upon was not based on a finding of conduct demonstrating a lack of integrity or violation of a prevailing rate of wage law.

The full text of the resolution adopting the policy may be found in the Minutes of the Authority's Board of Commissioners meeting of September 9, 1993.

### **4. Contractor Responsibility, Suspension of Work and Termination**

During the term of this Contract, the Contractor shall at all times during the Contract term remain responsible. The Contractor agrees, if requested by the Port Authority to present evidence of its continuing legal authority to do business in the States of New Jersey or New York, integrity, experience, ability, prior performance, and organizational and financial capacity.

The Port Authority, in its sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when it discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Contract activity may resume at such time as the Port Authority issues a written notice authorizing a resumption of performance under the Contract.

Upon written notice to the Contractor, and an opportunity to be heard with appropriate Port Authority officials or staff, the Contract may be terminated by Port Authority at the Contractor's expense where the Contractor is determined by the Port Authority to be non-responsible. In such event, the Port Authority or its designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for breach, including recovery of costs from Contractor associated with such termination.

### **5. No Gifts, Gratuities, Offers of Employment, Etc.**

At all times, the Contractor shall not offer, give or agree to give anything of value either to a Port Authority employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority, or to a member of the immediate family (i.e., a spouse, child, parent, brother or sister) of any of the foregoing, in connection with the performance by such employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority of duties involving transactions with the Contractor on behalf of the Port Authority, whether or not such duties are related to this Contract or any other Port Authority contract or matter. Any such conduct shall be deemed a material breach of this Contract.

As used herein "anything of value" shall include but not be limited to any (a) favors, such as meals, entertainment, transportation (other than that contemplated by the Contract or any other Port Authority contract), etc. which might tend to obligate the Port Authority employee to the Contractor, and (b) gift, gratuity, money, goods, equipment, services, lodging, discounts not available to the general public, offers or promises of employment, loans or the cancellation thereof, preferential treatment or business opportunity. Such term shall not include compensation contemplated by this Contract or any other Port Authority contract. Where used herein, the term "Port Authority" shall be deemed to include all subsidiaries of the Port Authority.

The Contractor shall insure that no gratuities of any kind or nature whatsoever shall be solicited or accepted by it and by its personnel for any reason whatsoever from the passengers, tenants, customers or other persons using the Facility and shall so instruct its personnel. The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

## **6. Obligation to Report**

In the event that the Contractor becomes aware of the occurrence of any conduct that is prohibited by the section entitled "No Gifts, Gratuities, Offers of Employment, Etc.", or if the Contractor knows or should reasonably know that a principal, employee, or agent of the Contractor or of its subcontractor(s) has committed a violation of federal, New York or New Jersey law addressing or governing: antitrust, public contracting, false claims, fraud, extortion, bribery, bid rigging, embezzlement, prevailing wage or minority, woman, small or disadvantaged business enterprises, it shall report such information to the Port Authority's Office of Inspector General within three (3) business days of obtaining such knowledge. (See "<http://www.panynj.gov/inspector-general>" for information about how to report information to the Office of Inspector General). Failing to report such conduct may be grounds for a finding of non-responsibility. The Contractor shall not take any Retaliatory Action against any of its employees for reporting such conduct.

In addition, during the term of this Contract, the Contractor shall not make an offer of employment or use confidential information in a manner proscribed by the Code of Ethics and Financial Disclosure dated March 11, 2014, or as may be revised (a copy of which is available upon request to the Office of the Secretary of the Port Authority).

The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

## **7. Conflict of Interest**

During the term of this Contract, the Contractor shall not participate in any way in the preparation, negotiation or award of any contract (other than a contract for its own services to the Authority) to which it is contemplated the Port Authority may become a party, or participate in any way in the review or resolution of a claim in connection with such a contract if the Contractor has a substantial financial interest in the contractor or potential contractor of the Port Authority or if the Contractor has an arrangement for future employment or for any other business relationship with said contractor or potential contractor, nor shall the Contractor at any time take any other action which might be viewed as or give the appearance of conflict of interest on its part. If the possibility of such an arrangement for future employment or for another business arrangement has been or is the subject of a previous or current discussion, or if the Contractor has reason to believe such an arrangement may be the subject of future discussion, or if the Contractor has any financial interest, substantial or not, in a contractor or potential contractor of the Authority, and the Contractor's participation in the preparation, negotiation or award of any contract with such a contractor or the review or resolution

of a claim in connection with such a contract is contemplated or if the Contractor has reason to believe that any other situation exists which might be viewed as or give the appearance of a conflict of interest, the Contractor shall immediately inform the Chief Procurement Officer in writing of such situation giving the full details thereof. Unless the Contractor receives the specific written approval of the Chief Procurement Officer, the Contractor shall not take the contemplated action which might be viewed as or give the appearance of a conflict of interest. The Chief Procurement Officer may require the Contractor to submit a mitigation plan addressing and mitigating any disclosed or undisclosed conflict, which is subject to the approval of the Chief Procurement Officer and shall become a requirement, as though fully set forth in this Contract. In the event the Chief Procurement Officer shall determine that the performance by the Contractor of a portion of its Services under this Agreement is precluded by the provisions of this numbered paragraph, or a portion of the Contractor's said Services is determined by the Chief Procurement Officer to be no longer appropriate because of such preclusion, then the Chief Procurement Officer shall have full authority on behalf of both parties to order that such portion of the Contractor's Services not be performed by the Contractor, reserving the right, however, to have the Services performed by others and any lump sum compensation payable hereunder which is applicable to the deleted work shall be equitably adjusted by the parties. The Contractor's execution of this document shall constitute a representation by the Contractor that at the time of such execution the Contractor knows of no circumstances, present or anticipated, which come within the provisions of this paragraph or which might otherwise be viewed as or give the appearance of a conflict of interest on the Contractor's part. The Contractor acknowledges that the Authority may preclude it from involvement in certain disposition/privatization initiatives or transactions that result from the findings of its evaluations hereunder or from participation in any contract, which results, directly or indirectly, from the Services provided by the Contractor hereunder. The Port Authority's determination regarding any questions of conflict of interest shall be final.

## **8. Integrity Monitor**

In the event that the Authority hires an Integrity Monitor in connection with the Work under this Contract, the Contractor and any subcontractors shall cooperate fully with the Monitor and the Authority, which includes, but is not limited to, providing complete access to all personnel and records in any way related to the Work performed pursuant to this Contract. Any failure to cooperate may result in the termination of this Contract. The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

## **9. Right to Audit**

Notwithstanding anything to the contrary, the Authority, including its Inspector General, Audit Department and Integrity Monitor, or its designee(s) each shall have the right to audit all of the records of the Contractor with respect to the Work and the Contract, including, without limitation, records pertaining to any compensation paid, payable, or to be paid under the Contract. The Contractor shall not be entitled to any reimbursement or other compensation for costs associated with such audit, investigation, or certification. The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

The Contractor agrees to pay for the cost of any audit or investigation conducted by the Authority, in which any criminal activity, ethics violations, or professional misconduct by the Contractor or any of its employees, or subcontractors or any of its employees, are discovered. The Contractor shall further agree that should it fail or refuse to pay for any such audit or investigation, the Authority is authorized to deduct from any sum owing the Contractor an amount equal to the cost of such audit and the damages resulting therefrom. The determination of the value of any such

costs and decision to withhold any such payments are at the sole discretion of the Authority (including its Inspector General).

## **10. Definitions**

As used in this section, the following terms shall mean:

Affiliate - Two or more firms are affiliates if a parent owns more than fifty percent of the voting stock of each of the firms, or a common shareholder or group of shareholders owns more than fifty percent of the voting stock of each of the firms, or if the firms have a common proprietor or general partner.

Agency or Governmental Agency - Any federal, state, city or other local agency, including departments, offices, public authorities and corporations, boards of education and higher education, public development corporations, local development corporations, the Port Authority of New York and New Jersey and its wholly owned subsidiaries and others.

Investigation - Any inquiries made by any federal, state or local criminal prosecuting and/or law enforcement agency and any inquiries concerning civil anti-trust investigations made by any federal, state or local governmental agency. Except for inquiries concerning civil anti-trust investigations, the term does not include inquiries made by any civil government agency concerning compliance with any regulation, the nature of which does not carry criminal penalties, nor does it include any background investigations for employment, or Federal, State, and local inquiries into tax returns.

Officer - Any individual who serves as chief executive officer, chief financial officer, or chief operating officer of the Bidder by whatever titles known.

Parent - An individual, partnership, joint venture or corporation which owns more than 50% of the voting stock of the Bidder.

Retaliatory Action- Any adverse action taken by, or at the direction of, the Contractor, against any of its employees for reporting any information as set forth in the clause entitled "Obligation to Report," above.

If the solicitation is a Request for Proposal:

Bid - shall mean Proposal;

Bidder - shall mean Proposer;

Bidding - shall mean submitting a Proposal.

In a Contract resulting from the taking of bids:

Bid - shall mean bid;

Bidder - shall mean Bidder; except and until the Contract has been awarded, then it shall mean Contractor;

Bidding - shall mean executing this Contract.

In a Contract resulting from the taking of Proposals:

Bid - shall mean Proposal;

Bidder - shall mean Proposer; except and until the Contract has been awarded, then it shall mean Contractor;

Bidding - shall mean executing this Contract.

### **39. CONFIDENTIAL INFORMATION/NON-PUBLICATION**

a. As used herein, confidential information shall mean all information disclosed to the Contractor or the personnel provided by the Contractor hereunder which relates to the Authority's and/or PATH's past, present, and future research, development and business activities including, but not limited to, software and documentation licensed to the Authority or proprietary to the Authority and/or PATH and all associated software, source code procedures and documentation. Confidential information shall also mean any other tangible or intangible information or materials including but not limited to computer identification numbers, access codes, passwords, and reports obtained and/or used during the performance of the Contractor's Services under this Contract.

b. Protected Information shall mean and include collectively, as per The Port Authority Information Security Handbook, dated October 2008, revised as of April 2, 2018, and as may be further amended. Confidential Information, Confidential Proprietary Information, Confidential Privileged Information and information that is labeled, marked or otherwise identified by or on behalf of the Authority so as to reasonably connote that such information is confidential, privileged, sensitive or proprietary in nature. Confidential Information shall also include all work product that contains or is derived from any of the foregoing, whether in whole or in part, regardless of whether prepared by the Authority or a third-party or when the Authority receives such information from others and agrees to treat such information as Confidential.

c. The Contractor shall hold all such Protected Information in trust and confidence for the Authority, and agrees that the Contractor and the personnel provided by the Contractor hereunder shall not, during or after the termination or expiration of this Contract, disclose to any person, firm or corporation, nor use for its own business or benefit, any information obtained by it under or in connection with the supplying of services contemplated by this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not violate in any manner any patent, copyright, trade secret or other proprietary right of the Authority or third persons in connection with their services hereunder, either before or after termination or expiration of this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not willfully or otherwise perform any dishonest or fraudulent acts, breach any security procedures, or damage or destroy any hardware, software or documentation, proprietary or otherwise, in connection with their services hereunder. The Contractor shall promptly and fully inform the Director in writing of any patent, copyright, trade secret or other intellectual property rights or disputes, whether existing or potential, of which the Contractor has knowledge, relating to any idea, design, method, material, equipment or other matter related to this Contract or coming to the Contractor's attention in connection with this Contract.

d. The Contractor shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to the Port Authority or to the fact that goods have been, are being or will be provided to it and/or that services have been, are being or will be



performed for it in connection with this Agreement, unless the vendor first obtains the written approval of the Port Authority. Such approval may be withheld if for any reason the Port Authority believes that the publication of such information would be harmful to the public interest or is in any way undesirable.

#### **40. PROVISIONS OF LAW DEEMED INSERTED**

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included therein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

#### **41. INVALID CLAUSES**

If any provision of this Contract shall be such as to destroy its mutuality or to render it invalid or illegal, then if it shall not appear to have been so material that without it the Contract would not have been made by the parties, it shall not be deemed to form part thereof but the balance of the Contract shall remain in full force and effect.

#### **42. NO ESTOPPEL OR WAIVER**

The Authority shall not be precluded or estopped by any acceptance, certificate or payment, final or otherwise, issued or made under this Contract or otherwise issued or made by it, the Director or any officer, agent or employee of The Authority, from showing at any time the true amount and character of Work performed, or from showing that any such acceptance, certificate or payment is incorrect or was improperly issued or made; and The Authority shall not be precluded or estopped, notwithstanding any such acceptance, certificate or payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on his part to comply strictly with this Contract, and any monies which may be paid to him or for his account in excess of those to which he is lawfully entitled.

#### **43. NON-LIABILITY OF THE AUTHORITY REPRESENTATIVES**

Neither the Commissioners of the Authority, nor any officer, agent, or employee thereof shall be charged personally by the Contractor with any liability or held liable under any term or provision of this Contract, or because of its execution or attempted execution, or because of any breach hereof.

#### **44. MODIFICATION OF CONTRACT**

No change in or modification, termination or discharge of this Contract, in any form whatsoever, shall be valid or enforceable unless it is in writing and signed by the party to be charged therewith or his duly authorized representative, provided, however, that any change in or modification, termination or discharge of this Contract expressly provided for in this Contract shall be effective as so provided.

#### **45. MBE/WBE GOOD FAITH PARTICIPATION**

Refer to the Request for Proposal, section entitled "Proposal Submission Requirements".

#### **46. TRASH REMOVAL**

The Contractor shall remove daily from the Facility by means provided by the Contractor all garbage, debris and other waste material (solid or liquid) arising out of or in connection with its operations hereunder, and any such garbage, debris and other waste material not immediately removed shall be temporarily stored in a clear and sanitary condition, approved by the Manager of the Facility, and shall be kept covered except when filling or emptying them. The Contractor shall exercise care in removing such garbage, debris and other waste materials from the Facility. The manner of such storage and removal shall always be subject in all respects to the continual approval of the Port Authority. No equipment or facilities of the Port Authority shall be used in such removal unless with its prior consent in writing. No such garbage, debris or other waste materials shall be or be permitted to be thrown, discharged or disposed into or upon the waters at or bounding the Facility.

#### **47. CODE OF ETHICS FOR PORT AUTHORITY VENDORS**

The Port Authority has adopted a Code of Ethics for Port Authority Vendors (the “Code”). The Code is hereby made a part of this Agreement. The Code can be found at: <https://www.panynj.gov/business-opportunities/become-vendor.html>.

#### **48. CONTRACT RECORDS AND DECOMMISSION CLAUSE**

Port Authority will own and have all right, title and interest in all data, regardless of media used, including, but not limited to all notations, electronic copy of documents and hard copy documents in Contractors possession, even if such data was obtained by the Contractor on behalf of the Port Authority prior to the Effective Date of this Agreement (the “Work Product”) and, to the extent possible all Work Product shall be considered a work made for hire for Port Authority within the meaning of Title 17 of the United States Code (the Copyright Act). Contractor hereby grants, transfers and assigns any and all right, title and interest in and to the Work Product and all materials contained therein or prepare therefor. In addition, Contractor shall assign and hereby so assigns to Port Authority all of its interest in the Work Product. Each party shall retain ownership of it pre-existing material used in accordance with this Agreement. While this Agreement is in force, Contractor grants to Port Authority an irrevocable, non-exclusive, worldwide, royalty free license to use, execute and copy for its internal purpose any pre-existing materials contained in the Work Product. Contractor and all of its personnel shall cooperate fully with Port Authority and shall execute such further documentation as Port Authority may request in order to establish, secure, maintain or protect Port Authority, or its assignee’s, ownership the Work Product and of all rights therein. Furthermore, Contractor agrees that it shall never transfer or assign the Work Product, or any rights therein, to any third party.

Contractor hereby (i) waives any so-called “moral rights” with respect to the Work Product; (ii) agrees never to use the Work Product without the prior express written consent of Port Authority; (iii) agrees never to contest Port Authority or its assignee’s exclusive, complete and unrestricted ownership in and to the Work Product (including all copyright rights therein), or to claim adverse rights therein; and (iv) acknowledges that it shall not be entitle to any compensation beyond the specifically provided herein for any of the Work Product.

When in the performance of the contact services the Contractor utilizes passwords or codes for any purpose, at any time during or after the performance of such services, upon written request by the Authority, and restricted to data and systems used by the Authority related to this Agreement, the Contractor shall make available to the designated Authority representative all such passwords and codes.

Upon Agreement expiration or termination, all Authority Work Product shall be returned to the Authority at no additional cost, within 30 days of such termination or expiration and via a methodology and in a format to be mutually determined at the time of contract expiration or termination. Furthermore, the Contractor shall provide to the Project Manager, within 30 days of Agreement termination or expiration, written confirmation all electronic instances of Authority data, including, but not limited to production data, test data, backups, disaster recovery data, shall have been purged, permanently removed or destroyed in a manner consistent with Contractor company policy related to such data.

#### **49. SSAE 18 COMPLIANCE CLAUSE**

Contractor shall produce an “Independent Service Auditor’s Report on a Description of Service Organization’s System and the Suitability of Design of Controls” in accordance with the American Institute of Certified Public Accountants (AICPA) Statement on Standards for Attestation Engagements No 18 (SSAE 18 formerly known as SSAE 16). The scope of the SSAE 18 audit report will include client considerations and services such as those provided within this Agreement and are reasonably expected within the industry, and as mutually agreed to by the Contractor and the Authority. The Contractor further agrees to maintain SSAE 18 SOC 2 Type II or similar certification for the duration of Agreement. The copy of the report and subsequent updates shall be submitted to the Authority throughout the term of this Agreement within 4 months following each report’s audit period close date, confirming compliance. The Contractor agrees to remain “SSAE 18 Compliant” throughout the term of this Agreement at no additional cost to the Port Authority. This should also include all datacenters where the Authority’s data may be stored or transmitted. The Contractor agrees to include the Authority in the sample tested by the independent auditor.

#### **50. NO VIRUSES/MALWARE**

All software, whether owned or licensed by the Contractor, that is provided to the Port Authority shall be and shall remain free of any software, hardware or other technologies, devices or means, the purpose or effect of which is to: (a) permit unauthorized access to, or to destroy, disrupt, disable, distort, or otherwise harm or impede in any manner, any (i) computer, software, firmware, hardware, system or network, or (ii) any application or function of any of the foregoing or the integrity, use or operation of any data processed thereby; or (b) prevent the Port Authority or any of its authorized users from accessing or using the such software as intended by this Contract, and includes any virus, bug, Trojan horse, worm, backdoor or other malicious computer code and any time bomb or drop dead device.

In performing the services required by this Contract the Contractor shall not introduce any software, hardware or other technologies, devices or means, the purpose or effect of which is to: (a) permit unauthorized access to, or to destroy, disrupt, disable, distort, or otherwise harm or impede in any manner, any (i) computer, software, firmware, hardware, system or network, or (ii)

any application or function of any of the foregoing or the integrity, use or operation of any data processed thereby; or (b) prevent the Port Authority or any of its authorized users from accessing or using the such software as intended by this Contract, and includes any virus, bug, Trojan horse, worm, backdoor or other malicious computer code and any time bomb or drop dead device.

## **51. ENTIRE AGREEMENT**

This Contract shall be comprised of the documents as set forth in the award letter.