



# **SPECIFICATIONS**

**STG-0978  
PRIDCO  
STRUCTURAL ASSESSMENT AND DESIGN PROJECT  
BUILDING ID #: T-0627-0-63-00/T-0627-1-70-00  
CANOVANAS, PR**

**June 2, 2022**

PRIDCO  
STRUCTURAL ASSESSMENT AND DESIGN PROJECT  
BUILDING ID #: T-0627-0-63-00/T-0627-1-70-00  
CANOVANAS, PR

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## **DIVISION 1 - GENERAL REQUIREMENTS**

### **SECTION 01000 - GENERAL REQUIREMENTS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 of the Specification Sections, apply to work of this Section.

##### **1.02 DEFINITIONS**

- A. These definitions apply wherever such terms are used:
  - 1. Architect/Engineer or Engineer: Owner's designated Engineering Representative.
  - 2. Owner: PRIDCO
  - 3. Contractor: Appropriate individual, partnership, company or corporation as established by work assignments set forth by PRIDCO or designated representative who becomes contractually obligated to Owner.
  - 4. Shop Drawings: Drawings, diagrams, schedules and other data specially prepared for the work by Contractor to illustrate some portion of the work.
  - 5. Product Data: Manufacturer's standard specifications, illustrations, schedules, performance charts, instructions, diagrams and other information furnished by Contractor to illustrate some portion of the work.
  - 6. Operation and Maintenance Data: Operational instructions, electrical and mechanical diagrams, maintenance instructions and schedules, trouble-shooting guides and other information furnished by Contractor necessary for proper operation and maintenance of various installed items of work.
  - 7. Words and Abbreviations which have well known technical or trade meanings are used in the specifications and drawings in accordance with such recognized meanings.

## SECTION 01000 - GENERAL REQUIREMENTS

### **1.03 FIELD QUALITY CONTROL**

- A. All installation work shall be performed by skilled craftsmen specifically trained for the work or trade which they are performing. Contractor shall replace any workers who, in the opinion of Owner's Representative, are insufficiently trained to perform the installation work in a quality, first class manner.
- B. Contractor shall maintain an adequate number of supervisory personnel on the project to assure that all areas of work are properly supervised and well coordinated with other trades. At least one supervisor shall be present at all times that Contractor's personnel are on the project site.
- C. Workmanship performed under this project shall be first class in every respect. All surfaces, members, frames and units shall be true, even and in alignment. No warped, bent, dented or otherwise damaged members, frames or units shall be built into the work. Finishes shall be free from chips, dents or other imperfections not in conformance with first class work.
- D. Factory assemblies shall conform to the first class standards of the trades concerned.
- E. Defective materials shall not be installed and, if installed, shall be removed at Contractor's expense. Where, in the opinion of Owner's Representative, doubt exists as to the quality or effectiveness of the work, the work shall be reinstalled as directed.
- F. Contractor shall be responsible for the coordination of his work including all excavation, demolition, cutting, chipping, etc., required with all existing installations and with all new work (including electrical, mechanical, and concrete work) where a hazardous situation and interruptions to existing services to any of the other trades are encountered. In the case of existing buildings, as-built conditions and record drawings shall be consulted as well as Owner's Representative, Maintenance Personnel, or Administrator, or any other authorized personnel before starting work.

## **PART 2 - PRODUCTS**

### **2.01 SUBSTITUTIONS**

- A. Substitution for items described in the Contract Documents shall be as follows:

## SECTION 01000 - GENERAL REQUIREMENTS

1. Where "Approved Equal" is omitted for the item, product, material, system or equipment, provide exactly as specified. No substitutions shall be considered or approved.
  2. Where "Approved Equal" is included for an item, product, material, system or equipment, substitution may be submitted to Owner's Representative for approval. Owner's Representative reserves the right to reject any or all substitutions which Contractor may submit for approval. The proposed substitutions shall be:
    - a. Accompanied by certified data.
    - b. Available in sufficient quantity to prevent delay of work.
    - c. Provide in the same range of colors, textures, gauges, dimensions, capacities, functions and finishes.
    - d. Equal or shall exceed the specified item in strength, durability, efficiency, serviceability, ease and cost of maintenance.
    - e. Compatible with design without design modifications by Owner's Representative or additional cost.
- B. All proposed substitutions shall be submitted to Owner's Representative for approval, in writing. The Contractor shall include with his submittal, and data pertinent to the proposed substitution so that the Engineer can properly evaluate it. Approval of substitutions shall be at the sole discretion of Owner's Representative and shall be in writing to be effective.
- C. Any additional cost incurred by an approved substitution shall be at Contractor's expense. Responsibility for proper performance of an approved substitution shall continue to rest with Contractor.

### **2.02 SUBMITTALS**

- A. Prior to fabrication or installation of work, Contractor shall submit shop drawings, product data and samples to Owner's Representative in accordance with the procedure below.
1. For shop drawings transmit five (5) prints for each submittal to Owner's Representative.

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2. For product data transmit three (3) copies for each submittal to Owner's Representative.
- B. Submittals shall include the following data:
1. Dimensioned equipment, layout and construction drawings.
  2. Schematics for controls, piping, electrical power, instruments loops.
  3. Equipment or product specifications, code compliance, certifications, etc.
  4. Nameplate data.
  5. Other information as required for proper evaluation by Owner's Representative.
- C. Review of submittals by Owner's Representative will be general only. Review shall not be interpreted as a checking of detailed dimensions of approval of deviations from contract documents. The review shall not relieve Contractor from his responsibility for the accuracy of submittals, including coordination with and clearances for the other trades, nor from the furnishing of all materials as required by the contract documents but not necessarily shown on the submittal.
- D. After review of submittals, Owner's Representative will note any comments or corrections and will also place a stamp thereon to indicate disposition of the review.
1. When the submittal is returned stamped "Rejected" or "Revise and Resubmit", Contractor shall make necessary corrections and resubmit before proceeding with the work.
  2. When the submittal is returned stamped "Furnish as Corrected", Contractor may proceed with the work subject to changes noted on the submittal. The submittal must be corrected for record drawings.
  3. When the submittal is returned stamped "Reviewed" Contractor may proceed with the work.

### **2.03 RECORD DRAWINGS**

- A. Contractor shall maintain at the site, one (1) record copy of all contract drawings, specifications, addenda, change orders and other modifications, in good order, and marked currently to record all changes made during construction, and shall maintain at the site copies of reviewed shop drawings, product data, operation and

## SECTION 01000 - GENERAL REQUIREMENTS

maintenance data and samples. These shall be available to Owner's Representative and shall be delivered to Owner upon completion of the work.

- B. Upon completion of work, Contractor shall deliver the following record drawing to Owner's Representative:
  - 1. Three (3) copies of all Contract and shop drawings. All record drawings shall be in "as-built" condition.
  - 2. Four (4) copies of all approved product data and operation and maintenance data.
  - 3. All drawings and sepia shall be clearly legible and in good condition; all other documentation shall be neatly bound, indexed and clearly legible.

## **PART 3 - EXECUTION**

### **3.01 GUARANTEES AND WARRANTIES**

- A. Upon completion of the work, Contractor shall submit to Owner's Representative, in triplicate, the following properly executed, signed documents:
  - 1. Contractor shall provide a written guarantee against faulty workmanship or installation of equipment and materials according to contract requirements.
  - 2. Correction of any faulty or defective workmanship or installations shall be performed at Contractor's own expense.
  - 3. Warranty period shall begin on Date of Acceptance of the project by Owner.
  - 4. All manufacturer's guarantees and warranties for installed equipment.

### **3.02 CLEAN UP**

- A. Contractor shall, at the end of each work day, clean up all waste materials and rubbish caused by his operations and shall remove them from the project site. Contractor shall also sweep and/or vacuum the work area at the end of each work day in order to remove any dust, concrete, fireproofing or other waste so as to maintain the area in a clean condition. Work which is performed within actual production, packing or warehouse areas must be cleaned up as the work proceeds.

## SECTION 01000 - GENERAL REQUIREMENTS

- B. Contractor shall maintain his material storage area, tools and construction equipment in a neat and orderly manner. At completion of the work, all tools, equipment and surplus material must be removed from the project site.
- C. If Contractor fails to clean up and maintain the work area as stipulated, Owner may do so and the cost thereof shall be charged to Contractor.

**- End of Section -**

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## **DIVISION 1 - GENERAL REQUIREMENTS**

### **SECTION 01010 – SCOPE OF WORK**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and all Divisions and Sections of this Specification.

##### **1.02 DEFINITIONS**

- A. This document covers furnishing and installation of all materials, tools, equipment and qualified personnel necessary to completely install the specified work in this phase of the contract.
- B. Major items of work which are incorporated into this document include, but are not limited to the following:
  - 1. Existing insulation and water proofing roof membranes shall be replaced.
  - 2. Existing precast roof slab shall be removed.
  - 3. Existing cross bridging shall be removed.
  - 4. New steel joist 20K3 shall be installed according to drawings.
  - 5. New and existing steel joist must be cleaned and painted with shop coat primer and two coat of polyurethane enamel.
  - 6. New metal deck type B GA. 22 shall be installed.
  - 7. New insulation and waterproofing roof treatment shall be installed.
  - 8. Attach deck to supporting member following the drawing screw schedule.
  - 9. New uplift and horizontal bridging shall be installed.
  - 10. New rigid steel metal conduit shall be installed.
  - 11. New electrical wire shall be installed.

## SECTION 01010 – SCOPE OF WORK

12. New metal roof deck shall be painted.
13. Building walls shall be painted, scratch and clean surfaces before apply primer and two coats of paint.
14. Cleaning and removal of all debris from site.
15. All shop drawings and product submittals.
16. Secure and pay for all permits.
17. All required record drawings.

### **1.03 RESPONSIBILITY**

- A. Contractor shall check carefully the site conditions affecting the work. Arrange the work and supply the labor and materials in accordance with the needs to fulfill the conditions of the Contract.
- B. Contractor shall complete all work in accordance with an approved work schedule maintaining the intermediate dates and the completion date. Submit all changes in the work programs to Owners Representative for approval if such changes are necessary.
- C. Before commencing work Contractor shall visit site and verify that requirements of the plans and specifications are consistent with site conditions.

### **PART 2 - MATERIALS NOT APPLICABLE**

### **PART 3 - EXECUTION NOT APPLICABLE**

**- End of Section -**

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## **DIVISION 1 - GENERAL REQUIREMENTS**

### **SECTION 01500 - GENERAL SITE REQUIREMENTS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION OF WORK**

- A. Contractor shall be responsible to see that all of his employees, subcontractors, subcontractors' employees, and material deliverymen obey the requirements outlined in this section of the specifications. Whatever is mentioned for Contractor shall automatically apply to all of the above.

#### **PART 2 - PRODUCTS (Not Applicable)**

#### **PART 3 - EXECUTION**

##### **3.01 PLANT SECURITY**

- A. Contractor shall obey all plant security regulations established by Construction Manager and shall abide by all plant rules and regulations. Contractor shall first check with Construction Manager before entering plant buildings. No contractor nor his employees shall use the plant lunchroom or washroom facilities other than the construction toilets specified herein. Picture passes issued by Construction Manager shall be mandatory for all contractor's employees, subcontractors and vendors and shall be issued before entering plant proper.

##### **3.02 RESTRICTED AREAS**

- A. All construction personnel shall be restricted to the area of the plant which is under construction. This area will be designated as the work area and all other areas of the plant will be considered off-limits and closed to construction personnel.

## **SECTION 01500 - GENERAL SITE REQUIREMENTS**

### **3.03 EMPLOYEE PARKING**

- A. Contractor shall make sure that all of his employees park their private automobiles in areas designated for this purpose by Construction Manager.

### **3.04 LAWS, PERMITS, CERTIFICATES, ETC**

- A. All materials, unless noted otherwise, shall be the best of their respective kinds and suitable for the duties imposed. Materials and workmanship shall comply with all Local, County, and State Codes and Ordinances having jurisdiction; also included will be all necessary supervision to insure the compliance of O.S.H.A. requirements in all phases of work.
- B. Contractor shall secure and pay for all necessary permits and certificates, if applicable.

### **3.05 PROTECTION OF OWNER'S PROPERTY**

- A. Contractor shall at all times protect Owner's property, buildings, equipment and employees from all hazards that may occur from or while doing his demolition or construction work.

### **3.06 CONTRACTOR'S GATE**

- A. All construction personnel, equipment and deliveries shall be admitted to the plant ground via a designated Contractor's gate.

### **3.07 NOISE AND DUST**

- A. Contractor shall coordinate and perform his work in such a manner that dust and noise from this project shall not interfere with Owner's regular plant operations. If there develops a problem in this regard Contractor shall re-schedule these problem phases of work to when the plant is shutdown.

### **3.08 AFTER HOURS WORK**

- A. Any construction personnel planning to be on the construction site beyond the normal 6:30 A.M. to 5:30 P.M. working hours must advise Construction Manager in advance so that he can make appropriate arrangements with the Security Director.

## **SECTION 01500 - GENERAL SITE REQUIREMENTS**

### **3.09 TEMPORARY FIELD OFFICE - CONTRACTOR AND SUBCONTRACTORS**

- A. Contractor shall provide, for his own use and at his expense for the duration of the project, a field office and telephone. Owner shall not provide any office space or telephone service for contractor. The field office location shall be designated by Construction Manager.

### **3.10 WORKMEN'S TEMPORARY TOILET FACILITIES**

- A. Construction Manager shall furnish and service three (3) chemical toilets for all workmen on the project until his phase of the work is completed. The toilets shall be the portable chemical type which shall be installed in a designated area and shall be of sufficient size and meet all requirements of the Puerto Rico Department of Labor. The facilities shall be equipped with urinals and water closets. The units shall be kept clean at all times and shall be routinely cleaned and serviced a minimum of three (3) times a week.

### **3.11 ELECTRICITY**

- A. Contractor shall obtain approval from Construction Manager for all temporary electrical power tie-ins required for his work. Contractor shall provide temporary generators, if so required, and make all necessary arrangements for his subcontractors.

### **3.12 WATER**

- A. Contractor shall coordinate with Construction Manager arrangements for all water required for his work. Contractor shall furnish all hoses and piping required. Contractor shall furnish drinking water for his employees and subcontractor's employees.

### **3.13 STORAGE OF CONSTRUCTION MATERIALS AND EQUIPMENT:**

- A. Contractor shall store all construction materials that shall be used in his phase of the work outside the building area under construction and in areas designated by Construction Manager in advance of placing the materials. If required for security reasons, Contractor shall bring storage trailers on site and store in designated area as approved by Construction Manager.

### **3.14 CLEAN UP:**

## **SECTION 01500 - GENERAL SITE REQUIREMENTS**

- A. Each Contractor shall remove all of his debris, packaging materials and excess materials from the site daily. A general clean up of the site shall take place every Thursday. It is Contractor's responsibility to have sufficient manpower available for this purpose. If Contractors' manpower is not available, Construction Manager shall have area cleaned and cost of same shall be back charged to contractor responsible for debris.

**- End of Section -**

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## **DIVISION 3 - CONCRETE**

### **SECTION 03110 - CONCRETE FORMWORK**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1, and Division 3 of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION OF WORK**

- A. Work includes the formwork for all cast-in-place concrete work shown on the drawings.

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

- A. Codes and Standards: Comply with provisions of following codes, Specifications and standards, except where more stringent requirements are shown or specified:
  - 1. ACI 301 "Specifications for Structural Concrete for Buildings".
  - 2. ACI 318 "Building Code Requirements for Reinforced Concrete".
  - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

#### **PART 2 - PRODUCTS**

##### **2.01 FORMS FOR EXPOSED FINISH CONCRETE**

- A. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

## SECTION 03110 - CONCRETE FORMWORK

- B. Use overlaid plywood complying with U.S. Product Standard S-1 "A-C or B-B High Density Overlaid Concrete Form", Class I.

### **2.02 FORMS FOR UNEXPOSED FINISH CONCRETE**

- A. Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

### **2.03 FORM COATINGS**

- A. Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

## **PART 3 - EXECUTION**

### **3.01 FORMWORK**

- A. Design, erect, support, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevations, and position.
- B. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

## SECTION 03110 - CONCRETE FORMWORK

- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Control "V" Joints shall be installed on all exposed faces of continuous wall foundations and spaced not greater than 30 ft. o.c. "V" joints shall also be placed wherever the wall foundation changes in thickness due to wider column foundations or the intersection of other foundations.
- G. Form Ties: Factory fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.
- J. All formwork is to be removed from excavations. No formwork is to remain in place during backfilling.

**- End of Section -**

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## **DIVISION 3 - CONCRETE**

### **SECTION 03210 - CONCRETE REINFORCEMENT**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 and Division 3 of the Specification Sections, apply to work of this Section.

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

- A. Codes and Standards: Comply with provisions of the latest version of the following codes, Specifications and standards, except where more stringent requirements are shown or specified:
  - 1. ACI 301-16 "Specifications for Structural Concrete for Buildings".
  - 2. ACI 318-14 "Building Code Requirements for Reinforced Concrete".
  - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice, 29<sup>th</sup> edition".

##### **1.03 SUBMITTALS**

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Owner's Representative.
- B. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with the latest version of ACI 315-18 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

#### **PART 2 - PRODUCTS**

## SECTION 03210 - CONCRETE REINFORCEMENT

### **2.01 REINFORCING MATERIALS**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A 767, Class II (2.0 oz. zinc psf) hot-dip galvanized, after fabrication and bending.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 775.
- D. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- E. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- F. Welded Deformed Steel Wire Fabric: ASTM A 497.
- G. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars, and welded wire fabric in place. Use wire bar type supports complying with CRSI Specifications, unless otherwise acceptable.
  - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

## **PART 3 - EXECUTION**

### **3.01 PLACING REINFORCEMENT**

- A. Clean reinforcement of loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
- B. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- C. Concrete protection of reinforcement - provide minimum cover as specified in ACI-318 and as follows:

|                                        |          |
|----------------------------------------|----------|
| Bottom bars structural slabs on ground | 3 inches |
| Top bars structural slabs on ground    | 1 inch   |
| Formed structural slabs                | 1 inch   |

## SECTION 03210 - CONCRETE REINFORCEMENT

|                                         |          |
|-----------------------------------------|----------|
| Footings and bottom bars of grade beams | 3 inches |
| Pedestals                               | 2 inches |
| Walls: Interior                         | 3/4 inch |

The system of holding bars in place must insure that all steel in top section will support the weight of workmen without displacement.

- D. All chairs, devices, nails or wiring for positioning reinforcing steel shall be galvanized.
- E. All reinforcing steel within the limits of a day's pour shall be in place and firmly wired before concreting starts. Placing or wiring steel less than six hours ahead of the concrete will not be permitted. Bending of bars by use of heat shall not be permitted.
- F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- G. Splicing Reinforcement: When it is necessary to splice reinforcements at points other than shown on drawings, the character of the splice shall be determined by Engineer. Whenever possible, splices of adjacent bars shall be staggered.

- End of Section -

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## **DIVISION 3 - CONCRETE**

### **SECTION 03310 - CAST-IN-PLACE CONCRETE**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1, and Sections 03110 and 03210 of the Specification, apply to work of this Section.

##### **1.02 DESCRIPTION OF WORK**

- A. Contractor shall furnish all labor, materials, tools, equipment, reinforcing, lumber, formwork, layout and supervision required to complete the Concrete and Cement Finishing Work for the project. The work shall be as shown on the drawings and herein specified, but not limited to, the following:
  - 1. Work Included:
    - a. All excavation and backfilling for footings, piers, beams and foundation walls.
    - b. The contractor shall be made aware of and furnish all underpinning and all measures necessary to prevent undermining of all existing footings and foundation due to the depth of excavation as required.
    - c. Construct all wall and column footings, piers, beams, and wall foundations as shown on drawings.
    - d. All floor slabs.
    - e. Set all anchors, leveling and base plates and bolts. Furnish and set all inserts, sleeves, dowels, embedded items and expansion joints shown on drawings and embedded in concrete.
    - f. Furnish and install all waterstops as shown on drawings.
    - g. Patching and cleaning of all concrete after removal.

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- h. Line and grade of all work under this section.
- i. All pumping and de-watering required to perform the work.
- j. All testing of concrete as specified herein.
- k. All temporary barricades and railings.
- l. Obtain and pay for all permits from local authorities.

### **1.03 QUALITY ASSURANCE**

- A. All concrete construction, unless otherwise specified, shall comply with the latest version of the American Concrete Institute's Standards and Recommendations, including "Building Code Requirements for Reinforced Concrete" (ACI-318-14) and the Recommendations of the Concrete Reinforcing Steel Institute, latest editions, all local and municipal codes, and OSHA.
- B. Ready-mixed concrete shall be in strict accordance with "Specifications for Ready-Mixed Concrete" ASTM C-94, latest edition.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Portland Cement: ASTM C-150, Type I or Type II. All cement shall be from the same mill and manufacturer and shall be of uniform color.
- B. Aggregates: Shall conform to ASTM Specification C-33. Fine aggregate shall be clean, natural sand, well graded from coarse to fine. Coarse aggregate shall be clean gravel or crushed stone 1" maximum size for all footings, grade beams, piers, walls over 8" thick and slabs on grade; 3/4" maximum size for all other locations.
- C. Water: Clean and free from oils, acids, salts or other injurious substances.
- D. Admixtures: Admixtures shall be used only with the approval of Owner's Representative. Admixtures shall be Pozzolite or similar and shall be equal to water reducing, set control admixture capable of exceeding minimum requirements of ASTM C-494-63T when used with local material.
- E. Curing Compound: Shall be "MASTERSEAL" - Master Builders Company, Cleveland, Ohio or an equal approved by Owner's Representative.

- F. Air Entraining Agent: Shall be as manufactured by the following:
  - 1. Master Builders Company (MB-NUR).
  - 2. Dewey & Almy Chemical Co. (Darex AEA).
- G. Metal Accessories: Include all spacers, chairs, ties, and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place. All metal accessories and tie wires to be galvanized.
- H. Non-Shrink Grout: Shall be "Imperial Grout" manufactured by Penn-Dixie Chemical Co. of North Arlington, New Jersey or an approved equal. Grout shall be used under column leveling plates and where shown in pits. The grout shall be non-metallic type mixed and applied in accordance with manufacturer's directions.
- I. Concrete Sealer: Shall be "Seal Hard" as manufactured by L & M Construction Chemicals, Inc. of Omaha, Nebraska or approved equal. Sealer shall be used as shown on drawings. No sealer shall be used in areas with special finishes. Verify with Owner's Representative. Sealer shall be non-metallic type. Contractor shall verify.

## **2.02 CONCRETE**

- A. Proportions of the concrete mixture shall produce a mixture of adequate workability free from segregation, honeycombing and bleeding. The percentage of sand will be the minimum practical that will permit adequate workability. Temperature of the concrete at the time of placing shall not be lower than 65°F, nor higher than 85°F.
- B. Control Concrete Mixture:
  - 1. Consistency: Test for slump shall be performed at the job site immediately prior to placing in accordance with Method of Slump Test for Consistency of Portland Cement - ASTM C-143. If the slump is greater than that specified, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability or poor finishing are observed, changes in the concrete mix shall be obtained only by any adjustment of one or more of the following:
    - a. The graduation of fine coarse aggregate.
    - b. The proportion of fine and coarse aggregate.
    - c. The percentage of entrained air within the allowable limits.
  - 2. Air Content: Test for air content shall be made with (Chace) Air Indicator on a concrete sample that has been removed from the slab when consolidation has been completed. Air content for concrete made of

## SECTION 03310 - CAST-IN-PLACE CONCRETE

ordinary aggregates having low absorption shall be made in accordance with either Method of Test for Air Content or Freshly Mixed Concrete by the Pressure Method, ASTM C-231, or Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method, ASTM C-173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used.

3. Unit Weight Test: In accordance with Method Test for Weight per cubic foot, yield, and air content (gravimetric) of concrete, ASTM C-138, may be used in lieu of the air content test, provided the relationship between air content and unit weight has been established for the materials being used.
4. Compression Test: Specimens shall be made and cured in accordance with method of Making and Curing Compression and Flexural Test Specimens in the Field ASTM C-31. During the progress of the work six (6) 6" x 12" cylinders shall be taken from each full day's concreting or from each 150 cu. yds. of concrete placed - three for a 7-day test and three for a 28-day test. Specimens shall be tested in accordance with Method of Test for Compressive Strength of Molded Concrete Cylinders, ASTM C-39.
5. Tests: Three cylinders shall be tested at seven days and three cylinders at twenty-eight days; the air content and slump test shall be made at the same time the test cylinder specimens are made. Contractor shall arrange and pay for all tests specified above. Concrete testing laboratory shall be approved in writing by Owner's Representative. Two copies of all tests shall be forwarded promptly and directly to Owner's Representative from testing laboratory.

### C. Strength, Slump and Air Entraining:

1. Concrete - Type C (all floor slabs, footings, wall foundations, beams, and piers)).

|                                        |          |
|----------------------------------------|----------|
| Minimum compressive strength @ 28 days | 4000 psi |
| Maximum slump (using Pozzoloth)        | 4"       |
| Air entrainment (plus or minus 1%)     | 5.6%     |
| Maximum water cement ratio             | 0.50     |

- D. Air Entraining Agent: Add sufficient air entraining agent to reduce the weight of concrete per cubic foot as specified in preceding articles of the Specifications.
- E. Design Procedure: To determine proportions of ingredients including water reducing, set control admixture necessary to produce durability and strength requirements mentioned above, concrete producer shall submit certified test

## SECTION 03310 - CAST-IN-PLACE CONCRETE

reports, showing compliance with maximum W/C, air entrainment, slump, and compressive strengths of approved materials. Contractor shall be responsible for concrete as delivered to the forms meeting all requirements as specified heretofore.

In lieu of this data, an approved independent testing laboratory is to design concrete mixtures capable of meeting, or exceeding, all the quality requirements as specified using approved material (cement, sand gravel, water reducing, set control admixtures) as selected by Contractor.

- F. Plasticity: Proportions of concrete ingredients shall produce concrete which will readily work into angles of forms and around reinforcements without segregation or free water gain on top of surfaces.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION OF FORM SURFACES**

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form coating compounds only with thinning agent of type and in amount and under conditions of form-coating compound Manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

#### **3.02 MIXING AND PLACING**

- A. No concrete shall be placed which has contained its water content more than 60 minutes.
- B. Remove water from trenches and keep moist while placing concrete. Never pour concrete on dry porous earth or on mud. All pumping of water necessary to keep trenches dry shall be by this Contractor.
- C. Equipment and forms shall be cleaned before reuse.
- D. Place concrete as near as practicable to its ultimate position in forms. Prevent

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segregation and loss of ingredients. Use mechanical vibration to insure contact with forms and reinforcing as concrete is poured.

- E. Plumb bulkheads with keys at joints for day's work. See details of construction joint. Clean and roughen hardened concrete surface and slush before placing additional concrete.
- F. After suitable bulkheads and screeds have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead edge form of corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
- G. Water stops shall have all joints welded together as per manufacturer's directions and shall be cleaned and secured in place before concreting is permitted.
- H. Hot Weather Placing:
  - 1. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
  - 2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. (32°C.). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
  - 3. Cover reinforcing steel with water-soaked burlap if it becomes too hot so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  - 4. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
  - 5. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

### **3.03 CURING**

- A. Concrete Curing and Protection:
  - 1. General:
    - a. Protect freshly placed concrete from premature drying and excessive hot temperatures.

## SECTION 03310 - CAST-IN-PLACE CONCRETE

- b. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven (7) days.
- c. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

### 2. Curing Methods:

- a. Perform curing of concrete by curing and sealing compound, by moist curing, by moisture retaining cover curing, and by combinations thereof, as herein specified.
- b. Provide moisture curing by following methods:
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Continuous water fog spray.
  - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.
- c. Provide moisture-cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- d. Provide curing and sealing compound to interior slabs with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs, as follows:
  - 1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation

## SECTION 03310 - CAST-IN-PLACE CONCRETE

by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

- e. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp proofing, membrane roofing, flooring, (such as acid brick or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Owner's Representative. Concrete to receive the above toppings are to be water cured only.

### 3. Curing Unformed Surfaces:

- a. Cure unformed surfaces such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- b. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

### 4. Sealer and Dustproofers:

- a. Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.
- b. Comply with ACI 347 for shoring and reshoring in multi-story construction, and as herein specified.

## **3.04 FORMS**

### A. Removal of Forms:

- 1. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F. (10°C.) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

## **3.05 MISCELLANEOUS**

### A. Miscellaneous Concrete Items:

## SECTION 03310 - CAST-IN-PLACE CONCRETE

### 1. Filling In:

- a. Fill in holes and openings left in concrete structures for passage of work by other trades unless otherwise shown or directed after work of other trades is in place. Mix, place, and cure concrete as herein specified to blend with in place construction. Provide other miscellaneous concrete filling shown or required to complete work.

## **3.06 REPAIRS**

### A. Concrete Surface Repairs:

#### 1. Patching Defective Areas:

- a. Repair and patch defective areas with cement mortar immediately after removal of forms when acceptable to Owner's Representative.
- b. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- c. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

#### 2. Repair of Formed Surfaces:

- a. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Owner's Representative. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- b. Repair concealed formed surfaces where possible that contain

## SECTION 03310 - CAST-IN-PLACE CONCRETE

defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

### 3. Repair of Unformed Surfaces:

- a. Test unformed surfaces such as monolithic slabs for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
- b. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch-wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop outs, honeycomb, rock pockets, and other objectionable conditions.
- c. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- d. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Owner's Representative.
- e. Repair defective areas, except random cracks and single holes not exceeding 1 inch diameter, but cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- f. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after

## SECTION 03310 - CAST-IN-PLACE CONCRETE

bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

- g. Perform structural repairs with prior approval of Owner's Representative for method and procedure, using specified epoxy adhesive and mortar.
- h. Repair methods not specified above may be used, subject to acceptance of Owner's Representative.

### **3.07 BONDING FRESH AND HARDENED CONCRETE**

- A. Before new concrete is deposited on or against concrete that has set, forms shall be retightened, surface of the set concrete roughened, cleaned of foreign matter and laitance and saturated with water. The cleaned and wetted surfaces of the hardened concrete, including vertical and inclined surfaces, shall be slushed with a 1:2 mortar and a bonding agent composed of anti-shrinkage aggregate brushed onto the slab and the new concrete shall be placed before the bond coat has attained its initial set. All contact surfaces shall be clean and wet but free from pools of water at the moment the fresh concrete is placed.

### **3.08 OPENINGS**

- A. Openings through concrete walls for sleeves, other mechanical, plumbing and electrical equipment shall be built and set by Contractor.
- B. Consult with mechanical, plumbing and electrical trades for size and locations and accurately locate same before placing of reinforcing and pouring of concrete.
- C. Provide two (2) 3/4" deformed bars on all sides for all openings in concrete walls unless otherwise noted. Extend bars two feet (2') beyond openings.

### **3.09 PROTECTION OF CONCRETE**

- A. The following rules are for the minimum requirements of protection and do not relive Contractor from producing concrete which has not been weakened.
  - 1. All concrete shall be adequately and continuously protected from mechanical injury or actions of the elements until such time as the concrete is thoroughly set.

### **3.10 PATCHING**

- A. Directly after forms have been removed, all exposed tie wires, etc. shall be

## SECTION 03310 - CAST-IN-PLACE CONCRETE

removed from concrete surfaces to be exposed. Rub smooth or cut off fins and projections. Remove all loose concrete and fill honeycomb surfaces, stone pockets and other irregularities with 1:2 cement mortar to match existing concrete. Do not patch any surface until examined by Owner's Representative and permission is given. All patching of concrete in pit walls shall be with non-shrink grout.

### **3.11 CURING AND HARDENING**

- A. Exposed surfaces of concrete shall be protected from premature drying and freshly placed concrete shall be protected against wash by rain. Concrete shall be kept wet for a period of six days after placing. An acceptable pigmented curing compound may be used in lieu of "wet" curing.
- B. Cement finish of every description shall be protected against frost or rapid drying paper covering and kept moist for at least seven (7) days. Paper shall be 2-ply Kraft, with membrane in the center, reinforced with cross fibers completely embedded in asphalt. Paper shall be laid with as few joints as practicable and lapped at least 3". A pigmented curing compound may be used in lieu of "wet" curing if approved by Owner's Representative for application.

### **3.12 LINE AND GRADE**

- A. Contractor shall be responsible for establishing all line and grade required for the work covered under this section. Contractor shall employ a licensed land surveyor to establish all corners of buildings, all column center lines and all elevations. Bench marks showing elevations shall be installed in both buildings for use of other Contractors. Upon completion of this phase of work, Contractor shall submit "Record" drawings of the site showing exact location of building in relation to property lines, adjacent buildings, and road areas.

### **3.13 JOINTS**

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate them in order as not to impair strength and appearance of the structure and as approved by Architect/Engineer.
  - 1. Provide keyways at least 1-1/2 inches deep in construction joints in slabs.
  - 2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

### **3.14 INSTALLATION OF EMBEDDED ITEMS**

## SECTION 03310 - CAST-IN-PLACE CONCRETE

### A. General:

Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast in place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

### **3.15 GUARANTEE**

- A. Contractor shall guarantee that the materials and workmanship covered by this Section of the Specifications shall be first class in every respect and that he shall make good any defects, not due to ordinary wear and tear or improper use, which may develop within one (1) year from the date of Final Acceptance by Owner.

**- End of Section -**

PRIDCO  
STRUCTURAL ASSESSMENT AND DESIGN PROJECT  
BUILDING ID #: T-0627-0-63-00/T-0627-1-70-00  
CANOVANAS, PR

## LIST OF SPECIFICATIONS

### **DIVISION 5 - METALS**

| <b><u>SECTION</u></b> | <b><u>TITLE</u></b>  | <b><u>PAGES</u></b> |
|-----------------------|----------------------|---------------------|
| 05120                 | Structural Steel     | 7 pages             |
| 05310                 | Metal Deck           | 3 pages             |
| 05990                 | Miscellaneous Metals | 5 pages             |

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## **DIVISION 5 - METALS**

### **SECTION 05120 – STRUCTURAL STEEL**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1 and Division 5, of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION**

- A. Contractor shall provide all materials, labor, tools, equipment, transportation and other facilities for the supply, erection and completion of all Structural Steel as shown on drawings and required to make a complete project. Work shall include all fabrication, delivery, and erection of steel for the new facility.
- B. The work shall include, but not be limited to, the following:
  - 1. Furnish and erect all structural steel columns, girders, beams, masonry anchors, channels, bracing, girts, outriggers, hanger rods, angles, pour stops, seats, etc., as shown on drawings.
  - 2. Furnish all foundation leveling plates and anchor bolts and deliver them to Foundation Contractor for installation.
  - 3. Furnish and install adjustable masonry wall anchors on center on all columns and beams located in masonry walls.
  - 4. Installation of structural steel for metal wall panel including girts, angles, channels, etc., and framing of openings as required and as shown on drawings.
  - 5. Furnish and erect all roof and floor openings and roof dunnage as shown on drawings.
  - 6. Furnish and erect all pipe trestles.
  - 7. Shop prime paint all structural steel and field touch up after erection.

## SECTION 05120 – STRUCTURAL STEEL

8. All field checking of anchor bolts, embedded items installed by others and all line and grade required for this work.

### **1.03 SHOP DRAWINGS**

- A. Contractor, immediately upon the award of the contract, shall prepare shop drawings and engineering calculations for connections of all structural steel based on the architectural and structural drawings for the approval of Engineer. These drawings and calculations shall give the necessary information for the design, fabrication, erection and painting of the structure and shall be based on A.I.S.C. Specifications and all local codes for loadings and design requirements. Before submitted to Engineer for review, shop drawings and engineering calculations shall be sealed by Professional Engineer authorized to practice engineering in Puerto Rico.
- B. Each submittal of shop drawings shall consist of five (5) sets of prints. No fabrication shall be conducted until approved drawings are in the hands of the shop inspector. Index sheets shall be furnished with all beam and column details. The approval of shop drawings shall not relieve Contractor of his responsibility for strength and fit of connection.

### **1.04 MILL REPORTS**

- A. Contractor shall furnish at his cost, two (2) certified copies of all mill reports covering the chemical and physical properties of the steel used in the work under this Specification and deliver to the Engineer.

### **1.05 DESIGN**

- A. Design shall conform to the requirements of the latest edition of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction and shall also meet all requirements demanded by local codes for loadings and steel requirements. The shop drawings and calculations shall be submitted to Engineer for approval before any material is fabricated. Subsequent to approval by the Engineer, any substitutions of sections or modifications of details or both, shall be made only when approved by Engineer, but such approval shall not relieve Contractor of responsibility for design.

### **1.06 RESPONSIBILITY FOR ERRORS**

- A. Contractor alone shall be responsible for all errors of design and fabrication and for the correct fitting of the structural members shown on the drawings.

### **1.07 WORKMANSHIP AND FABRICATION**

- A. Measurements shall be taken in the field, as required, to verify or supplement

## SECTION 05120 – STRUCTURAL STEEL

dimensions or conditions shown on the drawings. Contractor shall take all responsibility for the perfect fit of all work contained in this Contract including the proper connection to adjoining work of other trades. Contractor shall be responsible for checking all anchor bolt locations and leveling plates before starting erection and shall report all discrepancies in writing to Engineer. All work shall be fabricated in ample time so as not to delay the progress of the project and shall be delivered at such times and in such sequence as required for the proper coordination of all the work as determined by Owner's Representative.

- B. All column leveling plates and all items to be embedded in concrete shall be delivered as a separate item as soon as possible after award of contract to allow for completion of foundation work.
- C. All structural steel work shall be cut, punched, drilled or tapped as required for the attachment of, or to other work where shown on the drawings, or where instructions for same are given prior to or with the approval of the shop drawings. All cutting and field connections shall be made where shown on drawings or where required.
- D. All necessary temporary bracing and similar members shall be provided to support all loads to which the framing may be subjected including erection equipment. The temporary guy wires, falsework, bracing and other supports shall be left in place as long as may be required for safety and until approval is given by Engineer for their removal.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. All metals shall be clean and free from loose mill scale, flake rust, pitting and other defects, which would impair their strength, durability and appearance. All metals shall be new and of the best commercial quality for the purposes specified.
- B. All structural steel shapes and plates shall comply with the requirements of the standard Specifications of the A.S.T.M. for "Structural Steel for Buildings", latest edition.
- C. Steel pipe shall conform to the requirements of A.S.T.M. Specification A-53, latest edition.
- D. Bolts and nuts shall comply with the requirements of the standard specification of A.S.T.M. latest designation A-9, latest edition. Nuts shall be U.S. standard size. High strength bolts shall conform to ASTM A325, anchor bolts shall conform to ASTM A36, all other bolts shall conform to ASTM 307.
- E. No structural steel shall be stored on ground without proper protection from dirt and mud. All steel shall be cleaned of all dirt and mud before it is erected in place and before any touch-up painting.

## SECTION 05120 – STRUCTURAL STEEL

- F. Threads shall be U.S. Standard. Heavy, approved type lock washers shall be used under all nuts. The threads of bolts shall not extend into the bearing area.
- G. Stock materials shall be of quality equal to that herein before specified for the classifications covering its intended use Mill test reports shall constitute sufficient record as to the quality of material carried in stock.
- H. No materials containing plugged or filled holes shall be accepted.

### **PART 3 - EXECUTION**

#### **3.01 FABRICATION AND ERECTION**

- A. All steel work shall be designated, fabricated, delivered and erected to comply and be in accordance with:
  - 1. Requirements of all local codes as amended to date and all applicable directives of the department having jurisdiction.
  - 2. The latest edition of the American Institute of Steel Construction publication entitled "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
  - 3. "Code of Standard Practice for Steel Buildings and Bridges" and the "Standard Code for Arc and Gas Welding in Building Construction" by the American Welding Society, as in effect on the date the shop drawings are approved.
  - 4. These codes shall apply to the design and construction of all work performed under this Section provided, however, that no provisions therein, which are either in conflict with the requirements of the current edition of Local Building Codes or any directives of the department having jurisdiction over this Section of the Specifications, shall be applicable.
- B. Structural steel shall be delivered to the job site precut, ready for field connections and prime painted.
- C. All welders shall be certified in accordance with the A.S.M.E. Code Test for Building Construction Industries and shall comply with all local laws and ordinances.
- D. Welding shall be continuous along entire line of contact unless otherwise noted on drawings. Exposed welds shall be ground smooth and all slag chipped off.
- E. All workmanship shall be equal to the best practice in use in modern structural shops.

## SECTION 05120 – STRUCTURAL STEEL

### **3.02 CONNECTIONS**

- A. Weld or high strength bolt all shop connections. Design connections to develop reactions and stresses shown on the design drawings. Where the reaction or stress is not noted, design connections to develop the full working strength of the members in accordance with AISC standards. Notwithstanding any provision to the contrary in "Code of Standard Practice for Steel Buildings and Bridges" or in this Section, all connections designed by the fabricator shall be his responsibility and review of shop drawings by Engineer shall not relieve fabricator of this responsibility. Design connections to provide suitable access for field connection.
- B. Bolted Connections:
1. Assemble high strength bolted connections in accordance with "Specifications for Structural Joints using ASTM A325 or A490 Bolts". Unless otherwise noted on the drawings, design high strength bolted connections as bearing type with threads in shear planes. Where friction type connections are called for on the drawings, they shall be designed on the basis of threads in the shear plane. The maximum allowable working stress for friction type shear connections shall not exceed the allowable stress for bearing type connections with threads included in shear plane. Include in the design of connections consideration for web tear-out (block shear).
  2. Washers: In tightening all high strength bolts, regardless of method of tightening, a hardened washer should be used under the element. When an outer face of bolted parts has a slope greater than 1/20 with respect to a plane normal to the bolt axis, use a beveled washer to compensate for lack of parallelism.
  3. Torquing of Bolts:
    - a. All bolts on structural steel framing shall be torqued as called for on Table 3, Section 5-214 Specification for Structural Joints in the 8th edition of the AISC Manual of Steel Construction.
    - b. Load Indicator Bolt: Load indicator bolts meeting the requirements of ASTM A325 may be used to provide specified bolt tension. Load indicator bolts shall be installed in accordance with the manufacturer's recommended procedure, using wrenches as recommended by the manufacturer. Bethlehem Steel Corp. load indicator bolts or LeJeune Bolt Co. Tension Control Bolts may be used. Equivalent products of other manufacturer's may be used if approved in writing by Engineer.
    - c. Tighten each bolt to provide, when all fasteners in a joint are tight, at least the minimum tension listed below:

| Bolt Size | A325 Bolts |
|-----------|------------|
|-----------|------------|

## SECTION 05120 – STRUCTURAL STEEL

|      |         |
|------|---------|
| 5/8" | 19 Kips |
| 3/4" | 28 Kips |
| 7/8" | 39 Kips |
| 1"   | 51 Kips |

- d. Contractor shall have an independent testing laboratory test and certify in writing to Engineer that at least 10% of all bolts, maximum one bolt at each connection unless connection has more than ten (10) bolts, have been tested and found to be torqued as specified. If any one of the bolts in a connection is found to be defective, then all bolts in that connection shall be tested and retorqued as required.

The independent testing laboratory used for this work shall be approved by the Engineer.

- e. The costs for all testing and retesting shall be paid for by Contractor and shall be included in his Contract amount.

### 4. Welded Connections:

- a. Execute welding with welders qualified in accordance with AWS D1.1. Unless otherwise shown on the drawings, only prequalified welded joints shown in AWS D1.1 shall be used. Use current and voltage for welding in accordance with the requirements of AWS D1.1. Clean surfaces as outlined in AWS D1.1. Remove fins and burrs from joint surfaces. Finish members true to line and free from twists, bends and open joints.
- b. The contractor will contract the services of a certified inspector according to the procedures of the AWS.
- c. Inspections must follow the procedures and requirements established in AISC 360-16 (chapter N).
- d. A welding sampling test shall be required according of AWS2.4.

## **3.03 PAINTING**

- A. Thoroughly clean all structural steel of all rust, loose scale, grease and dirt and other foreign matter before painting. Then apply one shop coat of an approved Devguard 4160 metal primer as manufactured by ICI Devoe Coatings of Cleveland, Ohio or Engineer approved equal and applied as per manufacturer's recommendations. All painting shall be done on dry surfaces. After erection, clean and wire brush where necessary, then touch up field connections and abraded surfaces with above specified

## SECTION 05120 – STRUCTURAL STEEL

paint. All steel covered under this section for erection shall be free of all mill scale peeling, paint runs, rust, dirt, etc., before it shall be approved by Engineer.

- B. At weld locations, steel contact surfaces shall remain unpainted. Do not paint steel surfaces to be embedded in concrete.
- C. Steel surfaces to be adjacent to concrete or masonry or to be otherwise inaccessible after erection, shall receive a field coat of bituminous paint such as Kopper's "Inertil No. 49 Thick" or other bituminous paint certified as permanently compatible with shop coat paint. If compatibility is not possible, steel shall not be shop painted in these areas.

### **3.04 RECORD DRAWINGS**

- A. Contractor shall keep at the job site a complete up-to- date set of drawings showing all dimensional and other changes made in the field due to job conditions. Upon completion of the project, Contractor shall submit to Engineer a complete "As-Built" set with all these changes clearly made and noted.

**- End of Section -**

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## **DIVISION 5 - METALS**

### **SECTION 05310 - METAL DECK**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1 and Division 5 of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION**

- A. Contractor shall furnish all materials, equipment and labor necessary for the complete installation of all galvanized metal roof decks for the new facility in accordance with these specifications and drawings. Galvanized 14 gauge recessed roof sumps to be furnished and installed as per plan requirements. Furnish and install roof sump pans.
- B. Contractor shall coordinate his work with other trades and shall cut all roof openings as shown on drawings.

#### **PART 2 - PRODUCTS**

##### **2.01 MATERIALS**

- A. Metal roof decks shall be hot dipped galvanized type "B", 1-1/2" deep, 22 gage with 2 1/2" wide ribs (6 inches on center) and shall have overlap type side joint. Deck manufacturer shall be a member of the SDI.
- B. Weld washers shall be used at all connections of deck to structural steel.
- C. Basic steel to be ASTM designation A 446-72 (latest edition) for galvanized steel.
- D. Sump pans shall be stock pattern and shall consist of 14 gage galvanized steel. Contractor shall field cut and install sump pans for each roof drain in field.

## SECTION 05130 - METAL DECK

- E. All closure pieces at metal deck edges.

### **2.02 DESIGN**

- A. The maximum design stress shall not exceed 20 KSI under total dead and live load. Properties shall conform to AISC "Specifications for the Design of Cold Formed Steel Structural Members", latest edition.

### **2.03 FINISHES**

- A. Before forming, the steel sheets are to receive a hot-dip protective coating of zinc conforming to ASTM-A-525 class G 60.

## **PART 3 - EXECUTION**

### **3.01 ERECTION**

- A. Furnish erection shop drawings for approval before starting erection.
- B. Check alignment and level of structural steel and report inaccuracies to the Engineer for correction by others.
- C. Place and adjust panels in initial bay. Check coverage, dimensions, and alignment to avoid "fanning" and then weld original bay to act as staging area.
- D. Attachment of roof deck to supporting structural members shall be as follows:

1. ATTACH DECK TO SUPPORTING MEMBERS WITH SELF-DRILLING SELF-TAPPING HEX WASHER HEAD SCREWS. USE #12-24 X 2.0" TEK/5 FOR DECK ATTACHMENT TO SUPPORTS AND #12-14 X 1.25" TEK/2 SCREWS FOR SEAM/SIDELAP ATTACHMENT.

2. CONTRACTOR SHALL ATTACH ROOF DECK AS FOLLOW:

- A. AT DECK BEARING SUPPORTS ON ZONE 3 AND 2 PROVIDE SCREWS @ A 36/7 PATTERN
- B. AT DECK BEARING SUPPORTS ON ZONE 1 AND 1' PROVIDE SCREWS @ A 36/4 PATTERN
- C. AT SUPPORTS PARALLEL TO DECK SPAN PROVIDE SCREWS @ 6" ON CENTER ON ZONE 3 & 2, AND AT 12" ON CENTER ON ZONE 1 AND 1'.
- D. AT DECK SEAMS/SIDELAPS PROVIDE SCREWS @ 12" ON CENTER, TYPICAL

3. DECK SHALL BE CONTINUOUS OVER (3) OR MORE SPANS, TYP.

4. DECK INSTALLATION SHALL START FROM LOWER ELEVATION (EAVE) OF THE ROOF TO THE HIGHEST (RIDGE).

Please refer to drawing sheet S-04 for full description and details.

## SECTION 05130 - METAL DECK

- E. Paint all field welds on top surface with an approved metal primer.
- F. Cut all openings as indicated and dimensioned on structural and architectural drawings.
- G. Openings larger than 12" x 12" require sub-framing and must be shown on the shop drawings or reviewed by the Engineer before installation.
- H. Touch up all abrasions in the galvanized coating and weld marks with oil base paint. Upon completion of all work, wipe down the underside of decks with mineral spirits to remove erection markings, stencils, trademarks, and soil of any character leaving the exposed underside clean and in acceptable condition.

### **3.02 WORK WITH OTHER TRADES**

- A. Contractor shall cooperate with other contractors who furnish and install work in connection with the work of this section, giving them complete data as to his requirements, and shall notify the Engineer of any condition that will interfere with proper completion of this work.

### **3.03 STORAGE AND HANDLING**

- A. Contractor shall store all materials on site as directed by Owner's Representative, and is to start deck installation immediately after the steel erection in the area concerned is completed and is to proceed as rapidly as possible under the direction of Engineer. All stored materials shall be protected from the elements and physical damage. All damaged material shall not be installed but shall be replaced by Contractor. All deck shall be cleaned of all mud and dust before erection.

**- End of Section -**

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## **DIVISION 5 - METALS**

### **SECTION 05990 - MISCELLANEOUS METALS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1, and Division 5 of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION OF WORK**

- A. The intent of this Section is to provide all additional miscellaneous metal items required to complete this phase of work. Contractor shall physically field check and verify extent of work existing against limits of new work specified herein and as shown on drawings.
- B. Contractor shall provide all materials, labor, tools, equipment, transportation and other facilities to furnish and install all miscellaneous metal items shown on the drawings and not specified under other sections of the specifications. All such miscellaneous items for this phase of work, except those definitely indicated to be furnished by others or "Not in Contract" on the drawings, shall be furnished and installed regardless of whether no specific mention is made of them in this section.

- C. Work Included:

Contractor shall furnish and install, but not be limited to, the following:

1. All steel framing and miscellaneous angles required for rooftop pipe trestles as shown on drawings.
2. Steel framing for roof openings and support framing for exhaust fans and rooftop duct work.
3. All rooftop protective steel pipe railings and roof ladders as shown on drawings.
4. All steel platforms including toe plates, checkered steel plate, railings,

## SECTION 05990 - MISCELLANEOUS METALS

ladders, etc.

5. All steel framing and miscellaneous angles required for interior pipe racks and trapeze.
6. Prime painting of all steel items supplied by this contractor.
7. All other miscellaneous metal items shown on drawings.

### **1.03 SUBMITTALS**

- A. Contractor shall submit shop drawings to Owner's Representative for approval on all miscellaneous metal items showing thickness of metals, connections, and installation details. Contractor shall resubmit shop drawings until marked "Reviewed" by Owner's Representative.

### **1.04 RESPONSIBILITY FOR ERRORS**

- A. Contractor alone shall be responsible for all errors of design and fabrication and for the correct fitting of the miscellaneous metal items shown on the drawings.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Stock material patterns, products or fabricated items of manufacturers meeting the general requirements specified herein will be accepted. Metals, paints, and related items used in the manufacture, unless otherwise specified shall conform to the applicable requirements of the A.S.T.M. Standards of Federal Specifications. In addition to the above, the following shall apply:
  1. All metals shall be clean and free from loose mill scale, flake rust, pitting and other defects which would impair their strength, durability and appearance. All metals shall be new and of the best commercial quality for the purposes specified.
  2. All structural steel shapes and plates shall comply with the requirements of the standard Specifications of the A.S.T.M. for "Structural Steel for Buildings", latest edition.
  3. Steel pipe shall conform to the requirements of A.S.T.M. Specification A-53, latest edition.
  4. Bolts and nuts shall comply with the requirements of the standard specification of A.S.T.M. latest designation A-9, latest edition. Nuts shall

## SECTION 05990 - MISCELLANEOUS METALS

be U.S. standard size. High strength bolts shall conform to ASTM A325, anchor bolts shall conform to ASTM A36, all other bolts shall conform to ASTM 307.

5. No metals shall be stored on ground without proper protection from dirt and mud. All metals shall be cleaned of all dirt and mud before they are erected in place and before any touch-up painting.
6. No materials containing plugged or filled holes shall be accepted.
7. Steel railings shall be as shown on drawings.
8. All screws, miscellaneous fasteners and so forth shall be hot dipped galvanized steel except as otherwise indicated.

### B. Metal Parts and Fittings:

1. Contractor shall provide the required steel angles, channels, U-shaped clamps and whatever other necessary fittings to properly assemble the various construction items of this section, and these shall be of dimensions as given on the drawings or as necessary.

### C. Steel Ladders:

1. All materials shall be structural steel conforming to A.S.T.M. Standard Specification A-7 latest issue.
2. All work shall be fitted together at the shop as far as possible and shall be delivered complete and ready for erection and shall include all lugs, bolts, anchors and other such items.

### D. Supplementary Framing:

1. Contractor shall prepare shop drawings of all supplementary framing including all rods, beam sections, angles, bridging, clips, masonry anchors and all other miscellaneous items to form a complete system as per the drawings.

## SECTION 05990 - MISCELLANEOUS METALS

2. Contractor shall coordinate his shop drawings with those of the Mechanical Contractor. All supplementary framing and hangers shall be installed only after all HVAC duct/piping work has been installed and insulated. This Contractor shall not use ductwork for any supports nor use it as a means of access for working on.

### **PART 3 - EXECUTION**

#### **3.01 WORKMANSHIP AND FABRICATION**

- A. Measurements shall be taken in the field, as required, to verify or supplement dimensions or conditions shown on the drawings. Contractor shall take all responsibility for the perfect fit of all work contained in this Contract, including the proper connection to adjoining work of other trades. All work shall be fabricated in ample time so as not to delay the progress of the project and shall be delivered at such times and in such sequence as required for the proper coordination of all the work as determined by the Owner's Representative.
- B. All structural steel work shall be cut, punched, drilled, tapped or welded as required for the attachment of or to other work where shown on the drawings or where instructions for same are given prior to or with the approval of the shop drawings. All cutting and field connection shall be made where shown on drawings or where required.
- C. All necessary temporary bracing and similar members shall be provided to support all loads to which the framing may be subjected, including erection equipment. The temporary guy wires, false work, bracing and other supports shall be left in place as long as may be required for safety and until approval is given by the Owner's Representative for their removal.
- D. All support members and bridging members shall be securely anchored at their ends to provide lateral stability.
- E. Horizontal members shall be installed level to the heights shown on drawings.

#### **3.02 CUTTING FITTING AND DRILLING**

- A. Contractor shall do all cutting, fitting and drilling that may be necessary in connection with the miscellaneous and ornamental metal work properly set in place and to permit other engaging work to be properly installed.
- B. Contractor shall furnish screws, bolts, and other fastening devices necessary for attachment of other engaged work. Screws and bolts shall be standard, and proper washers shall be provided where necessary.

## SECTION 05990 - MISCELLANEOUS METALS

### **3.03 WELDING**

- A. Execute all shop and field welding with welders qualified in accordance with AWS D1.1. Unless otherwise shown on the drawings, only prequalified welded joints shown in AWS D1.1. shall be used. Use current and voltage for welding in accordance with the requirements of AWS D1.1. Clean surfaces as outlined in AWS D1.1. Remove fins and burrs from joint surfaces. Finish members true to line and free from twists, bends and open joints.
- B. The contractor will contract the services of a certified inspector according to the procedures of the AWS.
- C. Inspections must follow the procedures and requirements established in AISC 360-16 (chapter N).
- D. A welding sampling test shall be required according of AWS2.4.

### **3.04 RECORD DRAWINGS**

- A. Contractor shall keep at the jobsite a complete up-to-date set of prints and sepia showing all dimensional and other changes in the field due to job conditions. Upon completion of the project, Contractor shall submit to Owner's Representative a complete set of red-marks drawings showing all of these changes.

**- End of Section -**

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**LIST OF SPECIFICATIONS**

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

| <b><u>SECTION</u></b> | <b><u>DESCRIPTION</u></b>                    | <b><u>PAGES</u></b> |
|-----------------------|----------------------------------------------|---------------------|
| 07512                 | SBS MODIFIED BITUMEN (COLD) MEMBRANE ROOFING | 5 Pages             |

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## **DIVISION 7- THERMAL AND MOISTURE PROTECTION**

### **SBS MODIFIED BITUMEN (COLD) MEMBRANE ROOFING**

#### **PART 1 – GENERAL**

##### **1.1 SUBMITTALS**

- A. Product Data: Within 10 calendar days after the Contractor has received the Owner's Notice To Proceed The Roofing:
1. Materials list of items included in proposed system to be installed. under this Section.
  2. Manufacturer's Specifications and other data needed to ensure system compliance with the specified requirements.
  3. Manufacturer's recommended installation procedures which, when approved by the engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

##### **1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified materials, requirements and the methods needed for proper performance of the work of this Section.
- B. Use of a subcontractor. Name and Qualification's must be approved in advance.
- C. Comply with applicable codes, including but not limited to PRBC 2018, IBC 2018, ASCE 7-16. Ordinances, rules and regulations of all governmental authorities having jurisdiction on the work, and with the required standards as applicable to the work must be complied with.
- D. All materials used must show in their original individual packaging markings of an approved agency having a service for the inspection of materials and finished products during manufacture.

### 1.3 REFERENCES

- |         |                                               |
|---------|-----------------------------------------------|
| A. PRBC | Puerto Rico Building Code of 2018.            |
| B. UL   | Underwriters Laboratories, Inc.               |
| C. FM   | Factory Mutual                                |
| D. ASTM | American Society of Testing and Materials     |
| E. OSHA | Occupational Safety and Health Administration |
| F. NRCA | National Roofing Contractors Association      |

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of manufacturer recommendations:
- B. All products delivered to job site must retain and show original packaging and warning labels.; including UL, FM, ASTM listing marks and any other approved agency listings required.

## PART 2 - PRODUCTS

## 2.1 SBS MODIFIED BITUMINOUS (COLD) SYSTEM

- A. Two (2) Ply Styrene Butadiene Styrene (SBS) Modified Bituminous Composite Reinforcement Roofing System consists of:
- One (1) Ply: as Base consisting of glass fiber reinforcement SBS Modified Bituminous Membrane. The material shall meet or exceed the requirements of ASTM 6163-00 Type I, Grade S.
 

|                                                                                                              |                    |
|--------------------------------------------------------------------------------------------------------------|--------------------|
| • Thickness, min., mils(mm)                                                                                  | 80(2.0)            |
| • Net mass/ unit area, min lbs./100ft <sup>2</sup> (g/m <sup>2</sup> )                                       | 45(2197)           |
| • Max. load at 0±3.6°F (-18 ± 2°C), MD and XMD, min., before and after Heat conditioning, lbf/in (KN/M)      | 70(12.3)           |
| • Elongation at 0± 3.6 F( -18± 2°C),                                                                         | 1                  |
| • Before and after heat conditioning, (%)                                                                    |                    |
| • Elongation at 73.4± 3.6 F(23± 2°C), MD and XMD min., at max. load, Before and after heat conditioning, (%) | 2                  |
| • Tear strength at 73.4°±3.6°F(23±2°C), Min., lbf(N)                                                         | 35(156)            |
| • Roll Min. Weight Per 100 Sq. Ft.                                                                           | 45 Lbs. (20.5 Kg.) |

2. One (1) Ply as Cap Roll Surfacing, consisting of a Polyester Reinforced SBS Modified Ceramic Granule Covered Modified Bituminous Membrane. Material shall meet or exceed ASTM D 5147 Standard Test Methods and Requirements of ASTM D6164-00 Type I, Grade G and UBC Standard 15-6-E, Standard Specification for SBS Modified Bituminous Sheet Materials Using Polyester Reinforcement.

|                                                                                                                 |                     |
|-----------------------------------------------------------------------------------------------------------------|---------------------|
| • Thickness, min., mils(mm)                                                                                     | 130(3.3)            |
| • Net mass/ unit area, min lbs./100ft <sup>2</sup> (g/m <sup>2</sup> )                                          | 75(3661)            |
| • Max. load at 0±3.6°F ( -18 ± 2°C),<br>MD and XMD, min., before and after<br>Heat conditioning, lbf/in (KN/M). | 70(12.3)            |
| • Elongation at 0± 3.6 F( 18± 2°C),<br>Before and after heat conditioning, (%)                                  | 20                  |
| • Tear strength at 73.4°±3.6°F(23±2°C),<br>Min., lbf(N)                                                         | 35                  |
|                                                                                                                 | 55(246)             |
| • Roll Min. Weight Per 100 Sq. Ft.                                                                              | 75 Lbs. ( 34.1 Kg.) |

3. Gold Adhesive: Polymer (SBS) Modified Bitumen Adhesive (MBA) Solvent Based Cold Process Asphaltic Adhesive, Asbestos Free Specially Formulated to Bond -Modified Membranes to Insulation. And Other Membranes, in Compliance To ASTM 3019 Type III And ASTM-. D 3409. Application requires min.1.5 Gallons. Per Square in smooth surface as required in UBC. Approximate weight: 10 pound per gallons or 50 LBS. Per 5 gallons per pails.
4. Flashing, cants, stops, insulation anchorage and accessories acceptable to the Roofing System Manufacturer.

#### B. Installed (Cold) SBS System Quality Assurance

1. Weight of Assembled. System (Cold)  
(Sum Of Components) (Dry Aged Cured) 168 Lbs./100 Ft. 2
  - Component Minimum Weights
    - a. Mineral Surfaced SBS Modified Granular  
Surfaced Bitumen Membrane  
(One Each) 75 Lbs.
    - b. Modified Bitumen Adhesive For Cap  
(One Spread) 18 Lbs.
    - c. Glass Fiber Reinforcement Bitumen  
SBS Modified Bituminous Membrane  
(One Each) 45 Lbs.
    - d. Modified Bitumen Adhesive For Base  
(One Spread) over insulation board  
3gal/100sq..ft 30 Lbs.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION PROCEDURE AND REQUIREMENTS**

- A. Follow system manufacturer specifications for installation procedures.
- B. Follow NRCA published guidelines in absence of any other instructions.

### **3.2 APPLICATION OF INSULATION AND ROOFING**

- A. Apply insulation, Modified Roofing Membranes and Cold Adhesive over.. clean dry roof deck in strict conformance with the Manufacture's Specifications.
- B. Non-Combustible (Fire Rated) Cant Strip shall be provided at all intersections of roof surfaces with vertical walls, parapets and curbs Roofing layers shall be tuned up against cant strips and trimmed one inch above and parallel with upper edge of Cant Strip.
- C. Roofing shall fit neatly around all pipes, vents, drains, smoke vents and curbs and be sealed with plastic roof cement. Metal flanges of smoke vents, pipes, fans, etc., shall be embedded in asphalt between layers' of roofing. Edges shall be sealed in roofing with 6" wide asphalt-saturated web fabric, mopped on.
- D. At all open edges, treated wood blocking, 'equal in thickness for the insulation, shall be firmly fastened to the roof decking as indicated in the drawings. Around all roof openings, vents, stacks, drains, etc., treated wood blocking nailer strips shall be installed and securely fastened to the metal deck.
- E. Alternate: Cold Process Modified Bitumen Adhesive Roofing o(MBA/MBR) conforming with ASTM D 3019 ,Type III and ASTM D 3409-81 Low Solvent Adhesive Specially Formulated For The Bonding of Modified Bitumen Membranes, in lieu of Hot Roofing Asphalt.
- F. Flashings: Provide and Install Aluminum Metal as specified in the drawings provided.
- G. All materials shall be applied over a clean, dry insulation board secured to deck as specified by the Manufacturer.

### **3.3 SITE CONDITIONS**

- A. The Contractor shall, at all times, keep materials and equipment in orderly, safe arrangement, minimize conflict with other trades, protect surrounding existing building and equipment.

- B. At the completion of the work, or whenever directed, the Contractor shall remove all rubbish and unused materials accumulated in connection with the work, and leave the roofs in a clean and acceptable condition.
- C. Strictly comply with all safety regulations.; Maintain at all times' .fire extinguishers at kettle and roof areas.

### **3.4 APPROVAL**

- A. For roofing covering to be install, the method a application and the fastening shall conform to PRBC 2018, FM Approved Class 1-120 wind uplift and UL Class A Roof, requirements. Evidence of compliance is required submittal approval.

### **3.5 GUARANTEE**

Roofing and flashing shall be guarantee to\_ remain watertight and in good conditions for a period of 15 years from the date of acceptance of the work by the owner. The Contractor shall provide a bonded roof guarantee through a local Surety Company register with the local insurance , Commissioner's Office for the total cost of the roofing work, or other Guarantee acceptable to the Owner to make any repair and replacement needed on the roof without any additional cost to the Owner, for any part of the roof that fails to meet the water tightness guarantee during that period.

In lieu of the written bonded roof guarantee the through a Puerto Rico insurance commissioner recognized surety company referred to above the contractor may file with the owner a 15 year guarantee of a locally represented responsible manufacturer of the materials used or to be used in the roofing work; provide, however, that in consideration thereof, the Contractor hereby authorizes the owner (1) to proceed with and make any roof repairs for the account and at the expense of the Contractor in the event the later or any subcontractor thereof fails undertakes such work within seven (7) das after being requested in writing to do so as an obligation included in guarantee of the contractor, any amount of any claim, action or demand of the owner against the contractor; predicated upon or arising from such roofing work so guaranteed by the contractor

END OF SECTION

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## LIST OF SPECIFICATIONS

### **DIVISION 9 – FINISHES**

| <b><u>SECTION</u></b> | <b><u>TITLE</u></b> | <b><u>PAGES</u></b> |
|-----------------------|---------------------|---------------------|
| 09900                 | Painting            | 6 pages             |

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## **DIVISION 9 - FINISHES**

### **SECTION 09900 - PAINTING**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, General and Supplementary Conditions, including Division 7 of the Specification Sections, apply to work of this Section.

##### **1.02 DESCRIPTION OF WORK**

- A. Contractor shall provide all materials, labor, tools, equipment, scaffolding, transportation and other facilities for the complete painting of all work as shown on the drawings, as set forth in the Room Finish Schedule, and as specified herein.
- B. Work included:
  - 1. The work shall include but not be limited to:
    - a. Complete painting of all interior walls, exposed metal deck, all exposed columns and structural steel, all hollow metal doors and frames, platforms, stairs and railings, and all exposed steel lintels, frames, and exposed concrete.
    - b. Complete painting of all access doors, ductwork, and sprinkler piping exposed in the finished work, including fittings, hangers, etc. (Sprinkler piping to be painted red).
    - c. All items of mechanical and electrical equipment not finish painted in the plant such as: conduit, pull boxes, meter boards, distribution boxes, panel boxes, registers, grills, diffusers, air handlers, utility equipment, etc.
    - d. Caulking of interior control and expansion joints and between all interior door frames and masonry or concrete walls.

- e. Covering and/or protection of all floors, lighting fixtures, sprinkler heads, hardware, acoustical ceilings, Owner's equipment and all other items with factory finished coats of paint that will be damaged by paint spray and drippings.

C. Work Not Included:

1. The following items are not part of the work under this Section:

- a. Owner's equipment, except as specified.
- b. All stainless steel.
- c. Acoustical ceilings.
- d. All items with factory applied finished coats of paint, unless otherwise noted.

D. Before starting the work, Contractor shall check all walls, ceilings and items to be painted and shall inform Owner's Representative of any areas that require patching or need to be rubbed down. Upon his acceptance of the areas to be painted, Contractor shall be responsible for the final finish. Contractor shall be responsible for any minor patching that might be required. All materials shall be applied in accordance with the recommendations of the Manufacturer.

E. The intent of this Section is for a complete painting job. Contractor shall check the project for work already installed as well as Contract, Architectural, Mechanical and Electrical Drawings for possible items of the work to be installed.

F. Standard color charts shall be submitted for selection of colors.

**1.03 SAMPLES**

A. Contractor shall prepare three (3) paint samples on 12" x 12" boards of all paint colors to be used on the project. Samples are to be submitted to Owner's Representative for final approval before Contractor orders paint for the project. Two (2) sets of sample boards shall be given to Owner and one (1) set of sample boards to Owner's Representative. One (1) set of approved samples shall be kept at the job site as a standard of finish and color.

## SECTION - 09900 PAINTING

### **1.04 NUMBER OF COATS**

- A. The number of coats specified are a minimum and are in addition to any shop prime coats. The finished application shall have adequate coverage and be uniform in finish and color.

### **1.05 DELIVERY AND STORAGE**

- A. Paints shall be delivered to the job site ready-mixed, except as otherwise approved.
- B. Store materials and equipment used on the job in a single designated space. Keep storage area neat and clean, and floor adequately protected from paint spillage. Place cloths and cotton waste, which might constitute a fire hazard, in metal containers; remove at the end of each workday. Contractor shall comply with all local ordinances and regulations.

## **PART 2 - PRODUCTS**

### **2.01 MATERIAL**

- A. All paints used shall be Sherwin-Williams or approved equal by Owner's Representative. All paint products shall be delivered to the job site in unopened containers bearing the Manufacturer's labels. Contractor shall verify with Owner that all paints match Owner's standards including paint for metals, gypsum board, concrete block, etc.
- B. All materials used in the work shall be exactly as hereinafter specified in quality. All materials shall be used only as specified by the Manufacturer's direction label on the container or separate specific instructions.
- C. All painting materials such as epoxies, linseed oil, shellac, turpentine, solvents, etc., shall be pure and of the highest quality approved by Owner's Representative. Bids shall be based on the use of materials of the quality hereinafter specified.
- D. No claim by Painting Contractor as to unsuitability or unavailability of any material specified, or his unwillingness to use same, or his inability to produce first class work with same will be entertained unless such claims are made in writing, and submitted with his bid. After award, no substitution of materials for those mentioned in the accepted bid will be permitted.

## SECTION - 09900 PAINTING

### E. Caulking:

1. All door frames abutting masonry or dry wall construction, control and expansion joints and acoustic tile wall angles shall be caulked by Contractor using a paintable latex caulking compound, color as selected. (See specification Section 07900.)

## **PART 3 - EXECUTION**

### **3.01 WORKMANSHIP**

- A. All paint shall be applied in accordance with Manufacturer's detailed directions.
- B. All materials shall be applied by skilled mechanics. Paint shall be evenly spread and thoroughly brushed out. Enamels shall be evenly and smoothly flowed on. On painted work, each succeeding coat shall be tinted a slightly different shade than the preceding coat.
- C. All workmanship shall be executed in accordance with the best practices of the trade, applying to class of work, grade, type and kinds of material specified.
- D. All indentations in block work shall be filled and all joints pointed before painting commences.
- E. All rooms where paint is to be applied shall be free of dust. All surfaces shall be thoroughly cleaned and dusted by Contractor before applying paint. All rough spots shall be sanded with an emery wheel before applying any paint materials.

### **3.02 APPLICATION**

- A. Paint colors shall be as selected by Owner.
- B. Finishing shall be as specified herein.
- C. Materials for succeeding coats on any one surface shall be the products of the same Manufacturer furnishing the first or primer-sealer coat for that particular surface, except where factory applied metal primer is used.
- D. Do not apply paint to any surface where the ambient temperature is less than 50°F. or more than 90°F. Each coat of paint shall be thoroughly dry before a succeeding coat is applied.

## SECTION - 09900 PAINTING

- E. Each coat of paint shall be inspected and approved by Owner's Representative before the succeeding coat is put on.
- F. Painting Schedule:
  - 1. Galvanized metal (on exterior):
    - a. Remove all rust and paint with a power tool and wire brush.
    - b. Apply one coat of Macropoxy 920 Pre-Prime 1.5 – 2.0 Mils
    - c. Apply one coat Macropoxy 646 3.0 – 6.0 Mils
    - d. Apply two coats Acrolon 218 HS Acrylic Polyurethane 3.0 - 6.0 Mils
  - 3. Exposed columns and structural steel:
    - a. Remove all loose rust and paint with a power tool and wire brush.
    - b. Apply one coat of Macropoxy 920 Pre-Prime 1.5 – 2.0 Mils
    - c. Apply one coat Macropoxy 646 3.0 – 6.0 Mils
    - d. Apply two coats Acrolon 218 HS Acrylic Polyurethane 3.0 - 6.0 Mils
  - 4. Hollow metal and steel (on exterior):
    - a. Remove all loose rust, mill scale and/or paint with a power tool and wire brush.
    - b. Apply one coat Macropoxy 646 3.0 – 6.0 Mils
    - c. Apply two coats Acrolon 218 HS Acrylic Polyurethane 3.0 - 6.0 Mils
  - 5. Uninsulated piping:
    - a. Remove all rust by power tool and wire brush.
    - b. Apply one coat of Macropoxy 920 Pre-Prime 1.5 – 2.0 Mils
    - c. Apply one coat Macropoxy 646 3.0 – 6.0 Mils
    - d. Apply two coats Acrolon 218 HS Acrylic Polyurethane 3.0 - 6.0 Mils

## SECTION - 09900 PAINTING

6. Concrete floors (new):
  - a. For chemical resistant coating areas:
    - i. Apply two coatings of Phenicon HS Epoxy Phenolic 5.0- 7.0 Mils

### **3.03 TOUCH-UP AND REMEDIAL WORK**

- A. Prior to Final Acceptance, Contractor and Owner's Representative shall inspect the entire building both inside and outside. Those areas requiring touch-up and/or adjustment shall be noted. This remedial work shall be completed to the satisfaction of Owner and Owner's Representative prior to Final Acceptance of the work.

### **3.04 REMOVAL**

- A. Contractor shall, during the job, maintain all working areas free from rubbish and debris. Rubbish and debris shall be removed from the premises daily. At the completion of the work, all surfaces not requiring paint shall be left clean and undamaged.

### **3.05 GUARANTEE**

- A. All work under this Section shall be guaranteed to be free from defects in material and workmanship for a period of one (1) year from the date of Final Acceptance, by the Owner.

**- End of Section -**

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**LIST OF SPECIFICATIONS**

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| <b><u>SECTION</u></b> | <b><u>TITLE</u></b>           | <b><u>PAGES</u></b> |
|-----------------------|-------------------------------|---------------------|
| 16001                 | Basic Electrical requirements | 8 pages             |
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| 16020                 | Electrical Raceways           | 5 pages             |
| 16021                 | Building Wire and Cables      | 6 pages             |
| 16025                 | Boxes and Enclosures          | 4 pages             |
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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including all other Division 16 Specification Sections, apply to work of this Section.

##### **1.02 SUMMARY**

- A. This Section includes general administrative and procedural requirements for electrical installations.
  - 1. Submittals.
  - 2. Coordination drawings.
  - 3. Record documents.
  - 4. Maintenance manuals.
  - 5. Electrical installations.
  - 6. Cutting and patching.
  - 7. General clean-up.
- B. All electric wiring except that furnished as an integral part of factory assembled equipment, all control wiring and any specialty power and/or control wiring indicated in Contract Documents.
- C. Electrical requirements for the various types of equipment are indicated on the Drawings and Specifications.

##### **1.03 WORK UNDER OTHER SECTIONS**

- A. All finish painting.

##### **1.04 EQUIPMENT FURNISHED BY OTHERS**

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

- A. Contractor shall furnish all labor, tools and equipment necessary to wire to and connect Owner furnished equipment and equipment furnished under other Sections of these Specifications.

### **1.05 CODES, LAWS AND ORDINANCES**

- A. All work and equipment under this Contract shall be installed in strict accordance with the National Electrical Code and all Federal, State, Local Codes, Laws, Ordinances, Rules and Regulations of Public Administrative Authorities, including all Health and Safety Codes and Pollution Control and OSHA requirements.

### **1.06 FILING OF PLANS**

- A. All necessary Electrical Drawings and applications shall be filled with the local National Electrical Code Inspecting Agency and with the Federal, State, County, and Local Authorities, if their approval is required.
- B. Copies of these drawings bearing the stamp of approval of the authorities having jurisdiction shall be submitted to the Owner's Representative, prior to starting Work.

### **1.07 PERMITS**

- A. All required permits, licenses, and arrangements for inspection of the Work by all authorities shall be the Contractor's responsibility. In addition, the Contractor shall deliver without cost to Owner, such certifications of inspection and approval as are required, and shall pay all charges and fees in connection with the Work.
- B. Upon completion of the project, Contractor shall deliver to Owner a certificate of approval from the National Electrical Code Inspecting Agency.

### **1.08 SUBMITTALS**

- A. General: Follow the procedures specified in Division 16 Section 16004 "Submittals".

### **1.09 COORDINATION DRAWINGS**

- A. Coordination drawings detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components shall be prepared under Division 15 of these Specifications.

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

The Drawings shall indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the items listed below. This Contractor shall provide the following information necessary for the preparation of the Coordination Drawings:

1. Indicate the proposed locations of distribution equipment, panels, transformers, motor controllers, disconnect switches, pushbutton stations, lighting fixtures, major banks of conduits, and other electrical equipment and materials. Include the following:
  - a. Clearances for installation.
  - b. Clearances for servicing and maintaining equipment.
  - c. Equipment connections and support details.
  - d. Exterior wall and foundation penetrations.
  - e. Fire-rated wall and floor penetrations.
  - f. Sizes and location of required concrete pads and bases.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details as required to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

### **1.10 RECORD DOCUMENTS**

- A. Prepare Record Drawings to indicate the following installed conditions:
  1. Electrical service and distribution system plans and one line diagrams indicating the locations, ratings and electrical characteristics of all equipment and feeders.
  2. Power wiring plans indicating wiring for all electrically operated mechanical equipment.
  3. Approved substitutions, Contract Modifications and actual equipment and materials installed.

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

4. Contract Modifications, actual equipment and materials installed.

### **1.11 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels and other information needed for identification.

## **PART 2 - PRODUCTS**

### **2.01 QUALITY OF EQUIPMENT**

- A. The minimum quality of construction for the product is established by naming the product in the Specifications by type or catalog number. The order in which manufacturer's names are listed does not indicate a preference.
- B. Where non-standard construction or performance features are described, the manufacturer must modify the standard product to comply with the specified requirements.

### **2.02 MOVING OF EQUIPMENT**

- A. Investigate each space through which equipment must be moved. Where necessary, equipment shall be shipped from manufacturer in crated sections of size suitable for moving through restricted spaces available.

## **PART 3 - EXECUTION**

### **3.01 ROUGH-IN**

- A. Verify final locations for electrical rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to Equipment Specifications and approved shop drawings for electrical rough-in requirements.

### **3.02 ELECTRICAL INSTALLATIONS**

- A. General: Sequence, coordinate and integrate the various elements of electrical systems, materials and equipment. Comply with the following requirements:
  1. Coordinate electrical systems, equipment and materials installation with other building components and other trades.

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

2. Verify all dimensions by field measurements.
3. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.
4. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Owner's Representative.
5. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components.
6. Install electrical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

### **3.03 CLEANING**

- A. Thoroughly clean all electrical apparatus before being placed in operation. Restore finished surfaces if damaged and deliver the entire installation in an approved condition.
- B. All electrical equipment shall be free of all debris and dust and shall be free of obstructions.

### **3.04 MAINTENANCE OF EQUIPMENT**

- A. Insure adequate protection of all equipment and materials during delivery, storage, installation and shutdown conditions.
- B. Maintain all installed equipment and systems until final acceptance by the Owner's Representative and the Owner.

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

### **3.05 TESTS - ALL INSTALLED SYSTEMS**

- A. Perform tests of equipment, systems and controls as described in the Specifications, in the presence of the Owner's Representative and/or other parties as may have legal jurisdiction.
- B. Supply all labor, materials, instruments, power, etc. required for testing.
- C. The duration of tests shall be as determined by the authorities having jurisdiction.
- D. Equipment shall be tested under field conditions to demonstrate capability to meet Specification requirements.
- E. All defective work shall be promptly repaired or replaced and the tests repeated until the particular system and component parts thereof receive the approval of the Owner's Representative and/or the authorities having jurisdiction.
- F. Any damages resulting from tests shall be repaired and/or damaged materials replaced, all to the satisfaction of the Owner's Representative, at no cost to the Owner.
- G. Submit test records on reproducible sheets to the Owner's Representative for approval and include a copy in the Instruction Manual. The format of the record sheet shall be approved by the Owner's Representative prior to actual testing of equipment.

### **3.06 INSTRUCTION PERIOD**

- A. This Contractor shall instruct the Owner's personnel and the Owner's Representative in the proper operation and maintenance of the equipment and systems provided under this Contract.

### **3.07 INSTRUCTION AND MAINTENANCE MANUAL**

- A. Compile and submit bound instruction manuals of equipment and systems to the Owner's Representative in triplicate. Provide the Instruction Manuals with an index sheet listing the contents in alphabetical order together with reference pages, containing the following material:
  - 1. Operation instructions for each piece of equipment and/or system.

## SECTION 16001 - BASIC ELECTRICAL REQUIREMENTS

2. Manufacturer's literature describing each piece of equipment furnished giving the Manufacturer's Model No., parts list, wiring diagrams, and other pertinent data.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair and reassembly; and adjusting instructions.
4. List of nearest local suppliers of all equipment.

### **3.08 CODES AND STANDARDS**

- A. The Codes and Standards listed in the Specifications can be obtained from the organizations listed as follows:

#### ABBREVIATIONS

|      |                                                         |
|------|---------------------------------------------------------|
| ADA  | American Disabilities Act                               |
| ANSI | American National Standard Institute, Inc.              |
| ASME | American Society of Mechanical Engineers                |
| ASTM | American Society of Testing Materials                   |
| CBM  | Certified Ballast Manufacturers                         |
| EIA  | Electronics Institute of America                        |
| ETL  | Electrical Testing Laboratories                         |
| ICEA | Insulated Cable Engineers Association                   |
| IEEE | Institute of Electrical & Electronics Engineering, Inc. |
| NEC  | National Electrical Code                                |
| NECA | National Electrical Contractors Association             |
| NEMA | National Electrical Manufacturers Association           |
| NFPA | National Fire Protection Association                    |
| OSHA | Occupational Safety & Health Act                        |
| UL   | Underwriters Laboratories, Inc.                         |

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16004 - SUBMITTALS**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL REQUIREMENT:**

- A. Submit to Owner's Representative for product review information required for use by various trades or called for in different Sections of Specification. Submit data before commencing work affected by data.
- B. Shop drawings shall be submitted for all electrical equipment and materials including but not limited to the following:
  - 1. Distribution panelboard.
  - 2. Motor control centers.
  - 3. Lighting panels, power panels, transformers, and appliance panels.
  - 4. Safety disconnects switches.
  - 5. Wiring devices.
  - 6. Wire and cables.
  - 7. All material used in the Grounding System.
  - 8. Fuses and over current protective devices.

##### **1.02 SHOP DRAWINGS AND PRODUCT DATA**

- A. Shop Drawings: Submit three prints of each shop drawing.
- B. Product Data: Submit three copies of manufacturer's data with bulletins, Specifications, catalog cuts or similar materials not reproducible by the diazo process.
- C. Identification: Identify shop drawings and product data with following data:
  - 1. The owner's name.
  - 2. Project location.
  - 3. Project title.

4. Specification and Section numbers relating to drawing or data.
- D. Contractor's Stamp: Each submittal to bear Contractor's stamp indicating data set forth thereon has been checked for compliance with Contract Documents; shop drawings of equipment to bear the seal of certification of vendor or manufacturer.
- E. Review Notations: Owner's Representative will review shop drawings, and product data received and return one reproducible transparency or two copies of product data or similar material bearing notations as follows:
1. "Reviewed": Contractor may proceed with work.
  2. "Furnish as Corrected or Revise as noted": Contractor may proceed with work taking into account corrections noted; Contractor shall make corrections and resubmit revised documents without delay.
  3. "Rejected": Contractor shall submit new documents.
- F. Resubmittal
1. If documents are marked "Revise and Resubmit", resubmittal shall incorporate all marked revisions.

Where exceptions are taken to markings, Contractor shall state reasons for omitting and modifying marks in the transmittal letter.
  2. Make resubmittals in same manner as original submittals.
- G. Review by Owner's Representative
1. Corrections or comments made on the shop drawings during this review do not relieve Contractor from compliance with requirements of the Drawings and Specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication process and techniques of construction; coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner.

### **1.03 MAINTENANCE AND OPERATING INSTRUCTION**

- A. Submit three (3) copies of the following data to Owner's Representative for materials and equipment as requested or called for in Specifications:
  - 1. A copy of all reviewed shop drawings, including final comments, folded in a manner to be placed in a loose-leaf binder of standard size and to be fully opened without removal from the binder.
  - 2. Complete detailed parts lists and assembly drawings.
  - 3. Governing agencies and manufacturers test certificates, permits and inspection reports, and all shop or field performance tests.
  - 4. Certified performance reports required by Specification.
  - 5. Operating and maintenance manuals required by Specifications, edited to identify equipment furnished.
  - 6. Materials list required by Specification.
  - 7. Applicable manufacturer's specifications, including tabulation of sizes and identifying numbers for all installed material and equipment such as switches, fuses, circuit breakers, motor starters, electrical devices, and equipment, with items in each brochure clearly defined and marked.
- B. Forward to Owner's Representative all materials requested and identify by applicable Specifications Section, project title and building location or locations.
- C. Information in the form stated above must be received by Owner's Representative before delivery of equipment involved.

### **1.04 TIMELY SUBMISSIONS**

- A. Timely submissions of shop drawings and performance data are required by Owner to ensure compliance with Specifications and continued progress of work.

**PART 2 – PRODUCTS      Not Applicable**

**PART 3 - EXECUTION      Not Applicable**

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16020 - ELECTRICAL RACEWAYS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary conditions, Division 1 and Division 16 of the specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED**

- A. Provide conduit, including straight and curved sections, fittings, couplings, connectors and supports, for the protection of wires and cables as required.

##### **1.03 GENERAL**

- A. All wire and cable provided under this division shall be installed in conduits as specified in this section.
- B. All conduit bodies, fittings, connectors, couplings, elbows, nipples and the like shall be UL listed and shall be of suitable materials and construction for the conduit system with which they are to be used.
- C. Refer to Electrical Classification Drawing for areas in the building which are classified Hazardous Class I, Division I and Division II, Group D, wet and dusty.

#### **PART 2 - PRODUCTS**

##### **2.01 CONDUIT AND FITTINGS**

- A. All conductors shall be run in hot-dipped galvanized rigid steel conduit (RSC), except as otherwise noted in this section. RSC shall be furnished and stored at the jobsite with a galvanized coupling on one end and plastic thread protector on the other.

## SECTION 16020 - ELECTRICAL RACEWAYS

### **2.02 CABLE TRAYS**

#### **A. General**

1. Cable trays shall be heavy duty, solid bottom NEMA 1 aluminum, straight, curved and special sections equipped with fittings, connections, supports and hardware.

#### **B. Products**

1. The cable tray straight sections shall be at least 12 feet long.
  - a. Tray width shall be 12" and depth shall be 6".
2. Cable trays and supports shall provide a wiring installation which will achieve the required strength and rigidity and to meet seismic zone 3 installation.
3. Provide shop drawings for the cable tray installations.
  - a. Shop drawings shall indicate routing, elevations and details, and shall include equipment description and installation data.
4. The cable trays shall be products designed and fabricated by:
  - a. Globe
  - b. Cope
  - c. Husky

## **PART 3 - EXECUTION**

### **3.01 RACEWAY SYSTEMS**

- A. All wiring shall be installed in steel conduit. Steel conduit shall be zinc coated and shall comply with corresponding Federal Specifications for rigid conduit. Sizes of conduits used for various feeders, circuits, etc., shall be as noted on drawings or in accordance with National Electric Code, latest edition. Minimum size of conduit shall be 3/4 inches. Rigid galvanized conduit shall be used for all work.
- B. Exposed conduits shall run in a neat, workmanlike manner at right angles and parallel to the walls and partitions. Suitable approved conduit fittings shall be

## SECTION 16020 - ELECTRICAL RACEWAYS

used in place of outlet boxes in all such cases.

- C. All conduits shall be securely fastened to outlet boxes and cabinets with locknuts and bushings of an approved type, special care being exercised that the full number of threads project through, to allow the bushing to butt up tight against the end of threads after which the locknut shall be screwed up to bring the bushing into firm contact with the box. Double locknuts and bushings shall be used when required to provide appropriate mechanical and electrical connection. All joints shall be made with approved conduit couplings and in such a way that end of conduits couplings and in such a way that end of conduits shall butt together as to make all joints water tight throughout the system.
- D. Conduits terminating in panels, boxes, and cabinets shall enter perpendicular to the corresponding side.
- E. Circuit runs to all panels shall be installed with as few crossings as possible in straight line between outlets. Bends shall be avoided whenever possible.
- F. All conduit shall be cut with a hacksaw, ends reamed and squared, and thread cut and cleaned before reaming.
- G. The maximum length of any conduit run shall not exceed 100 feet, including two (2) 90 degree bends. Pull and junction boxes shall be used as required.
- H. In hazardous locations, seals shall be installed at all arc producing devices and in conduit runs in accordance with NEC Article 501. Sealing compound and sealing dam materials shall be installed in accordance with manufacturer's instructions. Duct seal shall not be permitted as dam material.
- I. Union shall be installed where necessary and/or where required for the future removal of devices.
- J. All exposed conduits in process area shall be stainless steel with stainless steel fittings. All stainless steel piping to be UL approved.

### **3.02 BOXES - STANDARD WIRING**

- A. All outlet, junction, pull boxes and fittings shall be galvanized metal and shall be installed plumb, rigidly and securely, in a satisfactory manner with an alignment tolerance of 1-1/16th inch.
- B. Ceiling outlets in a slab shall be 4" octagonal outlet boxes, 2-1/2" minimum depth

## SECTION 16020 - ELECTRICAL RACEWAYS

with K.O. to fit conduit except when so advisable, 4" square or larger, 2-1/8" minimum depth outlet boxes equipped with a canopy cover may be used in lieu of octagonal boxes. Ceiling outlets shall be provided with 3/8" fixture stud when necessary to support fixtures. Outlet boxes shall be flush with the ceiling surface or as indicated in plans. For size and type of boxes for recess ceiling fixture, see Lighting Fixtures General Section.

- C. Wall outlets for lighting fixtures shall be 4" octagonal by 2 1/8" depth with 3/8" fixture studs, and with K.O. to fit conduit. Boxes shall be flush with the finished wall surface, or if necessary, raised covers used for this purpose.

### **3.03 BOXES - EXPLOSION PROOF**

- A. All explosion proof junction boxes shall be of the screw cover type with necessary hubs to accommodate conduits as shown on drawings.
- B. Four inch nominal size boxes shall be of the Crouse-Hinds GUE Series.
- C. Larger junction boxes shall be Type GUB 02 and GUB 01110 as required.

### **3.04 SEALING FITTINGS**

- A. The sealing fittings for conduit system shall be of the EYS type for vertical and horizontal runs. Minimum size shall be 3/4 inch. Fittings shall be manufactured by Crouse-Hinds or equal.
- B. Provide Chico "X" fibre material before the installation of Chico A filling compound.
- C. All wiring shall be checked for grounds before this installation of the above fillers.

### **3.05 FLEXIBLE COUPLINGS**

- A. All connections to motors shall be made with male and/or female flexible couplings complete with unions.
- B. All pendant type light fixtures shall be wired with flexible couplings or swivel covers.
- C. Flexible couplings shall be equal to Crouse-Hinds type ECLK or ECGJH.

### **3.06 CABLE TRAY EXECUTION**

## SECTION 16020 - ELECTRICAL RACEWAYS

- A. Cable tray systems shall be supported from the building structure above using strut type trapeze hangers and threaded rods. Refer to seismic restraints drawings.
  - 1. In no case shall the cable tray system share supports with piping and HVAC equipment.
  - 2. Where indicated on the Drawings, provide support brackets mounted on adjacent building surfaces.
- B. The cable trays shall be secured to the strut using clips to permit lateral adjustment.
- C. Provide expansion splice plates where indicated. All expansion joints shall be bonded using bonding jumpers.
- D. Cable trays shall be run parallel to walls and ceilings.

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16021 - BUILDING WIRE AND CABLES**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 16 of the Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED:**

- A. This section specifies:
  - 1. 600 volt building wire and cables.
  - 2. 600 volt remote control wire and cables.
  - 3. Splicing materials.

##### **1.03 GENERAL:**

- A. All building wire and cables for branch circuit wiring, power wiring, feeders and remote control wiring operating at 600 volts or less shall be as specified in this section.

#### **PART 2 - PRODUCTS**

##### **2.01 BUILDING WIRES AND CABLES:**

- A. All conductors and cables shall be high conductivity copper; 600 volt insulated in accordance with the NFPA standards for type THWN/THHN 90°C. insulated conductors
- B. Conductors for power and lighting shall not be less than No. 12 AWG. All conductors no. 8 and larger shall be stranded.

## SECTION 16021 - BUILDING WIRE AND CABLES

- C. Identification on the conductors and cables shall be continuous and include the type, voltage rating, manufactured date and name of the manufacturer.
- D. Wires shall be color-codes as follows:
  - 208 Volt Systems - Black, Red and Blue
  - 480 Volt Systems - Brown, Orange and Yellow
  - Neutral - White
  - Equipment Ground - Green
  - Isolated Ground - Green with Yellow Stripe
- E. Wire and cable shall be products of the following manufacturers:
  - 1. American Insulated Wire Corp.
  - 2. Collyer Insulated Wire
  - 3. General Cable

### **2.02 REMOTE CONTROL WIRE AND CABLES:**

- A. All conductors shall be high conductivity copper, 600 volt insulated in accordance with the NFPA standards for type THWN/THHN 90°C insulated conductors, except as noted on the drawings or otherwise specified herein.
- B. Identification on the conductors and cables shall be continuous and shall include the type, voltage rating, manufactured date and name of the manufacturer.
- C. Conductors for control wiring shall be not less than no. 14 AWG, stranded single conductors and multi-conductor cables.
  - 1. Control wiring shall consist of multi-conductor cables wherever possible. Cables shall be provided with an overall flame retarding extruded jacket.
  - 2. Multi-conductor cables shall contain a minimum of 10% spare conductors, but not less than two spare conductors.
- D. Color coding of control wires shall match the existing color-coding system.
- E. Control wires and cables shall be products of the following manufacturers:
  - 1. American Insulated Wire Corp.

## SECTION 16021 - BUILDING WIRE AND CABLES

2. Collyer Insulted Wire

3. General Cable

### **2.03 SPLICING MATERIALS:**

A. Spring wire connectors shall be provided for all splices in conductors No. 10 AWG and smaller. Spring wire connectors shall be manufactured by:

1. Scotchlok, Type B

2. Thomas & Betts, Type PT

3. Ideal

B. Solderless bolted style or compression style wire connectors shall be used for all splices in conductors no. 8 AWG and larger. Connectors shall be manufactured by:

1. Thomas & Betts

2. Burndy

3. Buchanan

C. Encapsulating compound shall be manufactured by Minnesota Mining and Manufacturing Co., or equal and installed in accordance with manufacturer's recommendations.

D. Tape shall be plastic, 0.007 inch thick, and resistant to abrasion, alkalies, acids, corrosion, moisture, low and high temperatures. Tape shall be manufactured by:

1. Scotch No. 33 Plus

2. Slipnot No. 7

E. Lubricants shall be used to ease the pulling of cables and conductors in conduits. Lubricant shall be manufactured by:

1. Burndy "Slikon"

2. Holub "Hi-Green"

## SECTION 16021 - BUILDING WIRE AND CABLES

### 3. Ideal "Yellow 77"

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION:**

- A. Conductors shall be brought to the job in unbroken packages, bearing date of manufacture not more than 12 months prior to delivery to site.
- B. Wire previously pulled into conduit is considered used and shall not be repulled.
- C. Wire shall not be pulled until all work which may cause injury to the conductors or insulation has been completed and conduits are cleaned.
- D. Conductors shall be completely installed and connected. Apply wire lubricant to ease the pulling of conductors in conduits.
- E. Vertical runs of cable shall be supported at the top of the run by proper supports.
- F. Number all wires and label with permanent wire markers at all junction boxes and terminations. Wire markings shall be clearly shown on all schematics. Consistent color coding shall be used throughout.

### **3.02 CIRCUIT ARRANGEMENTS:**

- A. All wiring required by the various operational requirements specified shall be furnished and installed under this division whether or not specifically mentioned or shown on the drawings.
- B. The circuit numbers indicated on the drawings are intended as a guide for proper connection of circuits at panels. However, it shall be the responsibility of the Contractor to see that the circuiting work is complete as required herein.
- C. Single phase branch circuit wiring shall be alternately connected to circuit breakers in a manner to effect balancing the branch circuit connections as nearly as possible over each of the three phases. Loads on each panel bus shall be balanced to within 10% of each other.
- D. Branch circuit wiring for single phase applications shall be multiwire, utilizing common neutrals where indicated, in a manner consistent with the type of service furnished to the Project. Under no circumstances shall any switch or circuit breaker

## SECTION 16021 - BUILDING WIRE AND CABLES

break a neutral conductor.

- E. No neutral conductor shall be common to more than one circuit conductor connected to the same phase leg of the supply system.
- F. Home runs and branch circuit wiring for 277 Volt circuits shall be as follows:

| LENGTH, FT. | HOME RUN WIRE<br>SIZE | CIRCUIT WIRE SIZE |
|-------------|-----------------------|-------------------|
| 0 to 100    | No. 12                | No. 12            |
| 101 to 200  | No. 10                | No. 12            |
| 201 to 300  | No. 8                 | No. 10            |

- G. Home runs and branch circuit wiring for 120 Volt circuits shall be as follows:

| LENGTH, FT. | HOME RUN WIRE<br>SIZE | CIRCUIT WIRE SIZE |
|-------------|-----------------------|-------------------|
| 0 to 50     | No. 12                | No. 12            |
| 51 to 100   | No. 10                | No. 12            |
| 101 to 150  | No. 8                 | No. 10            |

### **3.03 SPLICING AND CONNECTIONS:**

- A. Splices in wires and cables shall be avoided wherever possible, and where necessary shall be made only in accessible pull, junction or outlet boxes. Connections in outlet boxes shall be made with solderless wire connectors with insulating caps.
- B. All connections and taps in pull, junction and panel boxes shall be made with solderless taps complete with bakelite covers.
- C. Splice and terminal connections shall be made tight with spring and compression connectors. The connectors shall be crimped with a tool that provides uniform and tight connections.
- D. Insulate all connections with tight wraps of plastic tape. Apply insulation putty to fill irregularities and voids in splices.
- E. Wire connectors shall be provided for splices and terminal connections of all copper conductors and cables.

## SECTION 16021 - BUILDING WIRE AND CABLES

- F. Wire connectors shall fit the conductor to which it is connected, and the assembly shall have joint contact surfaces not less than 50 percent.
- G. Compression wire connectors for conductors No. 8 AWG and larger shall be copper lugs for terminal connections and two way copper sleeves and taps for splice connections.
- H. Spring connectors shall have live springs attached to inner steel housings and be enclosed with plastic insulators.
- I. Lubricants shall be used to ease the pulling of conductors and cables in conduits.

### **3.04 TESTING:**

- A. All new 600 volt completed cable installations shall be field tested in accordance with cable manufacturer's recommendations.
- B. An insulation resistance test (megger) shall be performed with all test results delivered to the Engineer.

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16025 - BOXES AND ENCLOSURES**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 16 of the Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED:**

- A. This Section specifies:
  - 1. Outlet boxes
  - 2. Junction boxes
  - 3. Pull boxes
  - 4. Conduit bodies
  - 5. Wireways

##### **1.03 GENERAL**

- A. Furnish and install outlet boxes, junction boxes, pull boxes, conduit bodies and wireways as required to complete the installation.
- B. All boxes in finished areas shall be concealed to the maximum extent possible.
- C. Box sizes, types and configuration shall be selected by the Contractor to suit the wiring requirements and shall conform to the applicable sections of the National Electrical Code latest edition.

#### **PART 2 - PRODUCTS**

##### **2.01 OUTLET BOXES**

- A. Provide galvanized pressed steel outlet boxes of proper size and type as required by the building conditions for all interior outlets for lighting, switches, receptacles, signals, devices, etc.

## SECTION 16025 - BOXES AND ENCLOSURES

- B. Outlet boxes for NEMA 4X wet areas, exterior area, damp areas and "dust tight" and "dust tight ignition proof" installations as indicated on the Drawings shall be cast malleable iron type FS boxes or FD boxes with threaded conduit connections and gasket device covers specified. Screws for covers shall be stainless steel.
  - 1. Receptacle outlets and switch outlets shall have a gasket, spring-loaded cover.
- C. Where more than one wiring device is indicated, multi-gang or tandem boxes shall be used.

### **2.02 CONDUIT BODIES**

- A. Provide cast malleable iron conduit bodies for exposed conduit installations.
- B. Conduit bodies shall be installed where suitable for changes in conduit direction and at junction points. Selection of conduit body configuration shall be made by the Contractor to suit the application.

### **2.03 PULL BOXES AND JUNCTION BOXES**

- A. Pull boxes and junction boxes shall be code gauge galvanized steel, of required dimensions, with accessible, removable screw-on covers.
  - 1. Pull boxes shall be sized so that future use of spare conduits is not compromised. Box size calculations shall be based on the largest possible three phase feeders and largest bending radius for future conductors for the specified spare conduits.
  - 2. Where required by the building construction, furnish and install pull boxes and junction boxes in special sizes and shapes determined in the field.
  - 3. Each pull box and junction box shall be neatly stenciled to indicate the feeders, control or signal system wiring passing through the box.

### **2.04 WIREWAYS**

- A. Wireways shall be provided where indicated, or as required of standard or special shapes, design and construction to install, support and enclose wires and cables.
  - 1. Wireways shall be constructed as specified above for pull and junction boxes,

## SECTION 16025 - BOXES AND ENCLOSURES

with required reinforcing for rigidity. Provide insulating supports and clamping for the cable installation.

2. Cables shall be continuous throughout the wireways and shall be racked in distributed phase groupings arranged with phase cables surrounding the neutral conductors.

### **2.05 MANUFACTURERS**

- A. Sheet metal outlet boxes junction boxes, pull boxes and wireways shall be manufactured by:
  1. Racco, Inc.
  2. Spring City Electrical Manufacturing Co.
  3. Steel City, Electric Products Division, Midland Ross Co.
- B. Cast metal outlet boxes and conduit bodies shall be manufactured by:
  1. Appleton Electric Co.
  2. Crouse-Hinds Co.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION:**

- A. Location, size and configuration of outlet boxes for wiring to equipment shall be verified in the field prior to starting the installation.
  1. Outlets shall be of the type suitable for the purpose.
  2. Locations of outlet boxes shall be adjusted in the field to suit the equipment.
- B. Outlet boxes shall be securely fastened in place flush with finished wall and ceiling surfaces. Boxes at all lighting fixture outlets shall be provided with 3/8" malleable iron fixture studs, securely fastened to same if required. Follow manufacturers installation lighting fixture recommendation.
- C. Installation of boxes shall comply with The National Electrical Code latest edition:

## SECTION 16025 - BOXES AND ENCLOSURES

1. Boxes shall not be supported by conduits.
2. Covers of all boxes shall be accessible after completion of construction.
3. Outdoor boxes shall be installed to prevent the collection of standing water. Conduit connections at boxes exposed to the weather shall be made with gasketed hubs.

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16026 - WIRING DEVICES**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1 and Division 16 of the Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED:**

- A. This section specifies:
  - 1. Switches
  - 2. Receptacles
  - 3. Device Plates

##### **1.03 GENERAL:**

- A. Furnish and install specification grade wiring devices as herein specified.

#### **PART 2 - PRODUCTS**

##### **2.01 MANUFACTURERS:**

- A. The wiring devices specified herein, unless otherwise listed, are those of Pass and Seymour. However, equal devices are also acceptable, as approved by the Owner, made by:
  - 1. Hubbell
  - 2. Arrow-Hart and Hegeman (AH&H)

## SECTION 16026 - WIRING DEVICES

### 3. General Electric Company

#### **2.02 SWITCHES:**

- A. Lighting control switches shall be toggle type, 120-277 volt AC, rated 20 amperes, quiet-type with silent operating mechanism, totally enclosed in a molded composition base. Switches shall be P&S #20AC1, #20AC2, #20AC3 and #20AC4 for single pole, two pole, three or four way as indicated.
- B. Switch and pilot light combination, where indicated shall be as specified above, but with a lighted toggle with an integral neon lamp.
- C. Where "explosion proof" local switches are indicated, provide front operated factory sealed 20A-1P-277V switch with aluminum sealing chamber, malleable cast iron body and cover and nylon handle. Switch shall be UL listed for use in Class 1, Division 1 and Division 2, Group D Atmospheres and shall be Appleton Catalog No. EDS 175-F1.

#### **2.03 RECEPTACLES:**

- A. All receptacles installed in this project shall be grounding type, with grounding pin slot connected to device ground screw for ground wire connection to conduit system.
- B. Wall mounted receptacles shall be mounted 18 inches minimum above the floor, unless otherwise noted. Refer to Architect for exact height.
- C. Duplex convenience receptacles shall be P&S #CR15 rated 15 Amperes, 125 Volts, totally-enclosed in molded composition base, third-leg grounded to conduit system.
- D. Single receptacles on dedicated 20 amperes, 125 volts branch circuits shall be P&S #CR20 rated 20 amperes, 125 volts, totally-enclosed in a molded composition base.
- E. Where indicated, provide termination type duplex, ground fault circuit interrupter receptacle devices, P&S #2091.
  - 1. For exterior use, these receptacles shall be horizontally mounted in cast aluminum boxes with General Electric Company No. T11H weatherproof, gasketed cover.
- F. Single 480V receptacle to be Pass & Seymour #20403 rated 30 amperes, 480V totally enclosed with waterproof cover.

## SECTION 16026 - WIRING DEVICES

- G. Where "dust-tight" convenience receptacles are indicated, provide device as specified above with weatherproof, gasketed, stainless steel, double lift plate, Pass and Seymour WP-Series to suit outlet box WP-1, WP-8 or WP-26.
- H. Where "explosion-proof" local convenience receptacles are indicated, provide 20A-125 volts 2W-3P dead front device consisting of a sealing chamber, receptacle and cast malleable iron mounting box with spring cover. Device shall be UL listed for use in Class 1, Division 1 and Division 2 Atmospheres and shall be Crouse Hinds No. ENR-21201. Contractor shall furnish a minimum of six (6) 15A-2W-3P matching plugs. Blade arrangement shall fit NEMA-5-15R and 5-20R receptacles in non-classified areas. Plugs shall have integral cord grips.
- I. Where special receptacles are indicated on the drawings for connection of specific equipment, which operates at more than 120 volts and/or more than 20 amperes, provide "Specification Grade" receptacles by manufacturers as previously specified the ampere and voltage characteristics and with the required number of poles shall conform with the data on the drawings.
  - 1. For each special receptacle installed, furnish a suitable cordgrip-type attachment plug. These attachment plugs shall be connected under this division to the cords of the appliances associated with special purpose receptacle outlets.

### **2.04 DEVICE PLATES:**

- A. Plates for all wiring devices, except as specified otherwise, shall be .040-inch thick satin finished stainless steel.

## **PART 3 - EXECUTION**

- 3.01 A. All connections of branch circuit wiring-to-wiring devices shall utilize the side binding screws provided. The use of "push-in" back wiring holes will not be permitted.
- B. Combination switch and receptacle outlets shall consist of a switch with a duplex convenience receptacle, as specified, mounted under a single two-gang plate.
- C. Double-duplex convenience outlets shall consist of two duplex receptacles mounted under a single two-gang device plate.
- D. A multi-gang plate shall cover all devices which are indicated at a common location.

## SECTION 16026 - WIRING DEVICES

- E. On the outside of each device plate, write the panelboard designation and circuit number of the circuit serving the device.
- F. It is the intent of these specifications to provide connections for, and to leave completely connected and in operating condition, all equipment furnished by the Owner or furnished under other divisions.
- G. Determine the final connection requirements for permanently-mounted equipment, as outlined above, and provide a solid connection or a receptacle connection as required by the equipment supplied. Provide and attach suitable cords and plugs, as specified above, and leave equipment ready for use.

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16032 - RACEWAY SUPPORTS**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1, and Division 16 of the Specification Sections, apply to work of this Section.
- B. All supports to meet Section 16071 Seismic Restraints.

##### **1.02 DESCRIPTION OF WORK:**

- A. Provide raceway supports with all fittings, accessories and supports for a complete system as specified herein and indicated on the drawings.

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

- A. Load Calculations - Submit all load calculations to Construction Manager for review.

#### **PART 2 - PRODUCTS**

##### **2.01 BEAM CLAMPS:**

- A. They shall be suitable for structural members and conditions; claps shall be Appleton, Kindorf or Steel City, and shall be submitted for approval.

##### **2.02 CHANNELS:**

- A. They are used for trapeze hangers or other supporting means shall be Kindorf No. B-905 or equivalent by Steel City or Unistrut.

##### **2.03 CLAMPS FOR CLAMPING RIGID CONDUIT TO HANGERS:**

## SECTION 16032 - RACEWAY SUPPORTS

- A. They shall be Kindorf Series No. C-105, or equivalent by Steel City or unistrut. Clamps for electrical metallic tubing shall be Kindorf Series No. C-106 or equivalent by Steel City or Unistrut. Clamps used for clamping conduit to walls or other similar surfaces shall be one-hole malleable iron type.

### **2.04 FINISH:**

- A. All channels, beam clamps and conduit clamps shall be galvanize.
- B. All steel bolts, nuts, washers and screws shall be cadmium plated.
- C. All weld joints shall be cleaned, prime painted, and two coats of red lead or approved equal shall be applied to these areas.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION:**

- A. The required strength of the raceway supports and the size and type of anchors shall be based on the combined weight of raceway, hangers, conductors and any equipment supported from the raceway with a minimum safety factor of four times the total supported weight. Submit load calculations for review and approval prior to installation.
- B. All raceway systems shall be installed in such a way that no portion of the raceway system is dependent upon panels, boxes, motor control centers, etc. to support the raceway.
- C. No part of the raceway system shall be supported from anything other than structural members or masonry surfaces without the prior written approval of Construction Manager.
- D. Single Runs:
  - 1. Where conduits are run individually along walls or masonry surfaces, they shall be supported by approved conduit clamps secured by means of toggle bolts on hollow masonry, expansion shields and machine screws or standard preset inserts on concrete or solid masonry, and machine screws or bolts on metal surfaces. The use of perforated strap shall not be permitted. Expansion shields shall be installed using a Greenlee No. 866, No. 867, No.

## SECTION 16032 - RACEWAY SUPPORTS

868 or No. 870 expansion anchor tool. No expansion anchors of any other type shall be installed in mortar joints.

2. Conduits installed along the surface of damp locations or in refrigerated areas shall be provided with clamp backs under each conduit to prevent accumulation of moisture around the conduits.
3. Where individual conduits are suspended from a structural member, they shall be supported by hangers, Steel City No. 149 or an approved equal. All threaded rods shall not exceed 24 inches in length when used to make hangers for individual conduit runs. Conduit run directly along or across structural members shall be supported with Appleton right angle, parallel or edge Type "KClamps".

### E. Multiple Conduit Runs:

1. Where two or more conduits are to be run exposed and parallel one with another, they shall be grouped evenly and consistently spaced out allow for conduit installation and arranged to minimize crossing. They shall be supported in channel mounted to structural members or in trapeze hangers. All channel cut edges shall be filed smooth and free of burrs and cut square. All threaded rods shall not exceed 24 inches in length when used for trapeze hangers without prior written approval of Construction Manager.

### F. Additional supports for proper spacing or support of outlets, cabinets, pull boxes, lighting fixtures or starters shall be as detailed on the drawings. Where no detail is given, the supports shall be channel mounted to structural members or masonry surfaces in an approved manner. Supports shall have a minimum safety factor of four times the total supported weight.

### G. All threaded rod, bolts, etc. used for raceway support shall be double nutted and wrench tightened to appropriate torque values.

### H. All raceway supports shall be installed in a quality workmanlike manner, shall be neat in appearance, shall be cut square and filed to remove any sharp edges, and shall be capable of supporting the total required load with the required safety factor.

### I. Any raceway supports and associated hardware located in corrosive environments shall be stainless steel or PVC-coated and must be approved prior to installation by Construction Manager.

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16033 - NAMEPLATES AND IDENTIFICATION**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 16 of the Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED:**

- A. This Section specifies:
  - 1. Nameplates
  - 2. Directories
  - 3. Conduit Identification
  - 4. Panel Identification
  - 5. Safety Disconnect Switch Identification
  - 6. Wire Markers
  - 7. Outlets and light switches.
  - 8. Motor control centers.

##### **1.03 GENERAL:**

- A. Provide nameplates, schedules, directories, markers and tags for all electrical equipment furnished and/or installed under this division.

#### **PART 2 - PRODUCTS**

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## **2.01 NAMEPLATES:**

- A. Identify equipment and key equipment components with nameplates of black laminated phenolic material.
  - 1. Coordinate nameplates with actual equipment installed.
  - 2. Secure nameplates onto or near each item.
  - 3. Submit cut sheet of nameplates for approval prior to fabrication and installation.
  - 4. Minimum nameplate size shall be three inches long with 1/4 inch lettering.
- B. Secure nameplates with screws or bolts and nuts. Glued or pasted-on laminated nameplates are not acceptable.
- C. See attached list for tagging of process equipment.

## **2.02 PANELBOARD IDENTIFICATION:**

- A. Provide screw-on nameplates on the panel trim outside indicating the panelboard designation and the source of power origin of feeders serving each panel or switch.

## **2.03 SWITCH IDENTIFICATION:**

- A. Provide screw-on nameplates on outside of covers or doors indicating the load served and the source of power and the service. (See schedule at back of specification).

## **2.04 PANELBOARD DIRECTORIES:**

- A. All panelboards shall be furnished with a directory frame. Provide a neatly typed directory listing the circuit number, equipment served and location for each circuit in all lighting panels, power panels and distribution panels. Directories shall identify all spare circuit devices.

## **2.05 CONDUIT IDENTIFICATION:**

- A. Provide adhesive-type labels indicating voltage and circuit information.
  - 1. Install markers, after finish painting, every 50 feet and at every change of direction.
  - 2. Labels shall be W. H. Brady Company, Newark, NJ, B-500 vinyl cloth or equal.

## **2.06 OUTLETS:**

1. Provide bakelite with epoxy adhesive on emergency outlet indicating panelboard designation and circuit number.

## **2.06 WIRE MARKERS:**

- A. Wire markers shall be provided to identify devices served, conductors and cables at terminals, and in pull boxes. Numbering shall be specific to the device and per loop drawings.
- B. Wire markers shall be adhesive type manufactured by:
  1. Thomas & Betts
  2. W.H. Brady Company
- C. All wires shall be permanently marked with suitable wire markers in motor control centers, pull boxes, junction boxes, hand holes, terminal boxes and other accessible locations. All markings shall be unique and clearly shown on submittal data.

## **2.07 MOTOR CONTROL CENTERS:**

1. Provide adhesive type or plastic laminated labels including Tag No., equipment and service, (see table at end of specification for descriptions).

## **PART 3 - EXECUTION**

**Not Applicable**

**- End of Section -**

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## **DIVISION 16 - ELECTRICAL**

### **SECTION 16040 - LIGHTING FIXTURES**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 16 of the Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED**

- A. This section specifies:
  - 1. Lighting fixtures
  - 2. Lamps

##### **1.03 GENERAL**

- A. Furnish and install all lighting fixtures complete with lamps as indicated on the drawings, as herein specified and specified in the Lighting Floor Plan Notes.
- B. It is the intent to provide and install a complete fixture, and multiples thereof, on each and every outlet shown on the drawings. Therefore, in the event a type designation is omitted from any fixture outlet indicated, furnish and install units typical to those in similar locations, at no additional cost to the Owner.
- C. Include the cost of purchasing all fixtures specified in the Lighting Fixture Schedule, including plaster frames pendant hangers and miscellaneous accessories, as well as the cost involved in receiving, checking, cleaning, safeguarding, distributing, necessary wiring, disposal of cartons and crates from the site, etc., assembling, installing and connecting of lighting fixtures.
- D. All lighting fixtures shall be protected from damage during the installation. Any damaged fixtures, diffusers, glassware, sockets, stems and the like, shall be replaced with new parts, without additional cost to the Owner.
- E. All spare glassware shall be protected from damage and shall be delivered to the

## SECTION 16040 - LIGHTING FIXTURES

Owner.

### **1.04 UTILITY COMPANY REBATES**

- A. All lamps and ballasts furnished for this installation shall be of the types required by the local electric utility company to qualify for any applicable rebate programs.
- B. The Contractor shall assist in the preparation of utility company rebate applications.
- C. Rebates, if applicable, shall be paid to the Owner.

## **PART 2 - PRODUCTS**

### **2.01 FIXTURES AND APPURTENANCES**

- A. Lighting fixtures shall be furnished complete with all necessary devices and appurtenances to completely install fixtures in operating condition, including plaster rings, studs, hickey, canopies, stems, clamps, leveling devices, glassware, diffusers, etc., and lamps.

### **2.02 QUALITY ASSURANCE**

- A. Each lighting fixture shall have an UL label, and shall comply with the requirements of all authorities having jurisdiction.
- B. Ballasts for fluorescent fixtures shall be solid state electronic energy-saving CBM certified, Class P ballasts, sound rated 'A', high power factor type.
- C. Lighting fixtures shall be wired with approved fixture wire. Each fixture shall be wired to a single point with adequate slack for proper connection.
- D. Lighting fixtures shall be suitable for the location in which they are installed.
  - 1. Fixtures in damp or wet locations shall be listed for those locations.
  - 2. Fixtures in corrosive locations shall have non-metallic housings.
  - 3. Fixtures in hazardous locations shall be listed for those locations. Recessed fixtures to be Kurtzon-Haz-Lock Series.
  - 4. Fixtures installed outdoors shall be listed for those locations.

## SECTION 16040 - LIGHTING FIXTURES

5. Fixtures in process areas are to be Kurtzon-Klean-Lock Series, 4 lamp acrylic lens with stainless steel door.

### **2.03 MATERIALS**

- A. All "plastic" diffusers furnished under this division shall be "acrylic" material, regardless of whether or not so indicated in the Fixture Schedule.
  1. When directed, remove diffusers, selected at random by the Owner, for verification by test.
- B. Fluorescent fixtures in dry locations shall be fabricated from heavy gauge formed sheet steel.
  1. Metal parts shall be joined together to form rigid housings with wireway covers and frames.
- C. Exposed metal trim on lighting fixtures in process areas shall be stainless steel with welded joints and polished finish.
- D. The finish of all metal parts shall be baked white enamel, unless otherwise indicated in the Fixture Schedule.

### **2.04 BALLASTS**

- A. Fluorescent lighting fixtures shall be furnished with solid state electronic ballasts rated for 120/277 volt service as noted in the Lighting Fixture Schedule.
- B. Ballasts for fixtures located in indoor unheated areas and open outdoor areas shall be low temperature type.
- C. Fluorescent ballasts shall carry the CBM and UL labels.
- D. Hid ballasts shall carry the UL label.
- E. Ballasts shall be energy-saving type.
- F. Fluorescent ballasts shall be sound rated 'A'.

## SECTION 16040 - LIGHTING FIXTURES

- G. If ballast hum is noticeable, or lamp flicker persists, change ballast or take other effective action to remedy hum or flicker. If changing ballast or lamp, and detailed inspection and correction of faulty electrical connections fails to stop hum or flicker, replace the entire fixture with one of like kind, and re-test.
- H. Ballasts for fluorescent fixtures shall be solid state electronic, Class P, equipped with thermally actuated automatic reclosing protective device, sensitive to current and winding temperatures which shall prevent ballast case temperatures from exceeding 110°C.
- I. Ballasts shall be suitable for the quantity and types on lamps specified in the Lighting Fixture Schedule.
- J. Ballasts shall be high power factor, 60 Hz, 120/277 Volt, or other circuit voltages as listed in the Lighting Fixture Schedule on the drawings.

### **2.05 GLASSWARE LENSES AND DIFFUSERS**

- A. Provide to the Owner, one percent of spare glassware, lenses or diffusers, but in no case less than one for each type of lighting fixture indicated in the Fixture Schedule, which requires glassware, lenses or diffusers.

### **2.06 LAMPS**

- A. Provide a full complement of lamps, of all types required in the fixtures installed throughout the project area.
- B. Fluorescent lamps shall be 32 watt, 48 inch, T-8 rapid start medium bi-pin, 4000°K, unless otherwise noted.
- C. Metal halide lamps shall be clear, mogul base standard output lamps, wattage rating as indicated on the Drawings.
- D. Unless otherwise indicated, all lamps including led shall be as manufactured by:
  - 1. General Electric Co.
  - 2. Philips
  - 3. Sylvania

## SECTION 16040 - LIGHTING FIXTURES

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Provide a junction box at each recessed lighting fixture whether specifically indicated or not.
- B. All recessed lighting fixtures shall be secured to the ceiling frame members with approved clips, or other approved mechanical methods.
- C. All light fixtures to have two (2) sets of aircraft cable to structure above to meet seismic restraint for seismic zone 3.

#### **3.02 COORDINATION**

- A. Coordinate construction and design of trim and supports for all recessed lighting fixtures for conformity with suspended ceilings in which the lighting fixtures are installed.
  - 1. Submit sub-types of fixtures designations specified as necessary to indicate such conformity of design.
  - 2. Any work that may be required to overcome difficulties in fitting designs to particular locations, or to clear obstacles, etc., shall be done without additional cost to the Owner.
- B. Install pendant mounted and wall mounted lighting fixtures at the elevations indicated on the drawings.
- C. Pendant-mounted fixtures shall be hung from 3/8-inch stems with a minimum wall thickness of 0.091 inch. Swivel joints shall be used at the top of each stem.
  - 1. Arrange stems to avoid pipes and other interferences above fixtures.

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#### **3.03 TESTS**

- A. After the fixtures are completely installed, the wiring system, and fixtures must test free from grounds and short circuits.

SECTION 16040 - LIGHTING FIXTURES

- End of Section -

PRIDCO  
STRUCTURAL ASSESSMENT AND DESIGN PROJECT  
BUILDING ID #: T-0627-0-63-00/T-0627-1-70-00  
CANOVANAS, PR

## **DIVISION 16 - ELECTRICAL**

### **SECTION 16060 - DISTRIBUTION EQUIPMENT**

#### **PART 1 - GENERAL**

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

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 1, and all other Division 16 Specification Sections, apply to work of this Section.

##### **1.02 WORK INCLUDED**

- A. Distribution boards.
- B. Power Panels.
- C. Lighting Panels.
- D. Appliance Panels.

##### **1.03 GENERAL**

- A. Furnish and install all distribution equipment as herein specified and as indicated on the drawings.

#### **PART 2 - PRODUCTS**

##### **2.01 QUALITY ASSURANCE**

- A. All equipment ratings shall be in accordance with the applicable standards of ANSI, IEEE, NEMA and UL.
- B. All assemblies shall bear the UL label.
- C. Materials shall be of the type and size indicated on the drawings, specified herein and indicated in the Schedules. Manufacturer shall furnish certified test reports for actual

## SECTION 16060 - DISTRIBUTION EQUIPMENT

equipment provided for this project, or units of identical design, indicating compliance with applicable ANSI, IEEE and NEMA standards.

### **2.02 DISTRIBUTION BOARD**

**A. Short Circuit Current Ratings:**

1. Distribution Boards shall be rated with a minimum short circuit current rating of 65,000 rms symmetrical amperes at 480 VAC maximum.

**B. Future Provisions:**

1. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

**C. Enclosure: Type 1 - General Purpose:**

1. Sections shall be aligned front and rear.
2. Distribution Board height shall be a maximum 91.5 inches including 1.5 inch floor sills and excluding lifting members and pull boxes.
3. The Distribution Board(s) shall be of dead front construction.
4. The Distribution Board frame shall be of formed steel rigidly bolted together to support all cover plates, bussing and component devices during shipment and installation.
5. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
6. Each Distribution Board section shall have a barriered bottom and an individually removable top plate for installation and termination of conduit.
7. The Distribution Board enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.
8. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hung pins.
9. Top and bottom conduit areas shall be clearly indicated on shop drawings.

## SECTION 16060 - DISTRIBUTION EQUIPMENT

### D. Nameplates:

1. Provide 1 in. H x 3 in. W engraved laminated Gravoply nameplates for each device. Furnish black letters on white background for all voltages.

### E. Bus Composition:

1. Shall be plated copper. Plating shall be applied continuously to all bus work. The Distribution Board bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The Phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

### F. Bus Connection:

1. Shall be bolted with Grade 5 bolts and conical spring washers.

### G. Ground Bus:

1. Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the Distribution Board. Provisions for the addition of future sections shall be provided.

### H. Accessibility:

1. Accessible from the front of the switchboard.
2. Circuit breaker(s) shall have power terminals to accommodate either cable or bolted bus connections.

## **2.03 MAIN CIRCUIT BREAKER**

Thermal magnetic molded case circuit breaker(s).

- A. Group mounted through 1200 A

## SECTION 16060 - DISTRIBUTION EQUIPMENT

1. Circuit protective devices shall be Square D molded case circuit breaker(s). Circuit breaker(s) shall be standard interrupting Ampere ratings shall be as shown on the drawings.

Manufacturer shall submit one set of published Ip and It let-through curves as required by UL to the Owner.

2. Branch circuit breaker(s) shall be group mounted bolt-on type with mechanical restraint on a common pan or rail assembly.
3. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
4. Circuit breaker(s) equipped with the line terminal jaws shall not require additional external mounting hardware. Circuit breaker(s) shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breaker(s) of different frame size shall be capable of being mounted across from each other.
5. Line side circuit breaker connections are to be jaw type.

### **2.04 POWER PANELS**

- A. Power panels shall consist of an assembly of molded case circuit breakers installed in code gauge galvanized sheet steel cabinets, surface or flush mounted as indicated on the drawings.
- B. The panel sections shall be mounted away from the back of the cabinet trim and frames.
  1. The gutter space on sides, top and bottom shall be of sufficient size to prevent overcrowding of wires and cables, and overheating of the circuit breakers.
  2. Cabinets shall be complete with hinged doors with cylinder lock, directory frame and neatly typed directory charts.
  3. All panels shall be keyed alike.

## SECTION 16060 - DISTRIBUTION EQUIPMENT

4. Provide an angle piece on the inside of the bottom of each trim for ease of installation.
  5. All panels shall contain a main circuit breaker.
- C. Main buswork shall be copper rated 1000 amperes per square inch, and shall, as a minimum, be designed to carry the full rating of the feeder breaker or switch supplying the panel without perceptible heating.
1. Branch circuit breakers shall be arranged so that each breaker is readily removable from the panel without disturbing adjacent breakers.
  2. Phase legs shall be alternately bussed to each circuit breaker in a manner to effect balancing the branch circuit connections as nearly as possible over each phase.
- D. The branch circuit breakers, in general, shall be molded case, thermal magnetic trip, 3 pole as scheduled on the drawings.
1. All multiple pole breakers shall be single handle, common trip.
  2. Circuit breaker frame and trip ratings shall be as shown on the drawings.
- E. Power panels shall be Square D I-Line.
1. Power panels as manufactured by General Electric will be acceptable.

### **2.05 LIGHTING PANELS**

- A. Lighting panels shall consist of an assembly of molded case circuit breakers installed in code gauge galvanized sheet steel cabinets, surface or flush mounted as indicated on the drawings and shall automatically control lighting. System to be a Square 'D' Powerlink G3 system.
- B. The panel interior shall be mounted away from the back of the cabinet trim and frames.
1. The gutter space on sides, top and bottom shall be of sufficient size to prevent overcrowding of wires and cables, and overheating of the circuit breakers.
  2. Cabinets shall be complete with hinged doors with cylinder lock, directory frame and neatly typed directory charts.
  3. All panels shall be keyed alike.

## SECTION 16060 - DISTRIBUTION EQUIPMENT

4. Provide an angle piece on the inside of the bottom of each trim for ease of installation.
  5. All panels shall contain a main circuit breaker.
- C. Main buswork shall be copper rated 1,000 amperes per square inch, and shall, as a minimum, be designed to carry the full rating of the feeder breaker or switch supplying the panel without perceptible heating.
1. Branch circuit breakers shall be arranged so that each breaker is readily removable from the panel without disturbing adjacent breakers.
  2. Phase legs shall be alternately bussed to each circuit breaker in a manner to effect balancing the branch circuit connections as neatly as possible over each phase.
- D. The system shall be used as a networked system for controlling loads via external low voltage inputs.
- E. The system shall include branch circuit overcurrent protection and remote lighting control, low voltage switch inputs, control logic functionality and shall all fit within a standard lighting panelboard enclosure.
- F. To assure seamless integration, all major system components shall have a common manufacturer.
- G. Start-up: After the system has been installed, and the documentation delivered to the Owner, the Contractor shall secure the services of a factory trained manufacturer's representative to verify correct operation of all system components.
- H. The panelboard lighting control system shall be POWERLINK G3 as manufactured by Square 'D' Company. The lighting control system shall consist of a microprocessor-based control electronics with remotely operated circuit breakers.
- I. The circuit breakers shall provide overcurrent protection meeting or exceeding the fault current of the system to which the panelboard is applied.
- J. The lighting control system shall meet or exceed the following capabilities:
1. Individual remote control for 42 branch circuits.

## SECTION 16060 - DISTRIBUTION EQUIPMENT

2. Up to sixteen 2-wire maintained dry-contact inputs for connection to external low voltage (24 VDC or below) switch contacts.
  3. Zone creation of multiple branch circuits and control of individual branch circuits or zones.
  4. Individual branch circuit and zone override.
  5. True closed loop control by monitoring branch circuit breaker status based on actual system voltage at load side terminal.
  6. Downloadable firmware that will permit field installation of newest features in existing systems.
- K. All lighting control components shall be installed in a conventional panelboard enclosure. Suitable barriers between Class 1 and Class 2 wiring shall be provided.
- L. To minimize installation labor and space requirements, the remote operated circuit breakers, power interface module, and control module shall be integral to the lighting panelboard.
- M. Remotely operated circuit breakers: All remotely operated branch circuit breakers shall provide overload and short circuit protection suitable for that location in the electrical system, as defined in the panelboard schedules. Remotely operated lighting control devices shall provide:
1. Load switching endurance rating of 200,000 open/close operations at full load and 0.8 lagging power factor.
  2. Switching devices with lower endurance ratings may be judged to be acceptable, but must be provided with 100% spare switching devices for each circuit to ensure an equivalent total number of operations.
  3. 15A, 20A, and 30A current ratings.
  4. Integral branch circuit overcurrent protection as required by the National Electrical Code (NEC), and shall be either fully rated or shall have published series connected ratings for providing adequate protection at that point in the system.
  5. Available in single, 2 or 3 pole configurations.

## SECTION 16060 - DISTRIBUTION EQUIPMENT

6. UL listing SWD rating on 15A and 20A 1-, 2- and 3- pole branches; UL listed HACR rating and UL listed HID rating on all remotely operated lighting control devices.
7. Handle that mechanically opens lighting control device contacts when moved to the OFF position and disables remote control capabilities of the device.
8. Operating mode selector button on each lighting control device shall be provided to enable or disable remote operated function of the device independent of the handle.
9. Visible flag to clearly indicate the status of the circuit breaker contacts.
  - a. Status condition shall include: ON, OFF, TRIPPED.
  - b. The visible flag shall be mechanical in nature, directly tied to the breaker mechanism, and shall be provided in addition to any status indicator supplied by the system electronics.
10. All individual lighting control devices rated for 277 or 480Y/277 VAC shall have a short circuit interrupting rating 65,000 RMS symmetrical amperes.
11. Lighting control devices shall meet all NEC requirements for circuit breakers; shall be UL listed as circuit breakers.
- N. All electronic modules and circuit breakers in the panelboard shall be mounted in positions and control the loads as indicated on the panelboard drawings.
- O. Panelboards shall accept standard circuit breakers for loads not controlled by the system.
- P. Interconnections: All interconnections between circuit breakers, control buses and power interface modules shall meet NEC and UL requirements for Class 1 control circuits.
- Q. Modular control buses shall be used to provide control power and communications to the remote operated branch breakers.
- R. A power interface module shall be provided to supply control power for the operation of the remotely operated circuit breakers, for low voltage inputs, and for the electronics and communications. The module shall provide screw type terminals for up to sixteen 2-wire maintained or two-wire momentary inputs, or eight 3-wire momentary inputs for connection to external low voltage (24 VDC or below) switch contacts.

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- S. Control Module: A control module shall be provided where indicated.
  - 1. The control module shall provide time clock, communications, and programming functionality.
  - 2. Display control module shall have high-resolution graphics LCD display and keypad that will permit programming of the system, control override of the breaker status, and display diagnostic information at the front panel. Provide a display control module for each lighting control panelboard.
- T. RS-485 network option shall enable the panelboard lighting control system to connect with other control systems.
- U. User may set up, monitor, and control any panelboard connected to the network from a remote workstation.
- V. Network shall be configured to support all panelboards and personal computer workstations as required.
- W. LonWorks compliant network shall be required to provide interoperability between the lighting control panelboards such that inputs or switching events in one panel may be used to control the switching of breakers in another panel. This interoperability shall not be limited to panelboards, but shall extend to any LonWorks compliant device such as occupancy sensors or network switches.
- X. Furnish, install and connect remote control system components as required to interface the new remote control circuit breaker with the existing Square D Powerlink System presently in use in the building. Components shall include, but shall not be limited to:
  - 1. Square-D power interface modules for NEHB panelboards.
  - 2. P.C. workstation complete with software shall be provided and tested.

### **2.06 APPLIANCE PANELS**

- A. Appliance panels shall consist of an assembly of molded case circuit breakers installed in code gauge galvanized sheet steel cabinets, surface or flush mounted as indicated on the drawings.
- B. The panel sections shall be mounted away from the back of the cabinet trim and frames.

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1. The gutter space on sides, top and bottom shall be of sufficient size to prevent overcrowding of wires and cables, and overheating of the circuit breakers.
  2. Cabinets shall be complete with hinged doors with cylinder lock, directory frame and neatly typed directory charts.
  3. All panels shall be keyed alike.
  4. Provide an angle piece on the inside of the bottom of each trim for ease of installation.
  5. All panel shall contain a main circuit breaker.
- C. Main buswork shall be copper rated 1000 amperes per square inch, and shall, as a minimum, be designed to carry the full rating of the feeder breaker or switch supplying the panel without perceptible heating.
1. Branch circuit breakers shall be arranged so that each breaker is readily removable from the panel without disturbing adjacent breakers.
  2. Phase legs shall be alternately bussed to each circuit breaker in a manner to effect balancing the branch circuit connections as nearly as possible over each phase.
- D. Branch circuit breakers shall be molded case, bolt-on type, thermal magnetic trip, single, 2 or 3 pole as scheduled on the drawings.
1. Circuit breakers shall contain a visual trip indicator.
  2. Multiple pole breakers shall be single handle, common trip.
  3. Where breakers of larger capacity are required, they shall have circuit characteristics as shown on the drawings.
  4. Breakers for 120/208 volt service shall be rated 10,000 A.I.C. unless otherwise indicated.
- E. Appliance panels shall be Square D Type NQOD with type QOB circuit breakers.

### **PART 3 - EXECUTION**

Not Applicable

SECTION 16060 - DISTRIBUTION EQUIPMENT

**- End of Section -**