

## **Part 1 General**

### **1.1 RELATED REQUIREMENTS**

- .1 01 35 25 – Special Procedures on Lockout Requirements.
- .2 01 91 13 – General Commissioning (Cx) Requirements.
- .3 26 05 01 Common Work Results - For Electrical
- .4 26 05 20 Wire and Box Connectors (0-1000V)
- .5 26 05 21 Wires and Cables (0-1000V)
- .6 26 05 28 Grounding - Secondary
- .7 26 05 29 Hangers and Supports for Electrical Systems
- .8 26 05 31 Junction, Pull Boxes and Cabinets
- .9 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings
- .10 26 28 23 Disconnect Switches - Fused and Non-Fused
- .11 26 29 10 Motor Starters to 600V
- .12 26 05 44 Installation of Cables in Trenches and in Ducts
- .13 26 24 17 Panelboard Breaker type.

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (23<sup>rd</sup> Edition), Safety Standard for Electrical Installations.
  - .2 Abbreviations for electrical terms: to CSA Z85.
  - .3 CSA Electrical Bulletins in force at the time of tender submission, while not identified and specified by number in this division, are to be considered as forming part of the related CSA Part II standard and must be complied with.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### **1.3 CONTRACT DRAWINGS**

- .1 No omissions in the drawings or specifications are intended and the Contractor shall give due consideration to this matter. Any work or material referred to in the drawings and not in the specifications, or vice versa, shall be furnished and performed as though fully covered in both. This shall apply particularly to the drawings where descriptions are sufficiently detailed so as to require little or no

mention in the specifications. Items indicated on floor plans and not on riser diagrams, or vice versa, shall be considered fully covered by both.

- .2 Runs of conduit and outlet locations indicated on the drawings are diagrammatic and exact locations must be determined by the Contractor as the work proceeds, with due regard to the structure and the work of other trades. The Departmental Representative reserves the right to alter locations of conduit and outlets up to 3000 mm without extra cost, provided that the Contractor is advised prior to roughing in. The Contractor shall make any changes dictated by structural requirements, or conflicts with other trades, without charge.
- .3 Any error or omission shall be referred to the Departmental Representative whose decision shall be final.
- .4 Building dimensions shall not be scaled from the electrical drawings but shall be obtained from the site if Architectural and/or Structural drawings are not available. Any discrepancy between the drawings and the building shall be questioned before proceeding with the installation.

#### **1.4 WORK INCLUDED**

- .1 The specifications complement the drawings in describing the supply and installation of the complete electrical systems. The description of work shall include but not be limited to the following:
  - .1 The demolition and removal of electrical system and heat trace system as indicated on the drawing and in the specification.
  - .2 Provision of new electrical systems including power system and heat trace system as indicated on the drawing and in this specification.
  - .3 Provision of new heat trace system control equipment and upgrading and modifying existing heat trace control system to support the new addition.
  - .4 Provision of power supply and control to mechanical equipment as indicated on the drawing and in this specification.
  - .5 Commissioning of electrical systems and heat trace systems as per Section 01 91 13 requirements.
  - .6 Patching, painting, and furring as required.
  - .7 Tunnel below the Jetty is classified as a confined space area.
  - .8 Refer to Section 01 11 00 for additional requirements.

#### **1.5 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

#### **1.6 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Submit for review updated single line electrical diagrams, drawing 600 x 600 mm, minimum size, under Plexiglas and locate as indicated.
  - .1 In existing electrical room.
- .3 Shop drawings:
  - .1 The Contractor shall prepare shop drawings showing in detail the design and construction of all equipment, panels, cabinets, heat trace system, etc. Six (6) copies of all such drawings shall be submitted to the Departmental Representative for review, and the work shall not be executed until such review has been obtained.
  - .2 All shop drawings, other than standard manufacturers' dimensions and data sheets, shall bear the stamp of a registered professional Engineer who shall be fully responsible for the Engineering content of such drawings.
  - .3 Prior to submission the Contractor shall carefully check all shop drawings to ensure that they comply with the drawings and specifications in both intent and detail. No consideration will be given to shop drawings submitted without this approval and review from the Contractor. Appendix A at the end of this section must be completed and signed and must accompany all shop drawing submissions. Submissions not accompanied by Appendix A will be returned for re-submission.
  - .4 The Departmental Representative's review of these drawings is general and is not intended to serve as a check and shall not release the Contractor from responsibility for errors or from the necessity of checking the drawings himself, or of furnishing the materials and performing the work as required by the plans and specifications.
  - .5 High quality electronic "PDF" copies of shop drawings are acceptable.
- .4 Quality Control:
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
  - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

## 1.7 QUALITY ASSURANCE

- .1 Qualifications: electrical work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction as per the

conditions of Provincial Act respecting manpower vocational training and qualification.

- .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

## **1.8 SYSTEM STARTUP**

- .1 At the conclusion of the job, the Contractor shall review and demonstrate to the Departmental Representative, all electrical equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Departmental Representative. Such review and demonstration shall be made by an authorized representative of the Contractor, who shall be fully knowledgeable of the project, its installation and operation. Three bound maintenance and operational manuals shall be reviewed and left with the Departmental Representative. These manuals shall be custom written for materials and systems supplied for this project. Generic information may accompany the manuals but must only be supplemental information. These manuals shall include, but not be limited to, approved copies of all shop drawings, guarantees, manufacturers maintenance instructions, diagrams, and parts lists, all packaging and installation instructions, and all operating instructions. Where manufacturers' literature is not available, or appropriate, the Contractor shall provide same in written form. Refer also to Section 01 78 00. Prior to final inspection, submit these manuals to the Departmental Representative for review.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

## **1.9 MINIMUM STANDARDS**

- .1 All work shall be performed in accordance with Canadian Electrical Code, and National Building Code, as minimum standards. These standards together with all Local or Municipal Rules, Regulations, and Ordinances shall be considered as the Latest Approved Editions at the time of Tender Closing. In no instance, shall the standard established by the drawings and specifications, be reduced by any codes.

## **1.10 PERMITS, FEES AND INSPECTION**

- .1 The Contractor shall obtain all inspections and permits required by all laws, ordinances, rules, and regulations by public authority having jurisdiction in this district, and shall obtain certificates of such inspections and shall pay all charges in connection therewith. The final certificate of inspection shall be obtained before final payment for work shall be considered due.

- .2 In no instance shall the standard established by the drawings and specification be reduced by any codes, etc..

#### **1.11 SUPERVISION**

- .1 The Contractor shall provide supervision and sufficiently qualified foreman to ensure that the job proceeds in a proper and efficient manner. If in the opinion of the Departmental Representative, such personnel are not competent to carry out their work, the Contractor shall replace these men immediately upon written request of the Departmental Representative.

#### **1.12 OTHER TRADES**

- .1 The Contractor shall co-operate and investigate with other trades to make maximum use of the spaces and avoid conflict with pipes, ducts, equipment radiation, etc. Shop drawings shall be prepared by the Contractor indicating the route of main conduits and ducts which shall be submitted to the Departmental Representative for review.
- .2 The Contractor shall co-operate with other Contractors on the site and carry out the work, in such a way, as not to hinder or hold-up the work of other trades.
- .3 The Contractor shall consult with other Contractors, where their respective installations conflict and shall re-route conduits, ducts, outlets, equipments, etc., as required, subject to the approval of the Departmental Representative.
- .4 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

#### **1.13 GUARANTEE**

- .1 The Contractor shall guarantee all work, under this Division, free from defects, for a period of one (1) year, after final acceptance of the entire project. The Contractor shall make good all defects, other than normal wear and tear, during the life of the guarantee. Notwithstanding the above, longer guarantees may be required for specific installations or equipments, as indicated in other sections of the specifications.
- .2 Guarantees shall be submitted in writing, bound where more than one is required, and submitted to the Departmental Representative for review. Each guarantee shall include:
  - .1 Project name and address.
  - .2 Guarantee time period (commencement date shall be the date as shown on the project final certificate of completion, unless otherwise indicated).
  - .3 Clear and concise definition of what is guaranteed.
  - .4 Signatures of company officers of the Contractor and/or manufacturers, as applicable.

## **1.14 RECORD DRAWINGS**

- .1 One (1) set of white prints will be provided for record drawing purposes. Maintain project "as-built" record drawings and accurately record significant deviations from the Contract Documents, caused by site condition or Contract change. Mark changes on white prints in "RED".
- .2 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings.
- .3 Testing, balancing and adjusting to be performed using as-built drawings.
- .4 Turn over the as built drawings to the Departmental Representative at the completion of the project.

## **1.15 RENOVATION WORK**

- .1 Co-ordinate the removal or shutdown of existing services with the Departmental Representative. Indicate intent to remove, disconnect, or shutdown services in writing, and receive an affirmative written reply, prior to the start of such work.
- .2 Remove all equipment and services indicated on the drawings or made redundant by renovation. If doubt exists, with reference to the removal of same items, obtain clarification from the Departmental Representative before proceeding. All equipment removed shall be brought to the attention of the Departmental Representative, who shall take possession of such items. If the Departmental Representative deems such equipment redundant, the Contractor shall remove and dispose of such items at his own cost.
- .3 Maintain services to, and reconnect all equipment and apparatus to remain, should such services be disrupted during the renovation work.
- .4 Renovation must be accomplished with the facility in full operation. In the event that it is necessary to temporarily relocate existing equipment to accommodate the work, or allow it to proceed in an orderly fashion, temporary services must be provided as a part of the work.
- .5 Where circuitry to an existing panelboard has been changed, revise the existing directory accordingly. In the absence of a directory, provide one and detail the new and/or revised circuitry.

## **Part 2 Products**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Contract materials shall be new and C.S.A. approved for their specific use..
- .2 For the purposes of uniformity similar materials shall be of one manufacturer (i.e. all panels and switchgear; breakers, all motor control equipment; all light fixtures in as much as is possible; etc.)
- .3 To avoid the possibility of the work being delayed, the Contractor shall order all materials as soon as possible, and he shall report at once to the Departmental

Representative any delays in the delivery of materials which would hold up the completion of the job.

## **2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 All power and control wiring associated with the mechanical systems of this project shall be performed by the electrical contractor but only to the limits of what is actually shown on the electrical drawings.
- .3 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.
- .4 Prior to rough in of electrical services, co-ordinate location of all mechanical equipment with the mechanical contractor.

## **2.3 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

## **2.4 EQUIPMENT IDENTIFICATION**

- .1 All electrical equipment and heat trace equipment are to be provided with "Iamicaid" nameplates as further described herein. Care is to be taken to ensure that all plates are affixed true and level, and plumb in all instances.
- .2 Nameplates are to be affixed to all "metal" surfaces with steel type "pop-rivets".
- .3 Nameplates are to be affixed to other types of surfaces with contact type cement.
- .4 Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several locations or areas on same
- .5 Lamicoid nameplates installed on distribution panelboards, motor control centres, splitter troughs, transformers, etc. shall indicate the following:
  - .1 Designated name of equipment.
  - .2 Amperage of overcurrent protection device.
  - .3 Voltages, number of phases and wires.
  - .4 Designation of power source

- .1 Example:

<p><b>PANEL 101 – 150AMPS</b> <b>120/208V–3PH–4W</b> <b>FED FROM MAIN SWITCHBOARD</b></p>
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- .6 Lamicoid nameplates installed on combination starters, magnetic starters, manual starters, and all various system controls, control panels, disconnect switches, etc. shall contain the following information.

- .1 Designated name of equipment.
- .2 Designated name of power source.
- .3 Branch circuit breaker number(s) where possible.
- .4 Voltage(s).
- .1 Examples:

**EXHAUST FAN NO. 1  
PANEL H – 120V  
CCT. NO.17**

**SUPPLY FAN NO. 1  
M.C.C. NO.1  
600V–3PH**

- .7 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate maximum designated/designed fuse size.
- .8 Lamicoid nameplates are to be installed on all junction and/or pull boxes sized 150 mm x 150 mm and larger indicating name of system, designated panel name and electrical characteristics where applicable.
- .9 Lamicoid nameplates are to be installed adjacent to each overcurrent devices located in switchboards, CDP panels, etc.. They need only indicate designated name and/or number of equipment they feed. Unused O.C. devices are to be identified as spare(s).
- .10 Install an additional “lamicoid” nameplate on all, or any piece of electrical equipment, or apparatus (i.e.: main switchboard, CDP panels, panelboards, motor control centres, etc.) that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate interrupting capacity sized “larger” than 10 kAIC.
- .1 Example:

**Minimum interrupting capacity of  
breakers installed in this panel to be  
not less than 20 kAIC.**

**Minimum interrupting capacity of fuses  
installed in this MCC to be not  
less than 20 kAIC.**

- .11 Allow for an “average” of forty letters for each lamicoid nameplate.



- .1 Lamicoid 3 mm thick plastic engraving sheet, black letters, white face, for all electrical systems except fire alarm systems which shall have white letters on red face.
- .2 1.5 mm thick nameplates above receptacles as previously indicated, with top left and right corners to be rounded off.
- .3 Lettering on lamicoid nameplates shall not “start” or “end” nearer than 8 mm from either, or both ends of said plates. Size of lettering, including overall lengths of various plates shall be as indicated in the following chart.
- .4 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 mm x 50 mm	1 line	5 mm high letters
Size 2	13 mm x 75 mm	1 line	6 mm high letters
Size 3	16 mm x 75 mm	2 lines	5 mm high letters
Size 4	19 mm x 90 mm	1 line	10 mm high letters
Size 5	37½ mm x 90 mm	2 lines	13 mm high letters
Size 6	25 mm x 100 mm	1 line	13 mm high letters
Size 7	37½ mm x 100 mm	2 lines	6 mm high letters
Size 8	50 mm x 150 mm	2 lines	13 mm high letters

- .12 Labelling of all branch circuit phase and neutral conductors to be done on both ends of all circuit conductors plus in “all” junction and/or pull boxes located in between. Use write-on, self-laminating labels sized as necessary. To be installed in a “flagged” manner around individual conductor(s).
- .13 Coverplates for junction and/or pull boxes located above finish ceilings or located into the tunnel space and housing branch circuits are to have each branch circuit number neatly identified on coverplate. Felt marker-pen may be used for this purpose.
- .14 All of the following conductors are to have their insulation colours identified as indicated:

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White/Grey
Bond	Green
Ground	Green
Isolated Ground	Green c/w Yellow Strip

- .1 Colour code conductor insulation and others as per the following:
  - .1 All sizes of phase conductors up to and including #2 AWG.
  - .2 All sizes of neutral, bond and/or ground conductors, up to and including #3/0 AWG.

- .2 Approved coloured tapes in lieu of insulation colouring may be used to identify conductors that exceed sizes as indicated in items .14.1.1 and .14.1.2 above, and is to take place on both ends of runs for a minimum of 300 mm from where terminations take place.
- .15 Some examples of electrical apparatus that could have (identical types) of removable covers, and will require to have their lamicoid nameplates installed on wall(s) adjacent to control, rather than directly to their covers are the following.
  - .1 Magnetic starters.
  - .2 Manual TOL switches
  - .3 Magnetic contactors.
  - .4 Relays.
- .16 All various pieces of mechanical equipment are to be identified with identical information as indicated on electrical equipment nameplate feeding same mechanical equipment.
- .17 Both plates are to be supplied and installed by the electrical contractor in the absence of any mechanical trade identification.
- .18 Bonding conductors require labelling on both ends of runs where they are "dedicated" solely to the designated branch circuit they accompany. Identify with same number(s) being used to identify accompanying branch circuit phase and neutral conductor.
- .19 All junction and/or pull boxes, conduit fittings (and covers), etc., complete with their respective coverplates are to be colour coded as per the following. Boxes are to be coloured both inside and outside, where "one" colour only is required. Boxes are to be coloured on inside only where "two" colours are required. Metal coverplates are to have both colours applied diagonally where "two" colours are required. Complete plate is to be painted where one colour only is required.
- .20 Schedules shall be installed on the back of each door for panels, neatly arranged and mounted in frame under transparent cover. Schedules shall show system voltage, which outlets are on each circuit and any special information necessary. Schedules shall be typewritten and of a permanent nature.

## **2.5 WIRING IDENTIFICATION**

- .1 Identify wiring on both ends of phase conductors of feeders and branch circuit wiring by circuit number at all panelboards, pull and junction boxes, outlet and equipment connections, and all devices. Labels shall be Panduit PLD-1 or PLD-2 as required. Labels to be installed in such a manner as to present white area with information in "flagged" position. Wrap around conductor in "U" fashion and have it adhere to itself. Identify neutrals and bond wires indicating which circuits with which they are used.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

- .4 The individual conductors and conductor pairs used in the various communications cables shall be colour coded. Maintain the colour coding scheme for each system throughout.

## **2.6 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green

## **2.7 SPRINKLER PROTECTION**

- .1 All equipment such as panelboards, heat trace controller, control cabinets, etc., installed in areas equipped with sprinkler protection, shall be fitted with sprinkler hoods and shall comply with the intent of C.E.C. Sections 26-008 and Appendix B-26-008.

## **2.8 HOUSEKEEPING PADS**

- .1 Supply and install concrete housekeeping pads for all free standing, floor mounted, electrical equipment. Housekeeping pads to be 100mm thick, complete with 10M dowels at 457mm c/c around the perimeter, drilled and grouted into the existing slab (minimum embedment 100 mm. Concrete to be 211kg/cm<sup>2</sup> in accordance with CAN3-A23.1-M90. Reinforce with one layer 6 x 6 4/4 WWF. Pads to be nominally 150mm larger in all dimensions than the equipment being supported, and have chamfered edges.

# **Part 3 Execution**

## **3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

## **3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

## **3.3 MOTOR AND EQUIPMENT CONNECTIONS**

- .1 Provide final connections to all motors, equipments, controls, etc. indicated on the drawing. These motors, equipment, controls, etc. shall include those supplied under other sections of this specification, as well as Owner supplied items. Ensure that equipment will operate properly (e.g. proper rotation) and report any instance of defective equipment to the Departmental Representative.

### **3.4 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### **3.5 CUTTING AND PATCHING**

- .1 Cutting and patching shall be the responsibility of this Contractor and shall be performed by a skilled tradesperson.
- .2 Make every effort to minimize cutting and patching by providing dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and mark openings in concrete forms and masonry before placing concrete and masonry.

### **3.6 FIELD QUALITY CONTROL**

- .1 Conduct following tests:
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
- .2 Check resistance to ground before energizing.
- .3 Test all wiring included in the Contract, to ensure there are no shorts or grounded conductors and that insulation values are as required by the Canadian Electrical Code
- .4 The Departmental Representative reserves the right to use any piece of electrical equipment, device, or material installed under this Contract for such reasonable lengths of time and at such times as he may require to make a complete and thorough test of the same, before the final completion and acceptance of the work
- .5 The following wiring methods detailed below are designed to enhance the ability to perform capacitive leakage tests; these methods are to be strictly followed and tests performed under this Contract
  - .1 All circuit conductors are to be individually tie wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality
  - .2 The main switchboard, CDP's, panelboards, MCC's, etc. are to have their respective feeder phase and neutral conductors tie wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.

- .3 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are not ground shorts, and capacitive leakage in the system is within acceptable limits
- .4 All feeders or branch circuits, which do not have neutral conductors, are to have their respective phase conductors tie wrapped together in accordance with the methods described previously.
- .6 Submit properly prepared and bound reports of all tests indicating:
  - .1 The date and time of the test.
  - .2 The name or names of those who conducted the test.
  - .3 The purpose of the test.
  - .4 The results of the test.
  - .5 Any applicable code limits or bounds.
- .7 Such tests shall not be construed as evidence of acceptance of any part of the Contract, and it is agreed and understood that no claim for damage will be made for any injury or breakage to any part or parts of the above, due to the aforementioned tests, where caused by weakness or inaccuracy of parts, or by defective materials or workmanship of any kind whatsoever.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .9 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.7 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .3 On completion of this project, the Contractor shall remove all debris and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted, cleaned, repainted where necessary, and left in first class condition.

**END OF SECTION**

**APPENDIX A**

**ONSA Job Number: 15-238**

Shop Drawing Submittal Form

General Contractor:	
Phone Number:	Fax No:
Electrical Contractor:	
Phone Number:	Fax No:
Electrical Contractor Project Representative:	
Phone Number:	Fax No:
Shop Drawing Items:	
Number of Shop Drawing Copies:	
Supplier of Shop Drawings:	
Manufacturer of Shop Drawings:	
Specification Section and Items:	
Drawing Reference:	

<p><b><i>Specified Options Indicated</i></b>    <input type="checkbox"/> <b><i>Yes</i></b>    <input type="checkbox"/> <b><i>No</i></b></p> <p><b><i>Items are in Conformance with Plans and Specifications Confirmed by Contractor.</i></b></p> <p><b><i>(If No, explain):</i></b></p> <p><b><i>Contractor's Signature:</i></b></p> <p><b><i>Date:</i></b></p>
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