

ELECTRICAL GENERAL NOTES

1 CONDUIT, WIRE AND EQUIPMENT SIZES AND LOCATIONS SHOWN ARE FOR BID BASIS ONLY AND SHALL BE VERIFIED BY THE CONTRACTOR BEFORE CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE ALL WORK WITH APPROVED SHOP DRAWINGS, WITH THE REQUIREMENTS OF EQUIPMENT PROVIDED, WITH EQUIPMENT FURNISHED BY OWNER FOR INSTALLATION BY CONTRACTOR AND WITH REQUIREMENTS OF OTHER DIVISIONS OF THE CONTRACT AS NECESSARY TO PROVIDE COMPLETE AND WORKING SYSTEMS COMPLYING WITH THE CONTRACT DOCUMENTS. ALL PROPOSED DEVIATIONS FROM CONTRACT DOCUMENTS SHALL BE SUBMITTED AND APPROVED BEFORE EXECUTION OF THE AFFECTED WORK.

2 THE TERMS RACEWAY AND CONDUIT ARE USED IN THESE DOCUMENTS TO DENOTE NOT ONLY THE RACEWAY OR CONDUIT ITSELF BUT ALSO ALL JUNCTION BOXES, PULL BOXES, CONDUITS, FITTINGS, CLAMPS, SUPPORTS AND ALL OTHER ITEMS NECESSARY FOR A COMPLETE AND WORKING SYSTEM COMPLYING WITH THE CONTRACT DOCUMENTS.

3 NOTES INDICATED AS "REF", "REFERENCE" OR "REFER TO" ARE PROVIDED TO ASSIST IN LOCATING RELATED CONTRACTUAL REQUIREMENTS BUT ARE NOT CONTRACTUAL INSTRUCTIONS THEMSELVES. MISSING, INCORRECT OR INCOMPLETE REFERENCES SHALL HAVE NO EFFECT ON THE REQUIREMENTS OF THE CONTRACT.

4 AT ITEMS MARKED MSC (MANUFACTURER SUPPLIED OR SPECIFIED CABLE) CONTRACTOR SHALL DETERMINE REQUIREMENTS FOR, AND PROVIDE, CONDUIT AND CABLE AS REQUIRED BY MANUFACTURER AND IN COMPLIANCE WITH CONTRACT DOCUMENTS.

5 EXCEPT AS NOTED BELOW, ALL WIRE AND CABLE, INCLUDING FIBER OPTIC, SHALL BE INSTALLED IN RACEWAY. EXCEPTIONS ARE EQUIPMENT CABLES PROVIDED BY EQUIPMENT MANUFACTURERS AND UL LISTED FOR INSTALLATION OUTSIDE OF CONDUIT, INCLUDING FLOAT SWITCH AND SUBMERSIBLE PUMP CABLES.

6 SPARE RUNS OF CONDUCTORS SHALL BE INSULATED / TERMINATED AND LABELED AT BOTH ENDS. SPARE RUNS OF FIBER OPTIC STRANDS SHALL BE LABELED AND TERMINATED AT BOTH ENDS. ALL CONDUCTORS AND FIBERS SHALL BE TESTED AFTER INSTALLATION AND TEST REPORTS SHALL BE SUBMITTED. REPLACE ALL DEFECTIVE MATERIAL; DO NOT SUBMIT TEST REPORTS SHOWING DEFECTS.

7 LOCATIONS AND ELEVATIONS OF ELECTRICAL CONNECTIONS, MOTORS, PANEL BOARDS, SWITCH GEAR, TRANSFORMERS, CONTROL CABINETS AND OTHER ITEMS SHOWN ON DOCUMENTS ARE APPROXIMATE ONLY UNLESS DIMENSIONED. COORDINATE EXACT LOCATIONS AND ELEVATIONS WITH REQUIREMENTS OF OTHER DIVISIONS OF THESE DOCUMENTS. IN AREAS WHERE SPACE AVAILABLE IS LIMITED, PREPARE DIMENSIONED DRAWINGS SHOWING EXACT PROPOSED LOCATIONS OF EQUIPMENT AND VERIFYING THAT EQUIPMENT PROPOSED FOR USE CAN BE INSTALLED AS SHOWN ON PLANS IN COMPLIANCE WITH NEC AND MANUFACTURER'S REQUIREMENTS. BASE THESE DRAWINGS ON DIMENSIONS OF EQUIPMENT TO BE INSTALLED UNDER THIS CONTRACT WHICH ARE KNOWN TO CONTRACTOR TO BE CORRECT AND NOT SUBJECT TO CHANGE. NOTE DEVIATIONS FROM BID BASIS DRAWINGS AND DISCUSS WITH ENGINEER. SUBMIT THESE DRAWINGS AND RECEIVE APPROVAL BEFORE EXECUTING THE WORK. DO NOT SUBMIT SHOP DRAWINGS FOR EQUIPMENT WHICH IS NOT ACCOMPANIED BY DRAWINGS VERIFYING COMPLIANCE WITH CONTRACT REQUIREMENTS.

8 CONTROL (LADDER LOGIC) DIAGRAMS DEPICT FUNCTIONS REQUIRED, MAJOR COMPONENTS AND THEIR INTERCONNECTIONS, BUT ARE NOT INTENDED TO BE COMPLETE WIRING DIAGRAMS. CONTRACTOR SHALL COORDINATE WITH MANUFACTURERS OF EQUIPMENT PROVIDED TO ENSURE THAT ALL MATERIALS AND LABOR ARE PROVIDED WHICH ARE NECESSARY TO SECURE COMPLETE AND WORKING SYSTEMS WITH ALL FUNCTIONS AND COMPONENTS SHOWN ON THE CONTRACT DOCUMENTS, INCLUDING THIS DIVISION CONTRACT AND INSTRUMENTATION AND CONTROL DOCUMENTS.

9 PROVIDE DISCONNECT SWITCHES WHERE SHOWN, WITH THE SAME NUMBER OF POLES AS THEIR SOURCE CIRCUIT BREAKERS, AND WITH VOLTAGE AND CURRENT RATINGS EQUAL TO OR GREATER THAN THAT OF THE SOURCE CIRCUIT BREAKER'S.

10 THE REQUIREMENTS FOR DISCONNECT SWITCHES SHOWN MAY BE MET BY DISCONNECT SWITCHES PROVIDED BY EQUIPMENT MANUFACTURERS, WHERE ALL REQUIREMENTS OF THE NEC AND THESE DOCUMENTS ARE MET BY THOSE SWITCHES.

11 INSTALL GROUND RINGS AS NEC-250.52(A)(4) GROUNDING ELECTRODE SYSTEMS AROUND ALL OBJECTS PROVIDED AT OR ABOVE FINISHED GRADE BY THIS PROJECT OR INDICATED ON THE DRAWINGS, EXCEPT AS NOTED BELOW FOR LIGHT POLES, HANDHOLES AND MANHOLES. GROUND RING AND ITS RADIAL CONDUCTORS SHALL BE #2/0 OR LARGER TINNED BARE COPPER CONDUCTOR WITH GROUND RODS AT ALL CORNERS AND AT INTERVALS BETWEEN CORNERS NOT EXCEEDING FIFTY FEET. INSTALL GROUND RING AND GROUND CONDUCTORS NOT LESS THAN 30 INCHES BELOW FINISHED GRADE WITH 6 INCH RED, DETECTABLE, ELECTRICAL WARNING TAPE DIRECTLY ABOVE CONDUCTOR AND 12 INCHES BELOW FINISHED GRADE. MAINTAIN SIX FEET MINIMUM CLEARANCE TO ALL OBJECTS AT OR ABOVE FINISHED GRADE EXCEPT AS NOTED AND FROM LIGHTNING PROTECTION GROUNDING ELECTRODE SYSTEM PER NEC-250.53-(B). PROVIDE NOT LESS THAN ONE GROUND ROD TEST WELLS IN EACH GROUND RING, AT DIAGONALLY OPPOSITE GROUND RODS. WELLS SHALL BE CHRISTY NO. G-5, LIGHTNING AND GROUNDING SYSTEMS I-R SERIES OR ENGINEER APPROVED EQUAL. CAD WELD GROUND RING AND RADIAL GROUND CONDUCTORS TO ALL BURIED GROUND RODS EXCEPT PROVIDE CLAMPS WHERE SHOWN AND AT TEST WELLS. CONNECT RADIAL GROUND CABLES TO STEEL REINFORCEMENT MEMBERS IN CONCRETE AND OTHER STRUCTURAL ELEMENTS AT ALL CORNERS AND AT INTERVALS ON STRAIGHT SECTIONS NOT EXCEEDING FIFTY FEET. WHERE A LIGHTNING PROTECTION SYSTEM IS PROVIDED OR PRESENT, CONNECT ALL DOWN CONDUCTOR GROUNDING ELECTRODES (NFPA-780-4.13.1.1) TO THE NEC GROUNDING ELECTRODE SYSTEM PER NFPA-780-4.14.1 AND NEC-250.106. PROVIDE GROUND ROD INSTEAD OF GROUND RING AT ALL POLE MOUNTED LIGHTING FIXTURES. PROVIDE GROUNDING SYSTEMS DESCRIBED ELSEWHERE IN DOCUMENTS FOR MANHOLE AND HANDHOLE INSTEAD OF GROUND RINGS. THE TERM CAD WELD IS USED TO DENOTE EXOTHERMIC WELDS.

12 RAILING, LADDER, STEPS, GRATINGS, FRAMING, ANTENNAS, ENCLOSURES OF ELECTRICAL, PROCESS OR CONTROL EQUIPMENT OPERATING ABOVE 150 VOLTS TO GROUND OR OTHER CONDUCTIVE ITEMS INSTALLED, OUTDOORS, WHICH ARE NORMALLY NOT ENERGIZED SHALL BE BONDED TOGETHER TO THE OUTDOOR FACILITY GROUND RING WITH #2/0 MINIMUM TINNED BARE COPPER CONDUCTOR, USING UL LISTED CLAMPS ABOVE GRADE AND CAD WELDS BELOW GRADE. ITEMS SUCH AS STAIRS OR RAILINGS WHICH ARE INSTALLED AS MULTIPLE SECTIONS SHALL BE BONDED TOGETHER WITH TINNED #2/0 COPPER CONDUCTOR OR EQUIVALENT TINNED BRAIDED COPPER STRAP. ALL ITEMS SHALL HAVE TWO GROUND CONNECTIONS WITH DIFFERENT TERMINATION POINTS TO AVOID ISOLATION FROM A GROUND SYSTEM OF ANY ITEM DUE TO DISCONNECTION OF A SINGLE GROUND CONNECTION. CONDUCTIVE ENCLOSURES AND OTHER EXTERIOR METAL COMPONENTS WHICH ARE NOT NORMALLY ENERGIZED, OF INSTRUMENTS AND CONTROLS OPERATING AT OR BELOW 150 VOLTS TO GROUND, SHALL BE CONNECTED TO GROUNDING SYSTEM WITH TWO #6 AWG OR LARGER TINNED COPPER OR GREEN INSULATED GROUNDING CONDUCTORS.

13 PROVIDE SURGE SUPPRESSORS ON BOTH ENDS OF ALL LOW VOLTAGE (600 VOLTS OR LESS) BRANCH CIRCUITS, FEEDERS, INSTRUMENTATION AND CONTROL CIRCUITS WHICH ARE NOT ENTIRELY WITHIN A BUILDING PROTECTED BY A LIGHTNING PROTECTION SYSTEM OR ENTIRELY UNDER ITS SLAB.

14 PROVIDE #10 WIRE INSTEAD OF #12 WIRE FOR ALL 20 AMPERE 120 VOLT OR 208 VOLT CIRCUITS EXCEEDING 150 FEET CONDUIT LENGTH.

15 WHERE THE NUMBER OR SIZE OF CONDUCTORS SHOWN TO BE CONNECTED ARE IN EXCESS OF THE CAPACITY OF THE STANDARD TERMINALS OF THE CONNECTED EQUIPMENT, PROVIDE ADDITIONAL TERMINALS, ENCLOSURES, JUNCTION BOXES, PULL SECTIONS, WIRES, CONDUITS AND ALL OTHER MATERIALS AND LABOR AS NECESSARY TO MAKE THE CONNECTIONS SHOWN IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.

16 ALL MATERIALS AND EQUIPMENT PROPOSED FOR USE SHALL BE NEW, UNUSED, FREE OF DAMAGE OR DETERIORATION, FULLY RATED AS SPECIFIED AND SCHEDULED IN THE CONTRACT DOCUMENTS AT THE PROJECT ALTITUDE AND MAXIMUM AMBIENT TEMPERATURE.

17 PROVIDE ARC FLASH WARNING AND OTHER SIGNS ON ALL PANELBOARDS, MOTOR CONTROL CENTERS, MOTOR CONTROLLERS, CONTROL PANELS, SWITCHBOARDS AND OTHER EQUIPMENT REQUIRED BY NEC INCLUDING BUT NOT LIMITED TO PARAGRAPH 110.16 FLASH PROTECTION.

18 COORDINATE SIZE AND INSTALLATION OF ALL EQUIPMENT WITH EXISTING CONDITIONS AND WORK IN OTHER DIVISIONS OF CONTRACT TO ENSURE COMPLIANCE WITH THE NEC, INCLUDING BUT NOT LIMITED TO PARAGRAPH 110.26 SPACES ABOUT ELECTRICAL EQUIPMENT.

19 STANDARD DETAILS INCLUDED IN THESE DOCUMENTS SHALL BE USED WHERE APPLICABLE WHETHER SPECIFICALLY CALLED OUT ON THE PLANS OR NOT. PRACTICES CUSTOMARY TO THE TRADE MAY BE USED ONLY WHERE NO APPLICABLE STANDARD DETAIL CAN BE FOUND IN THESE DOCUMENTS AND WHERE THE CUSTOMARY PRACTICE WILL RESULT IN A COMPLETE AND WORKING SYSTEM IN COMPLIANCE WITH THESE DOCUMENTS.

20 ALL TERMINATIONS OF RIGID CONDUIT IN WALLS OF ENCLOSURES WITHOUT CAST-IN-PLACE THREADED CONDUIT BOSSES, AND WHICH ARE LOCATED OUTDOORS OR IN WET OR DAMP LOCATIONS, SHALL BE MADE USING STAINLESS STEEL MYERS HUBS.

21 REFER TO DOCUMENTS OF OTHER DIVISIONS OF CONTRACT, INCLUDING BUT NOT LIMITED TO PROCESS MECHANICAL AND HVAC, FOR LOCATIONS OF PROCESS, INSTRUMENTATION, CONTROL, HVAC AND OTHER EQUIPMENT REQUIRING ELECTRICAL, FIBER OPTIC OR RACEWAY-ONLY CONNECTIONS TO BE PROVIDED UNDER THIS DIVISION OF CONTRACT. ALL EQUIPMENT LOCATIONS SHOWN ON DRAWINGS IN THIS DIVISION ARE APPROXIMATE ONLY UNLESS DIMENSIONED.

22 PROVIDE ADDITIONAL RACEWAY, WIRING AND CONNECTIONS AS NECESSARY FOR MOTOR TEMPERATURE PROTECTIVE DEVICES AND OTHER MOTOR AUXILIARIES WHERE RECOMMENDED BY EQUIPMENT MANUFACTURERS, SHOWN IN CONTROL DIAGRAMS OR ON PLANS OR REQUIRED IN SPECIFICATIONS.

23 ALL SHEET METAL JUNCTION BOXES, TERMINAL JUNCTION BOXES, CONTROL PANELS AND OTHER SHEET METAL ELECTRICAL ENCLOSURES SHALL BE NEMA 4-X STAINLESS STEEL WHERE SHOWN WITH FAST OPERATING CLAMP ASSEMBLIES. PROVIDE HOFFMAN SUFFIX TYPE S5LP WITH AFC412SS CLAMPS OR APPROVED EQUALS. PROVIDE TERMINAL JUNCTION BOXES AND CONTROL PANELS WITH REMOVABLE INTERIOR STEEL PANELS FACTORY PAINTED WHITE.

24 ALL FABRICATED ASSEMBLIES SUPPORTING ELECTRICAL EQUIPMENT PROVIDED UNDER THIS DIVISION OF CONTRACT SHALL BE UL LISTED INDIVIDUALLY, UL LISTED AS PART OF AN ASSEMBLY OR SHALL BE FABRICATED TO A DESIGN PREPARED BY A STRUCTURAL ENGINEER LICENSED TO PRACTICE IN THE STATE OR OTHERWISE PERMITTED TO PRACTICE ENGINEERING IN THE STATE. WHERE DETAILS IN THIS DIVISION OF THE CONTRACT DOCUMENTS CONTAIN SPECIFIC DIMENSIONS, SIZES, WELD INSTRUCTIONS OR SIMILAR INFORMATION RELATED TO THE STRENGTH OF THE ASSEMBLY, THESE SHALL BE INTERPRETED AS BID-BASIS REQUIREMENTS ONLY AND SHALL BE SUPERCEDED BY THE UL OR ENGINEERING DESIGN REQUIREMENTS ABOVE.

25 AT ALL LOCATIONS WHERE CONTRACTOR IS DIRECTED TO CUT OFF CONDUITS THROUGH CONCRETE SLAB AND GROUT CLOSED, CONTRACTOR SHALL FIRST DRILL 1-1/2 INCHES DEEP INTO CONCRETE AND USE NON-SHRINK GROUT TO BACKFILL HOLE FLUSH AND SMOOTH WITH EXISTING CONCRETE SURFACE.

26 COORDINATE EARTH WORK AND INSTALLATION OF ELECTRICAL ITEMS WITH INTERFERENCES SHOWN ON DOCUMENTS OF ALL DIVISIONS OF CONTRACT, INCLUDING CIVIL AND YARD PIPING. REPORT ALL DAMAGE AT ONCE TO OWNER AND ENGINEER AND REPAIR AS DIRECTED AT NO CHANGE IN CONTRACT.

27 LOOP ALL FIBER OPTIC AND ELECTRICAL CABLES AT LEAST 360 DEGREES AROUND EVERY HANDHOLE OR MANHOLE.

28 ALL CONDUCTORS INSTALLED OUTDOORS OR UNDERGROUND, INCLUDING IN DUCT BANK, CONDUIT OR DIRECT BURIED OR IN HANDHOLES OR MANHOLES SHALL BE TRAY RATED CABLE TYPE TC UL LISTED FOR CONTINUOUS SUBMERSION. CABLE SHALL NOT BE SPLICED OR JOINED AND SHALL BE CONTINUOUS BETWEEN SOURCE AND LOAD TERMINATIONS. CONTRACTOR SHALL PROVIDE LARGER CONDUIT IF NECESSARY TO MEET NEC FILL LIMITS FOR CABLE.

29 PROVIDE FOUR INCH THICK STEEL-REINFORCED CONCRETE HOUSEKEEPING PAD UNDER ALL FLOOR MOUNTED EQUIPMENT PROVIDED OR INSTALLED UNDER THIS CONTRACT. PAD SHALL HAVE SMOOTH FINISH AND 3/4 INCH BEVEL ON ALL EDGES. COMPLY WITH STRUCTURAL AND CIVIL DIVISIONS OF CONTRACT FOR REINFORCEMENT, CONCRETE AND OTHER ITEMS COVERED BY THOSE DIVISIONS.

30 PROVIDE RACKS AND SUPPORT ARMS ON WALLS OF ALL HANDHOLES. ROUTE CABLES ON, AND SECURED TO, THESE SUPPORTS. CABLES SHALL NOT BE ROUTED DIRECTLY FROM ONE DUCT TO ANOTHER WITHOUT ATTACHMENT TO SUPPORT ARMS UNLESS NOTED ON DRAWINGS OR ENGINEER HAS ISSUED WRITTEN PERMISSION TO DO SO IN RESPONSE TO AN RFI.

31 WHERE UL LISTED AND LABELED MATERIAL OR EQUIPMENT IS REQUIRED BUT IS NOT AVAILABLE FROM A MANUFACTURER NAMED IN THE APPLICABLE SPECIFICATION SECTION OR ON THE DRAWINGS, LISTING AND LABELING BY CSA, ETL OR FM WILL BE ACCEPTABLE UNDER THIS CONTRACT IF ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION (AHJ). IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ACCEPTANCE BY THE AHJ; MATERIAL AND EQUIPMENT WHICH IS UNACCEPTABLE OR OTHERWISE NOT IN COMPLIANCE WITH THE CONTRACT SHALL BE REPLACED AT NO CHANGE IN CONTRACT.

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ch2m		ELECTRICAL LEGEND SHEET 2		GENERAL	
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BID DOCUMENTS