ELECTRICAL SPECIFICATIONS

I GENERAL CONDITIONS

A. THE SCOPE OF THE WORK SHALL INCLUDE THE FURNISHING AND INSTALLATION OF THE NECESSARY MATERIAL AND LABOR TO ACCOMPLISH THE WORK INDICATED BY THE DRAWINGS AND HEREIN SPECIFIED. ALL WORK BY THIS CONTRACTOR SHALL CONFORM TO ALL APPLICABLE FEDERAL, STATE AND LOCAL BUILDING CODES.

B. THE CONTRACT DOCUMENTS DO NOT PROPOSE TO SHOW ALL EXISTING SYSTEMS, EQUIPMENT OR MATERIAL. CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING THE EXISTING CONDITIONS AT THE JOB SITE BEFORE SUBMITTING PROPOSALS. SUBMISSION OF PROPOSALS SHALL BE TAKEN AS EVIDENCE THAT SUCH INSPECTION HAS TAKEN PLACE. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE COMPLETE SET OF CONSTRUCTION DOCUMENTS, AND THE LACK OF SPECIFIC INFORMATION ON THE DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY.

C. MATERIALS AND EQUIPMENT FURNISHED UNDER THIS CONTRACT SHALL BE NEW AND SHALL BEAR THE U.L. LABEL WHERE APPLICABLE, UNLESS NOTED OTHERWISE. ALL WORK SHALL BE GUARANTEED AGAINST DEFECTIVE MATERIALS AND WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR AFTER COMPLETION AND ACCEPTANCE BY THE OWNER.

D. CONTRACTOR SHALL INSTALL ELECTRICAL SYSTEMS WITHOUT INTERFERENCE AND IN STRICT COORDINATION WITH OTHER TRADES.

E. MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE CONTRACT DOCUMENTS AND APPLICABLE CODES AND STANDARDS. IN CASE OF DIFFERENCE BETWEEN APPLICABLE CODES AND STANDARDS AND THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF SUCH DIFFERENCE. SHOULD THE CONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH THE REQUIREMENTS OF APPLICABLE CODES AND STANDARDS, HE SHALL BEAR ALL COSTS ARISING IN CORRECTING SUCH DEFECTS. APPLICABLE CODES AND STANDARDS SHALL INCLUDE ALL ORDINANCES, UTILITY COMPANY REGULATIONS, AND APPLICABLE REQUIREMENTS OF NATIONALLY ACCEPTED CODES AND STANDARDS. SHOULD THE CONTRACTOR SUPPLY EQUIPMENT DIFFERING FROM THE SPECIFIED ITEMS IN THE CONTRACT DOCUMENTS WITHOUT NOTIFICATION TO THE ENGINEER, HE SHALL BEAR ALL COSTS TO UPGRADE DEFICIENCIES ARISING FROM SUCH.

F. WHERE ONLY ONE MANUFACTURER'S NAME IS LISTED IN THE EQUIPMENT SPECIFICATION, OTHER MANUFACTURERS OF SIMILAR CHARACTERISTICS AND OF EQUAL OR BETTER PERFORMANCE CAPACITIES MAY BE CONSIDERED FOR "OR EQUAL" ACCEPTANCE BY THE ENGINEER. SUBSTITUTION REQUESTS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL. WHERE MORE THAN ONE MANUFACTURER IS LISTED IN THE NOTES AND EQUIPMENT SPECIFICATIONS, ONLY THOSE NAMED MANUFACTURERS WILL BE CONSIDERED FOR ACCEPTANCE. SHOULD A SUBSTITUTION BE ACCEPTED, AND SHOULD THE SUBSTITUTE MATERIAL PROVE DEFECTIVE, OR OTHERWISE UNSATISFACTORY FOR THE SERVICE INTENDED WITHIN THE GUARANTEE PERIOD, THIS MATERIAL OR EQUIPMENT SHALL BE REPLACED WITH THE MATERIAL OR EQUIPMENT SPECIFIED AT NO COST TO THE OWNER.

G. PROVIDE ACCESS, INCLUDING NECESSARY ACCESS DOORS, FOR NEW AND EXISTING EQUIPMENT REQUIRING OPERATION AND/OR MAINTENANCE. RELOCATE EXISTING AND LOCATE ALL NEW EQUIPMENT SUCH THAT OPERATION OR MAINTENANCE IS NOT RESTRICTED.

H. INSTALL EQUIPMENT WITH WORKING CLEARANCES COMPLYING WITH NEC 110-16 AND 110-34.

II PRODUCTS

A. CONDUIT

1. ELECTRIC METALLIC TUBING (EMT): OF HIGH GRADE STEEL MANUFACTURED SPECIFICALLY TO STANDARDS ASSURING MAXIMUM WELDING CHARACTERISTICS AND DUCTILITY, AND SHALL CONFORM TO FED. SPEC. WW-T-806b.

2. FLEXIBLE METAL CONDUIT: MANUFACTURED OF MILD STEEL STRIP MATERIAL HAVING A HOT-DIP GALVANIZED COATING AND MEETING REQUIREMENTS OF FED. SPEC. WW-C-566b.

B. COUPLINGS AND TERMINATORS

1. FOR ELECTRICAL METALLIC TUBING: STEEL SET SCREW COUPLINGS; STEEL SET SCREW BOX CONNECTORS WITH NYLON INSULATED THROAT AND LOCKNUTS AT ALL BOXES AND CABINET TERMINATIONS OR NON-INSULATED BOX CONNECTOR, LOCKNUT AND NYLON-INSULATED GROUNDING BUSHING ON ALL TUBING WHERE GROUNDING BUSHINGS ARE REQUIRED.

2. FOR FLEXIBLE METAL CONDUIT: COUPLINGS AT CONNECTIONS BETWEEN FLEXIBLE CONDUIT AND EMT, AND NYLON INSULATED THROAT STEEL CONNECTORS AT BOX OR CABINET TERMINATIONS.

C. JUNCTION AND PULL BOXES

1. SIZE BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEC. BOXES SHALL BE NO SMALLER THAN 4 INCHES SQUARE BY 1-1/2 INCHES DEEP WITH COVERS ACCESSIBLE AT ALL TIMES. SET BOXES ON CONCEALED CONDUITS WITH COVERS FLUSH WITH THE FINISHED WALL OR CEILING LINE. PROVIDE JUNCTION AND PULL BOXES OF APPROPRIATE DIMENSIONS FOR CONDUITS AND CONDUCTORS NOTED, WHERE SHOWN AND WHERE NECESSARY FOR THE INSTALLATION AND PULLING OF CABLES AND WIRES. INSTALL COVERS ON JUNCTION BOXES AND CONDUITS AFTER WIRING AND CONNECTIONS ARE COMPLETED.

D. PULL CORDS

1. PROVIDE A NYLON POLYETHYLENE CORD, WITH A TENSILE STRENGTH OF NOT LESS THAN 200 POUNDS, IN EACH EMPTY CONDUIT TO FACILITATE THE FUTURE INSTALLATION OF CONDUCTORS. INCORPORATE PLASTIC TAGS FOR IDENTIFICATION.

E. CONDUCTORS

1. CONDUCTORS SHALL BE 98% CONDUCTIVITY SOFT DRAWN ANNEALED COPPER, 600 VOLT, THHN/THWN INSULATION, #10 AND SMALLER - SOLID, #8 AND LARGER - STRANDED.

2. NO CONDUCTORS SHALL BE SMALLER THAN NO. 12, EXCEPT FOR SIGNAL OR CONTROL CIRCUITS AND FOR INDIVIDUAL LIGHTING FIXTURE TAPS AS PERMITTED BY NEC.

F. WIRING DEVICES, COVER PLATES AND ACCESSORIES

1. PROVIDE WIRING DEVICES AND ASSOCIATED ACCESSORIES OF SPECIFICATION GRADE. DEVICES OF LEVITON, HUBBELL OR PASS & SEYMORE ARE ACCEPTABLE. SUBMIT FOR REVIEW A COMPLETE LIST OF ANY SUBSTITUTES OFFERED FROM THOSE SPECIFIED.

2. COLOR OF WALL SWITCHES, RECEPTACLES AND FACEPLATES: AS SPECIFIED OR SELECTED BY ARCHITECT.

3. WHERE LIGHTING CIRCUITS ARE SHOWN TO BE LINE VOLTAGE SWITCHED, PROVIDE WITH SPECIFICATION GRADE, HORSEPOWER RATED, UL LISTED, BACK- AND SIDE-WIRED, TOGGLE SWITCHES RATED 20-AMP, 120 VOLTS OR 277 VOLTS. SWITCHES SHALL BE SPST, DPST, 3-WAY OR 4-WAY, WITH OR WITHOUT PILOT LIGHT, AS INDICATED ON THE DRAWINGS.

G. ISOLATION PANELBOARDS
1. MANUFACTURERS:
a. PANELBOARDS, OVERCURRENT PROTECTIVE DEVICES AND ACCESSORIES:
1) ISOTROL SYSTEMS
2) POST GLOVER LIFELINK, INC.
3) SQUARE D.
2. GENERAL REQUIREMENTS
a. DESCRIPTION: ISOLATION PANELBOARD SPECIFICALLY DESIGNED FOR THE PURPOSE OF SUPPLYING UNGROUNDED POWER.
b. ENCLOSURE:
1) FLUSH- AND SURFACE-MOUNTED CABINETS, AS INDICATED. NEMA 250, TYPE 1. NEMA PB 1.
2) NON-VENTILATED DESIGN WITH MAXIMUM FRONT PANEL TEMPERATURE NOT TO EXCEED 30°C RISE UNDER FULL LOAD CONTINUOUS OPERATION.
3) BACKBOX: 14-GAUGE STEEL, DEGREASED, PHOSPHATIZED, PRIMED, AND FINISH BAKED ENAMEL PAINTED.
4) TRIM AND FINISH: 12-GAUGE TYPE 304 STAINLESS STEEL TRIM WITH BRUSHED FINISH. STANDARD CONCEALED-HINGE DOOR WITH KEYED LOOK WITHIN TRIM COVER TO ACCESS DEVICE HANDLES AND LIM. TRIM SHALL NOT CONTAIN ANY VENTS, OPENINGS, OR STANDING HINGES THAT CAN IMPEDE INFECTION CONTROL EFFORTS.
5) BARRIERED COMPARTMENT: PROVIDE FOR SEPARATION OF INCOMING PRIMARY FEED, GROUNDED AND UNGROUNDED CONDUCTORS.
6) TERMINAL BLOCKS: PROVIDE FOR CONNECTION OF REMOTE SIGNAL CONDUCTORS
c. UNGROUNDED LOW-LEAKAGE TRANSFORMER:
1) TRANSFORMER WINDINGS: COPPER, RATING AS INDICATED.
2) ELECTROSTATIC SHIELD: ELECTROSTATIC SHIELD BETWEEN THE PRIMARY AND SECONDARY WINDINGS. SHIELD GROUNDED TO THE ENCLOSURE AND THE REFERENCE GROUND BAR IN THE ISOLATION PANEL. ELECTROSTATIC SHIELD DESIGNED TO PREVENT DIRECT SHORTING OF THE PRIMARY WINDING TO THE SECONDARY WINDING, AND TO REDUCE THE COUPLING OF HARMONIC DISTORTIONS BETWEEN THE PRIMARY AND SECONDARY CIRCUITS.
3) TRANSFORMER CORE DESIGN: STACKED CORE DESIGN, INTERNALLY ISOLATED FROM THE ENCLOSURE BY MEANS OF A SUITABLE VIBRATION DAMPENING SYSTEM, VARNISH IMPREGNATED, WITH A FINAL WRAP OF INSULATING MATERIAL TO PREVENT EXPOSURE OF BARE CONDUCTORS.
4) TOTAL LEAKAGE CURRENT TO GROUND: NOT TO EXCEED THE VALUES SHOWN IN TABLE 29.2 OF UL 1047.
5) VOLTAGE REGULATION: NOT TO EXCEED 2.5 PERCENT AT 0.8 POWER FACTOR (PF) AT 20°C ABOVE THE FULL LOAD CONTINUOUS OPERATING TEMPERATURE IN ACCORDANCE WITH NEMA AND ANSI STANDARDS.
6) INSULATION CLASS: CLASS H; MATERIALS IN ACCORDANCE WITH NEMA ST20 220 DEG C, UL-COMPONENT-RECOGNIZED INSULATION SYSTEM WITH A MAXIMUM OF 55 DEG C RISE ABOVE 40 DEG C AMBIENT TEMPERATURE.
7) LOW-SOUND-LEVEL REQUIREMENTS: MAXIMUM OF 27 DBA FOR 5KVA AND 35 DBA FOR 7.5 KVA AND GREATER, WHEN FACTORY TESTED ACCORDING TO IEEE C57.12.91.
d. CIRCUIT BREAKERS:
1) TYPE: THERMAL-MAGNETIC MOLDED-CASE CIRCUIT BREAKER. UL 489, NEMA AB 1, WITH INTERRUPTING CAPACITY TO MEET AVAILABLE FAULT CURRENTS WITH INVERSE TIME-CURRENT ELEMENT FOR LOW-LEVEL OVERLOADS, AND INSTANTANEOUS MAGNETIC TRIP ELEMENT FOR SHORT CIRCUITS.
2) PRIMARY MAIN CIRCUIT BREAKER: QUANTITY AND SIZE AS INDICATED.
3) SECONDARY MAIN CIRCUIT BREAKER: QUANTITY AND SIZE AS INDICATED.
4) BRANCH FEEDER BREAKERS: TWO-POLE BREAKERS, QUANTITY AND SIZED AS INDICATED.
e. CONDUCTOR CONNECTORS: SUITABLE FOR USE WITH CONDUCTOR MATERIAL.
f. LINE ISOLATION MONITOR (LIM):
1) PROVIDE UNIT WHICH MEETS THE FOLLOWING REQUIREMENTS:
a) MICROPROCESSOR-BASED DIGITAL SIGNAL PROCESSING THAT CONTINUALLY MONITOR THE IMPEDANCE FROM ALL SECONDARY CONDUCTORS OF THE ISOLATED POWER SYSTEMS TO GROUND.
b) CAPABLE OF MEASURING ALL COMBINATIONS OF CAPACITIVE AND RESISTIVE FAULTS INCLUDING BALANCED, UNBALANCED AND HYBRID FAULTS.
c) OPERATING VOLTAGE: 85 TO 265 VAC
d) OPERATING FREQUENCY: 60 HZ
e) ACCURACY: 5 PERCENT OR BETTER
f) MONITOR HAZARD CURRENT: 25 MICROAMPERES (MA) OR LESS.
2) DISPLAYS, ALARM INDICATORS, AND FEATURES:
a) DIGITAL AMMETER INDICATING TOTAL HAZARD CURRENT OF SYSTEM IN AMPERES, MOUNTED BEHIND TRIM DOOR.
b) MOMENTARY TEST SWITCH: SWITCH FOR PERIODIC TESTING AND RECALIBRATION OF LIM CIRCUITRY, MOUNTED BEHIND TRIM DOOR.
c) DIGITAL OR ANALOG AMMETER ON THE FRONT FACE OF PANEL TO INDICATING TOTAL HAZARD CURRENT OF SYSTEM IN AMPERES.
d) GREEN SAFE LIGHT ON THE FRONT FACE OF PANEL TO INDICATE NORMAL OPERATING CONDITIONS.
e) RED HAZARD LIGHT ON THE FRONT FACE OF PANEL TO INDICATE ALARM CONDITION.
f) AUDIBLE ALARM TO OPERATE IN CONJUNCTION WITH THE RED HAZARD LIGHT.
g) PUSH-TO-SILENCE BUTTON ON THE FRONT FACE OF PANEL TO ACKNOWLEDGE ALARM CONDITION. LIGHT SHALL REMAIN ILLUMINATED UNTIL FAULT CONDITION HAS BEEN CORRECTED.
h) AUXILIARY CONTACTS: TWO SPST SWITCHES WITH ONE NORMALLY OPEN AND ONE NORMALLY CLOSED CONTACT FOR CONNECTION TO REMOTE ALARM SYSTEMS.
3) ALARM CONDITIONS:
a) HAZARD CURRENT LEVEL: 2 OR 5 MILLIAMPERES (SELECTABLE)
b) LOSS OF GROUND: ALARM TO INDICATE WHEN REFERENCE GROUND IS DISCONNECTED.
g. REMOTE INDICATING ALARM UNIT:
1) FLUSH-MOUNTED STAINLESS STEEL UNIT SEPARATE FROM PANELBOARD WITH THE FOLLOWING FEATURES TO MIMIC LIM STATUS AND ALARM CONDITIONS AT A REMOTE LOCATION:
a) DIGITAL OR ANALOG AMMETER INDICATING TOTAL HAZARD CURRENT OF SYSTEM IN AMPERES
b) GREEN SAFE LIGHT ON THE FRONT PANEL TO INDICATE NORMAL OPERATING CONDITIONS.
c) RED HAZARD LIGHT ON THE FRONT PANEL TO INDICATE ALARM CONDITION.
d) AUDIBLE ALARM TO OPERATE IN CONJUNCTION WITH THE RED HAZARD LIGHT.
e) PUSH-TO-SILENCE BUTTON ON THE FRONT PANEL TO ACKNOWLEDGE ALARM CONDITION. LIGHT SHALL REMAIN ILLUMINATED UNTIL FAULT CONDITION HAS BEEN CORRECTED.
2) LOCATION: PROVIDE REMOTE INDICATING ALARM UNITS IN THE FOLLOWING LOCATIONS:
a) WHERE PANELS ARE NOT INSTALLED WITHIN THE OPERATING ROOM, PROVIDE A SEPARATELY MOUNTED REMOTE INDICATING ALARM IN RECESSED BACK BOX WITHIN THE OPERATING ROOM.
3. PANELBOARD SHORT-CIRCUIT RATING
a. FULLY RATED TO INTERRUPT SYMMETRICAL SHORT-CIRCUIT CURRENT AVAILABLE AT TERMINALS. SERIES RATING IS NOT ACCEPTABLE.
4. SINGLE VOLTAGE ISOLATION PANELBOARDS
a. SINGLE VOLTAGE OUTPUT ISOLATION PANELBOARDS: ISOLATION PANELBOARDS INDICATED TO BE SINGLE VOLTAGE OUTPUT SHALL COMPLY WITH ALL REQUIREMENTS LISTED IN GENERAL ISOLATION PANELBOARD REQUIREMENTS PARAGRAPH ABOVE, UNLESS OTHERWISE INDICATED.
1) NUMBER OF SECONDARY TRANSFORMER WINDINGS: ONE
2) QUANTITY OF PRIMARY MAIN CIRCUIT BREAKER: ONE
3) QUANTITY OF SECONDARY MAIN CIRCUIT BREAKER: ONE
4) QUANTITY OF BRANCH FEEDER BREAKERS: (16) TWO-POLE BREAKERS, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
5) QUANTITY OF LIMS: ONE
5. ISOLATION PANELBOARD WIRING
a. CONDUCTOR TYPE: COPPER STRANDED LOW LEAKAGE TYPE XHHW CONDUCTOR WITH A DIELECTRIC CONSTANT OF 3.5 OR LESS.
b. COLOR CODING: COMPLY WITH APPLICABLE PARAGRAPHS OF THE CURRENT EDITIONS OF NFPA 70 AND NFPA 99.
c. TOTAL LEAKAGE CURRENT: NOT TO EXCEED THE VALUES SHOWN IN TABLE 29.1 OF UL 1047. TOTAL LEAKAGE CURRENT OF THE MANUFACTURED ISOLATION PANEL SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING ITEMS:
1) LIM
2) ISOLATION TRANSFORMER
3) PANELBOARD
4) BRANCH CIRCUIT BREAKERS
5) PANEL MOUNTED ACCESSORIES

H. GROUNDING

1. GROUNDING SHALL COMPLY WITH THE REQUIREMENTS OF THE NEC.

2. GROUNDING CONDUCTORS SHALL BE ANNEALED COPPER CABLES OF THE SIZES INDICATED OR REQUIRED.

3. A "GREEN WIRE" EQUIPMENT GROUNDING CONDUCTOR SHALL BE INSTALLED WITHIN EACH FEEDER AND BRANCH CIRCUIT RACEWAY, WHETHER METALLIC OR NON-METALLIC, TO FORM A COMPLETE AND CONTINUOUS GROUNDING PATH. CONNECT GROUNDING CONDUCTORS TO GROUND TERMINALS AT EACH END OF THE RUN.

III EXECUTION

A. INSTALLATION OF BUILDING CONDUIT

1. ALL INTERIOR RACEWAYS SHALL BE EMT. RACEWAYS IN DAMP OR WET LOCATIONS, OR IN HAZARDOUS LOCATIONS, SHALL BE GRC OR IMC.

2. CONDUITS SHALL BE OF SUCH SIZE AND SO INSTALLED THAT THE CONDUCTORS MAY BE DRAWN THROUGH WITHOUT INJURY OR EXCESSIVE STRAIN, SHALL BE SECURED AT CABINETS AND BOXES WITH GALVANIZED LOCKNUTS, BOTH INSIDE AND OUTSIDE, AND SHALL HAVE APPROPRIATE BUSHINGS INSIDE. BUSHINGS SHALL BE INSULATING TYPE WITH BOND GROUND CLAMPS.

3. USE LENGTHS OF FLEXIBLE METAL CONDUIT NOT LESS THAN 12 INCHES LONG AT FINAL CONNECTIONS TO ALL MOTORS, TRANSFORMERS AND SIMILAR DEVICES SUBJECT TO MOVEMENT BECAUSE OF VIBRATION OR MECHANICAL ADJUSTMENT. USE FLEXIBLE METAL CONDUITS TO EFFECT FINAL CONNECTIONS TO RECESSED LIGHTING FIXTURES. USE LIQUID TIGHT FLEXIBLE METAL CONDUIT, WITH APPROPRIATE CONNECTIONS, IN DAMP OR WET LOCATIONS, AT MOTOR OR EQUIPMENT LOCATIONS IN MECHANICAL EQUIPMENT ROOMS, AT OR NEAR PUMPS, AND WHEN INSTALLED OUTDOORS.

4. GROUND METALLIC CONDUITS AS REQUIRED BY NEC.

5. INSTALL RACEWAYS CONTINUOUS FROM OUTLET TO OUTLET BOX, OR CABINET, WITH A MAXIMUM OF 150 FEET BETWEEN PULLS. IN AREAS WHERE THERE ARE NO SUSPENDED CEILINGS, RUN ALL CONDUITS PARALLEL/PERPENDICULAR TO BUILDING SURFACE PLANES.

6. IN SYSTEMS OPERATING AT MORE THAN 300 VOLTS BETWEEN PHASE CONDUCTORS, AND WHERE DIFFERENT PHASE CONDUCTORS ARE TO BE RUN TO A COMMON GANG WALL SWITCH BOX, PROVIDE SUBSTANTIAL BARRIERS BETWEEN ADJACENT SWITCHES IN THE BOX SO THAT TWO DIFFERENT PHASE WIRES WILL NOT BE IN THE SAME COMPARTMENT.

7. WHEREVER RACEWAYS PASS THROUGH FLOORS, WALLS, PENETRATIONS, OR OTHER PARTITIONS, CAREFULLY FILL ANY SPACE BETWEEN THE OUTSIDE OF THE RACEWAY AND THE BUILDING MATERIAL TO PREVENT PASSAGE OF AIR, WATER, SMOKE, AND FUMES. FILLING MATERIAL SHALL BE A UL LISTED, INTUMESCENT SEALING HAVING FIRE/SMOKE RESISTIVE RATING EQUAL TO THE BUILDING MATERIAL PENETRATED.

8. CONDUITS UTILIZED THROUGHOUT THE PROJECT SHALL NOT BE SMALLER THAN 3/4 INCH FOR FEEDERS, MULTIPLE BRANCH CIRCUIT HOMERUNS AND HOMERUNS OF CONDUCTORS LARGER THAN NO. 12. INDIVIDUAL BRANCH CIRCUIT WIRING FOR NO. 12 CONDUCTORS SHALL BE ACCEPTABLE IN 1/2" CONDUIT, I.E. 2#12, 1#12G, 1/2"C.

B. INSTALLATION OF PULL AND JUNCTION BOXES

1. FASTEN ALL BOXES SECURELY TO THE BUILDING CONSTRUCTION, INDEPENDENT OF CONDUIT SYSTEMS.

2. ON CONCEALED CONDUIT SYSTEMS WHERE BOXES ARE NOT OTHERWISE ACCESSIBLE, SET BOXES FLUSH WITH FINISHED SURFACES FOR ACCESS, AND PROVIDE OVERLAPPING COVERS.

C. INSTALLATION OF CONDUIT HANGERS AND SUPPORTS

1. FURNISH AND INSTALL ALL HANGERS AND SUPPORTS REQUIRED BY RACEWAY SYSTEMS.

2. SUPPORT ALL ABOVE-GROUND ELECTRICAL CONDUITS FROM THE BUILDING STRUCTURE/CONSTRUCTION. SUPPORT CONDUITS RUNNING VERTICALLY OR HORIZONTALLY ALONG WALLS WITH GALVANIZED MALLEABLE IRON ONE-HOLE CLAMPS. CARRY INDIVIDUALLY SUPPORTED HORIZONTAL CONDUITS 1-1/4 INCH AND LARGER ON SUITABLE HANGERS.

3. LOCATE HANGERS AND TRAPEZES TO SUPPORT HORIZONTAL RACEWAYS WITHOUT APPRECIABLE SAGGING. HANGER SPACING SHALL NOT EXCEED NEC REQUIREMENTS, OR RECOMMENDATIONS OF THE NECA "STANDARD OF INSTALLATION".

4. WHERE CONDUITS SMALLER THAN 1-1/4 INCH ARE INSTALLED ABOVE REMOVABLE TYPE DRY CEILINGS, SUPPORT THEM ON SUITABLE HANGER RODS WITH METAL CLIPS AT A DISTANCE ABOVE THE CEILING SUFFICIENT TO PERMIT REMOVAL OF CEILING PANELS AND LAY-IN LIGHT FIXTURES. LOCATE SUCH CONDUITS SO AS NOT TO HINDER ACCESS TO MECHANICAL EQUIPMENT THROUGH CEILING PANELS.

D. INSTALLATION OF CONDUCTORS

1. PULL NO CONDUCTORS INTO CONDUITS UNTIL ALL WORK OF A NATURE WHICH MAY CAUSE INJURY TO CONDUCTORS IS COMPLETED.

2. RUN FEEDERS IN CONTINUOUS PIECES, WITHOUT JOINTS OR SPLICES, INSOFAR AS PRACTICABLE.

3. RUN CONDUITS FOR EMERGENCY POWER CONDUCTORS SEPARATE FROM ALL OTHER WIRING.

E. INSTALLATION OF ISOLATION PANELBOARDS

1. INSTALL PANELBOARDS AND ACCESSORIES ACCORDING TO NEMA PB 1.1 AND MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

2. MOUNT TOP OF TRIM 74 INCHES (1880 MM) ABOVE FINISHED FLOOR, UNLESS OTHERWISE INDICATED.

3. MOUNT PLUMB AND RIGID WITHOUT DISTORTION OF BOX. MOUNT RECESSED PANELBOARDS WITH FRONTS UNIFORMLY FLUSH WITH WALL FINISH.

4. INSTALL OVERCURRENT PROTECTIVE DEVICES AND CONTROLLERS.

5. INSTALL FILLER PLATES IN UNUSED SPACES.
6. FOR RECESSED PANELS: STUB FOUR 1-INCH (27-GRC) EMPTY CONDUITS FROM PANELBOARD INTO ACCESSIBLE CEILING SPACE.

7. ARRANGE CONDUCTORS IN GUTTERS INTO GROUPS AND BUNDLE AND WRAP WITH WIRE TIES.

8. DO NOT USE GUTTERS OF PANELBOARDS AS RACEWAYS FOR ROUTING FEEDER CONDUCTORS FROM BOTTOM ENTRANCE TO TOP-FEED LUGS OR VICE VERSA; AN EXTERNAL GUTTER OR CONDUIT SHALL BE USED FOR THIS PURPOSE.

9. CLOSE UNUSED CONDUIT OPENING OR OTHER UNUSED HOLES IN SIDES OF BOX WITH PROPER MATING BLANK-OFF PLATES.

10. IDENTIFY FIELD-INSTALLED CONDUCTORS, INTERCONNECTING WIRING, AND COMPONENTS.

11. PANELBOARD NAMEPLATES: LABEL EACH PANELBOARD WITH NAMEPLATE.

12. PANELBOARD DIRECTORY: CREATE A DIRECTORY TO INDICATE NAME/DESCRIPTIONS OF INSTALLED CIRCUIT LOADS. OBTAIN APPROVAL BEFORE INSTALLING. USE A COMPUTER OR TYPEWRITER TO CREATE DIRECTORY; HANDWRITTEN DIRECTORIES ARE NOT ACCEPTABLE.

13. GROUND PANELBOARD PER NEC REQUIREMENTS.
14. FIELD QUALITY CONTROL
a. PREPARE FOR ACCEPTANCE TESTS AS FOLLOWS:
1) TEST INSULATION RESISTANCE FOR EACH PANELBOARD BUS, COMPONENT, CONNECTING SUPPLY, FEEDER, POWER AND CONTROL CIRCUIT.
2) TEST CONTINUITY OF EACH CIRCUIT.
b. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT, TEST, AND ADJUST COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS. ASSIST FACTORY-AUTHORIZED SERVICE REPRESENTATIVE DURING TESTING AND CORRECT DEFICIENCIES AS REQUIRED. PREPARE TEST REPORTS AND SUBMIT REPORTS IN CONJUNCTION WITH FIELD QUALITY CONTROL REPORTS REQUIRED IN DIVISION 26 SECTION "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS".
1) PERFORM EACH ELECTRICAL TEST AND VISUAL AND MECHANICAL INSPECTION STATED IN NETA ATS, SECTION 7.6 FOR MOLDED-CASE CIRCUIT BREAKERS. CERTIFY COMPLIANCE WITH TEST PARAMETERS.
2) PERFORM EACH ELECTRICAL TEST STATED IN NFPA 99, CHAPTER "ELECTRICAL SYSTEMS" FOR IMPEDANCE OF ISOLATED WIRING. CERTIFY COMPLIANCE WITH TEST PARAMETERS.
a) OBSERVE AND RECORD SYSTEM CURRENT LEAKAGES.
b) TEST AND RECORD THE RESISTANCE BETWEEN THE GROUND POINT OF EACH RECEPTACLE AND THE REFERENCE POINT. RESISTANCE LEVEL SHALL BE LESS THAN 0.1 OHM.
c) TEST AND RECORD THE VOLTAGE POTENTIAL DIFFERENCE BETWEEN EXPOSED CONDUCTIVE SURFACES IN THE PATIENT VICINITY. POTENTIAL DIFFERENCE TO BE NO MORE THAN 20 MILLIVOLTS (MV).
3) SIMULATE FAULTS ON THE ISOLATED SYSTEM OF A MAGNITUDE HIGH ENOUGH TO BRING THE TOTAL SYSTEM LEAKAGE ABOVE THE LIM CALIBRATED POINT. THE FAULTS SIMULATED SHALL BE COMBINATIONS OF RESISTIVE AND CAPACITIVE FAULTS. VERIFY AND RECORD THAT THE LIM OPERATES IN ACCORDANCE WITH REQUIREMENTS.
4) INFRARED SCANNING: PERFORM THERMOGRAPHIC SURVEY IN ACCORDANCE WITH NETA ATS, SECTION 9.0.
a) INITIAL INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH PANELBOARD. OPEN OR REMOVE COVERS SO CONNECTIONS ARE ACCESSIBLE TO PORTABLE SCANNER.
b) INSTRUMENTS, EQUIPMENT:
1 USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR DEVICE.
2 PREPARE A CERTIFIED REPORT THAT IDENTIFIES PANELBOARDS CHECKED AND DESCRIBES SCANNING RESULTS. INCLUDE NOTATION OF DEFICIENCIES DETECTED, REMEDIAL ACTION TAKEN, AND OBSERVATIONS AFTER REMEDIAL ACTION.
c. CORRECT DEFICIENCIES, RETEST AND REPORT:
1) CORRECT UNSATISFACTORY CONDITIONS, AND RETEST TO DEMONSTRATE COMPLIANCE; REPLACE CONDUCTORS, UNITS, AND DEVICES AS REQUIRED TO BRING SYSTEM INTO COMPLIANCE.
2) CORRECT MALFUNCTIONING UNITS ON-SITE, WHERE POSSIBLE, AND RETEST TO DEMONSTRATE COMPLIANCE; OTHERWISE, REPLACE WITH NEW UNITS AND RETEST.
d. TEST LABELING: ON COMPLETION OF SATISFACTORY TESTING OF EACH UNIT, ATTACH A DATED AND SIGNED "SATISFACTORY TEST" LABEL TO TESTED COMPONENT.

F. SEGREGATION OF WIRING SYSTEMS

1. SEGREGATION OF WIRING SYSTEMS SHALL NOT BE COMPROMISED BY THE USE OF COMMON PULLBOXES, WIREWAYS, CABINETS OR ANY OTHER TYPE OF ENCLOSURE.

2. THE RACEWAY SYSTEM FOR EACH FEEDER SHALL BE A SEPARATE SYSTEM COMPLETELY FAULT ISOLATED FROM ALL OTHER RACEWAY SYSTEMS.

3. THE RACEWAY SYSTEM FOR THE BRANCH CIRCUITS OF EACH PANELBOARD SHALL BE A SEPARATE SYSTEM COMPLETELY FAULT ISOLATED FROM ALL OTHER RACEWAY SYSTEMS.

G. EXISTING SYSTEMS TO REMAIN

1. THE CONTRACT DOCUMENTS DO NOT PROPOSE TO SHOW ALL EXISTING SYSTEMS, MATERIAL OR EQUIPMENT. OBTAIN DATA RELATED TO EXISTING CONDITIONS FROM EXISTING DOCUMENTS, MEASUREMENTS, NOTATIONS, PHOTOGRAPHS, SURVEYS AND OTHER OBSERVATIONS AT THE SITE.

2. REMOVE EXISTING WIRE, CONDUIT, EQUIPMENT, FIXTURES AND OTHER ITEMS TO PROVIDE ACCESS FOR WORK IN EXISTING FACILITIES. REINSTALL AND REFINISH ITEMS REMOVED, OR OTHERWISE DAMAGED, TO MATCH EXISTING ADJACENT SURFACED UPON COMPLETION OF THE WORK.

3. WHERE EXISTING FUNCTIONS TO REMAIN IN USE ARE DISRUPTED, THEY SHALL BE FULLY RESTORED AFTER DISRUPTION, IN FULL COMPLIANCE WITH THIS DIVISION OF THE SPECIFICATIONS FOR NEW WORK.

4. MODIFY, REMOVE OR RELOCATE MATERIALS AND ITEMS INDICATED ON THE DRAWINGS OR REQUIRED BY THE INSTALLATION OF NEW WORK.

5. WORKING JOINTLY WITH THE ARCHITECT, ESTABLISH AND MARK SALVAGE AND DEMOLITION ITEMS BEFORE COMMENCING WORK; REPORT ITEMS SCHEDULE FOR RELOCATION, REINSTALLATION OR REUSE, WHICH ARE FOUND TO BE IN DAMAGED CONDITION; AWAIT FURTHER INSTRUCTIONS FROM THE ARCHITECT BEFORE COMMENCING WITH WORK.

6. DEMOLITION EQUIPMENT, DEVICES AND MATERIAL SHALL BE REMOVED FROM THE SITE AND DISPOSED OF BY THE CONTRACTOR. SALVAGED EQUIPMENT AND DEVICES SHALL BE THE PROPERTY OF THE CONTRACTOR UNLESS NOTED OTHERWISE.

7. MAKE MINOR RELOCATIONS NECESSITATED BY THE CONDITIONS AT THE SITE OR AS DIRECTED BY THE ARCHITECT, WITHOUT ADDITIONAL COST TO THE OWNER. REPAIR AND RESTORE TO GOOD FUNCTIONAL CONDITION, EQUIPMENT, MATERIALS AND ITEMS SCHEDULED FOR RELOCATION, WHICH ARE DAMAGED DURING DISMANTLING OR REASSEMBLY OPERATIONS. NEW MATERIALS AND ITEMS OF SIMILAR DESIGN AND QUALITY MAY BE SUBSTITUTED FOR MATERIALS AND ITEMS INDICATED TO BE RELOCATED UPON APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. REMOVE CAREFULLY, IN REVERSE ORDER TO ORIGINAL ASSEMBLY OR PLACEMENT, ITEMS WHICH ARE TO BE RELOCATED. PROTECT ITEMS UNTIL RELOCATION IS COMPLETE. CLEAN AND REPAIR ITEMS TO BE RELOCATED, AND PROVIDE NEW MATERIALS, FITTINGS AND APPURTENANCES REQUIRED TO COMPLETE THE RELOCATIONS AND TO RESTORE TO GOOD OPERATING ORDER. PERFORM THE RELOCATION WORK IN ACCORDANCE WITH APPLICABLE PORTIONS OF THESE SPECIFICATIONS, UTILIZING SKILLED WORKERS.

8. RELOCATING DEVICES: REMOVE AND REINSTALL IN LOCATIONS DESIGNATED BY THE ARCHITECT TEMPERATURE CONTROL SYSTEM DEVICES, RELAYS, WIRE, CONDUIT, FIXTURES, EQUIPMENT AND OTHER DEVICES REQUIRED FOR THE OPERATION OF THE VARIOUS SYSTEMS THAT ARE INSTALLED IN EXISTING-TO-BE-REMOVED CONSTRUCTION.

H. CONTRACTOR SHALL KEEP A CLEAN SET OF DRAWINGS ON THE JOB, NOTING DAILY ALL CHANGES MADE IN THESE DRAWINGS IN CONNECTION WITH THE FINAL INSTALLATION INCLUDING EXACT DIMENSIONED LOCATIONS OF ALL NEW AND UNCOVERED EXISTING UTILITIES AND SHALL, WITH HIS REQUEST FOR FINAL PAYMENT, TURN OVER A CLEAN, NEATLY MARKED SET OF REPRODUCIBLE MYLARS SHOWING "AS INSTALLED" WORK TO THE ARCHITECT FOR SUBSEQUENT REVIEW AND TRANSMITTAL TO THE OWNER. CONTRACTOR SHALL NOTE ALL CONSTRUCTION CHANGES, DATE EACH SHEET AND LABEL "AS-BUILTS" IN THE REVISION BLOCK ON THE DRAWINGS. CONTRACTOR SHALL ALSO FURNISH ONE (1) SET OF AS-BUILT BLUELINE PRINTS.

I. IN ADDITION TO THE ABOVE, CONTRACTOR SHALL ACCUMULATE DURING THE JOB'S PROGRESS, THE FOLLOWING DATA, IN TRIPLICATE, PREPARED IN A NEAT BROCHURE OR PACKET FOLDER AND TURNED OVER TO THE ARCHITECT FOR REVIEW AND SUBSEQUENT DELIVERY TO THE OWNER.

1. ALL WARRANTIES AND GUARANTEES AND MANUFACTURER'S DIRECTIONS ON EQUIPMENT AND MATERIAL COVERED BY THE CONTRACT INCLUDING THE NAMES, ADDRESSES AND TELEPHONE NUMBERS OF THE MANUFACTURER'S REPRESENTATIVE.

2. APPROVED FIXTURE BROCHURES, WIRING DIAGRAMS AND CONTROL DIAGRAMS (ORIGINAL DATA, NO COPIES).

3. COPIES OF APPROVED SHOP DRAWINGS.

4. OPERATING INSTRUCTIONS FOR ALL ELECTRICAL SYSTEM EQUIPMENT. OPERATING INSTRUCTIONS SHALL ALSO INCLUDE RECOMMENDED MAINTENANCE PROCEDURES.

5. TEST REPORTS REQUIRED BY THESE SPECIFICATIONS.

6. ANY AND ALL OTHER DATA AND/OR DRAWINGS REQUIRED DURING CONSTRUCTION.

7. REPAIR PARTS LISTS OF ALL MAJOR ITEMS OF EQUIPMENT INCLUDING NAME, ADDRESS AND TELEPHONE NUMBERS OF LOCAL SUPPLIER OR AGENT.

J. ALL OF THE ABOVE DATA SHALL BE SUBMITTED TO THE ENGINEER FOR HIS REVIEW AT SUCH TIME AS THE CONTRACTOR SUBMITS HIS LAST ESTIMATE PRIOR TO HIS FINAL PAYMENT, BUT IN NO CASE, LESS THAN TWO WEEKS BEFORE FINAL INSPECTION.

City of Aurora Building Division
Project: TMCA Cath Lab Laser
Address: 1501 S Potomac St.
Occupancy Group: IBC I-2
Construction Type: IBC IA-SPK
RSN: 1235013
Permit: 17-1351383

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: Erick B.
Date: Sep 01, 2017
2015 INTERNATIONAL CODES & 2017 NEC

Code violations that are found during inspection are required to be corrected. Permit issuance does not grant approval of a code violation.

Failure to follow approved plans may result in an hourly fee to review the field changes for code compliance.

Field Inspection consultation is available upon request. Call 303-739-7420 to request a consultation

GENERAL NOTES

GENERAL CONDITIONS

A1 THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND IT IS THE INTENT AND MEANING OF THE CONTRACT DOCUMENTS THAT THE CONTRACTOR SHALL PROVIDE AN ELECTRICAL INSTALLATION THAT IS COMPLETE AND ALL ITEMS AND APPURTENANCES NECESSARY, REASONABLE INCIDENTAL, OR CUSTOMARILY INCLUDED, EVEN THOUGH EACH AND EVERY ITEM IS NOT SPECIFICALLY CALLED OUT OR SHOWN. THE CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, MATERIALS, LABOR, SUPERVISION AND SERVICE NECESSARY SO AS TO PROVIDE A COMPLETE, FUNCTIONING ELECTRICAL SYSTEM IN SAFE WORKING ORDER.

A2 SYMBOLS FOR VARIOUS ELEMENTS AND SYSTEMS ARE SHOWN ON THE DRAWINGS. SHOULD THERE BE ANY DOUBT REGARDING THE MEANING OR INTENT OF THE SYMBOLS USED, AN INTERPRETATION SHALL BE OBTAINED FROM THE ARCHITECT IN WRITING. THE DECISION OF THE ARCHITECT SHALL BE FINAL.

A3 IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO EXAMINE THE CONTRACT DOCUMENTS CAREFULLY BEFORE SUBMITTING HIS BID, WITH PARTICULAR ATTENTION TO ERRORS, OMISSIONS, CONFLICTS WITH PROVISIONS OF LAWS AND CODES HAVING JURISDICTION, CONFLICTS BETWEEN DRAWINGS OR DRAWINGS AND SPECIFICATIONS, AND AMBIGUOUS DEFINITION OF THE EXTENT OF COVERAGE BETWEEN CONTRACTS. ANY SUCH DISCREPANCY SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ARCHITECT FOR CORRECTION. SHOULD ANY OF THESE ERRORS, OMISSIONS, CONFLICTS, OR AMBIGUITIES EXIST, THE CONTRACTOR SHALL HAVE THEM EXPLAINED AND ADJUSTED IN WRITING BEFORE SIGNING THE CONTRACT OR PROCEEDING WITH THE WORK; OTHERWISE, HE SHALL, AT HIS OWN EXPENSE, SUPPLY THE PROPER MATERIALS AND LABOR TO MAKE GOOD ANY DAMAGE OR DEFECTS IN HIS WORK OR THE RESULTS OBTAINED THEREFROM, CAUSED BY SUCH DISCREPANCY.

A4 WHEREVER CONFLICTS OCCUR BETWEEN DIFFERENT PARTS OF THE CONTRACT DOCUMENTS, THE GREATER QUANTITY, THE BETTER QUALITY, OR LARGER SIZE SHALL PREVAIL UNLESS THE ARCHITECT INFORMS THE CONTRACTOR OTHERWISE IN WRITING.

A5 THE SCALE OF EACH DRAWING IS RELATIVELY ACCURATE; ANY DIMENSIONS SHOWN ARE APPROXIMATE TO CENTERLINE FROM ASSUMED BUILDING PERIMETER. THE CONTRACTOR SHALL OBTAIN THE NECESSARY DIMENSIONS FOR ANY EXACT TAKEOFFS FROM THE ARCHITECT. NO ADDITIONAL COST TO THE OWNER WILL BE CONSIDERED FOR FAILURE TO OBTAIN EXACT DIMENSIONS WHERE NOT CLEAR OR IN ERROR ON THE DRAWINGS. ANY DEVICE OR FIXTURE ROUGHED IN IMPROPERLY AND NOT POSITIONED ON IMPLIED CENTER-LINES OR AS REQUIRED BY GOOD PRACTICE MUST BE REPOSITIONED AT NO COST TO THE OWNER.

A6 ALL WORK AND MATERIALS SHALL BE GUARANTEED FREE FROM DEFECTS FOR A MINIMUM PERIOD OF ONE YEAR UNLESS NOTED OTHERWISE. THE WARRANTY PERIOD SHALL BEGIN AT THE DATE OF BENEFICIAL OCCUPANCY OF THE FACILITY.

A7 THE CONTRACTOR IS RESPONSIBLE FOR FILING AND PAYING ALL FEES AND OBTAINING NECESSARY PERMITS AND CERTIFICATES OF INSPECTION. THE CONTRACTOR SHALL DELIVER ALL CERTIFICATES OF INSPECTION TO OWNER/CONSTRUCTION MANAGER INCLUDING COPIES WITH MAINTENANCE MANUALS.

A8 ONLY EXPERIENCED CRAFTSMEN KNOWLEDGEABLE IN THEIR RESPECTIVE TRADE SHALL PERFORM THE WORK DESCRIBED IN THE CONSTRUCTION DOCUMENTS.

A9 ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST ADDITION OF NFPA STANDARD 70 (NATIONAL ELECTRICAL CODE). CONTRACTOR SHALL ALSO CONFORM TO ALL APPLICABLE LOCAL CODES AND AMENDMENTS.

A10 ALL ELECTRICAL EQUIPMENT, INCLUDING BUT NOT LIMITED TO SWITCHGEAR, CONDUIT, WIRE, BOXES AND FITTINGS SHALL BE NEW AND SHALL MEET NEMA AND ANSI STANDARDS AND SHALL BEAR THE UL LABEL.

A11 PROVIDE SHOP DRAWINGS FOR ENGINEER'S REVIEW FOR ALL ELECTRICAL EQUIPMENT, DEVICES, AND MATERIALS PROPOSED TO BE PROVIDED UNDER THIS CONTRACT. ANY DEVIATIONS FROM ITEMS SPECIFIED SHALL BE CLEARLY IDENTIFIED AND SEPARATELY SUBMITTED WITH A FORMAL SUBSTITUTION REQUEST. REFER TO SPECIFICATIONS (PROJECT MANUAL) FOR REQUIREMENTS.

ELECTRICAL EQUIPMENT

B1 PROVIDE AN IDENTIFICATION NAMEPLATE FOR EACH ELECTRICAL EQUIPMENT, APPURTENANCE DEPICTING THE DESIGNATION INDICATED ON THE DRAWINGS. REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS.

B2 WEATHERPROOF ENCLOSURES SHALL BE PROVIDED FOR ALL ELECTRICAL EQUIPMENT, DEVICES AND APPURTENANCES (ALL SYSTEMS) INSTALLED OUTDOORS.

B3 CONTRACTOR SHALL COORDINATE AND SCHEDULE ALL POWER OUTAGES WITH OWNER'S REPRESENTATIVE.

B4 CONTRACTOR SHALL NOT USE PERMANENT INK WHEN MAKING FIELD MARKINGS OR TEMPORARY CIRCUIT LABELS ON PANELS. CONTRACTOR SHALL USE REMOVABLE TAPE/TAGS FOR ALL TEMPORARY MARKINGS AND SHALL REMOVE THESE TEMPORARY MARKINGS AT THE CONCLUSION OF THIS PROJECT.

CONDUIT & RACEWAY

C1 ALL WORK SHALL BE COORDINATED SO THAT INTERFERENCES ARE AVOIDED. PROVIDE ALL NECESSARY OFFSETS IN CONDUITS, RACEWAYS, ETC., REQUIRED TO PROPERLY INSTALL THE WORK. EXPOSED WORK MUST BE KEPT AS CLOSE AS POSSIBLE TO WALLS, CEILINGS, COLUMNS, ETC., SO AS TO TAKE UP MINIMUM AMOUNT OF SPACE; ALL OFFSETS, FITTINGS, ETC., REQUIRED SHALL BE PROVIDED WITHOUT ADDITIONAL EXPENSE TO THE OWNER. WORK SHALL BE COORDINATED WITH OTHER TRADES.

C2 CONDUIT RUNS ARE DIAGRAMMATIC IN NATURE. CONTRACTOR IS RESPONSIBLE FOR SIZING AND LOCATING PULL BOXES PER N.E.C. AND FOR COORDINATION WITH OTHER DISCIPLINES.

C3 CONTRACTOR SHALL PROVIDE AND INSTALL ADEQUATE SUPPORTS NECESSARY FOR THE RACEWAY SYSTEM. THIS INCLUDES BUT IS NOT LIMITED TO BLOCKING FOR SURFACE AND FLUSH MOUNTED PANELS. CONTRACTOR SHALL REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SIZES AND QUANTITIES OF ALL SUPPORTING MEANS.

C4 PENETRATIONS OF WALLS, FLOORS, AND ROOFS FOR THE PASSAGE OF ELECTRICAL RACEWAYS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO THE COMMENCEMENT OF WORK. ALL SUCH PENETRATIONS SHALL BE PROPERLY SEALED OFF AFTER INSTALLATION OF RACEWAY SO AS TO MAINTAIN THE STRUCTURAL, WATER PROOF, AND FIRE PROOF INTEGRITY OF THE WALL, FLOOR, OR ROOF SYSTEM PENETRATED.

C5 THE CONTRACTOR SHALL SEAL ALL CONDUITS THAT PENETRATE THE FLOOR SLAB TO MAKE THEM WATER TIGHT. THE CONDUITS SHALL BE DRIED PRIOR TO INSTALLATION OF WIRE/CABLE AND SHALL BE SEALED AT TERMINATIONS.

C6 ALL PENETRATIONS THROUGH FIRE RATED WALLS OR PARTITIONS SHALL BE MADE IN ACCORDANCE WITH U.L. 483 "FIRE RESISTANCE DIRECTORY". PENETRATIONS SHALL BE SLEEVED AND SEALED WITH A UL APPROVED FIRE RATED SEALANT. REFER TO ARCHITECTURAL PLANS FOR FIRE RATED WALLS.

C7 ALL EMPTY CONDUIT SYSTEMS SHALL CONTAIN A PULL WIRE FOR FUTURE PULLING OF CONDUCTORS.

BRANCH CIRCUITS AND FEEDERS

D1 UNLESS NOTED OTHERWISE, ALL CIRCUITS 100' OR LESS SHALL BE MINIMUM #12 AWG WIRE SIZE. CIRCUITS OVER 100' BUT LESS THAN 200' SHALL BE MINIMUM #10 AWG WIRE SIZE. CIRCUITS OVER 200' SHALL BE MINIMUM #8 AWG WIRE SIZE.

D2 ALL POWER WIRING SHALL BE INSTALLED IN CONDUIT. CONDUCTOR SIZES #12 AWG AND SMALLER SHALL BE SOLID. CONDUCTOR SIZES #10 AWG AND LARGER MAY BE STRANDED.

D3 A SEPARATE INSULATED EQUIPMENT GROUNDING CONDUCTOR SHALL BE PULLED WITH THE CIRCUIT CONDUCTORS FOR GROUNDING WHETHER OR NOT INDICATED ON THE DRAWINGS. METAL RACEWAY, OR A CABLE ARMOR OR SHEATH SHALL NOT BE USED AS AN EQUIPMENT GROUNDING CONDUCTOR.

D4 CONTRACTOR SHALL GROUND ALL EQUIPMENT AND ELECTRICAL SYSTEM PER N.E.C.

EMERGENCY POWER SYSTEM

J1 ALL EMERGENCY SYSTEMS SHALL BE RUN IN A SEPARATE RACEWAY/CONDUIT SYSTEM AND SHALL BE CLEARLY LABELED AS SUCH.

ELECTRICAL DEMOLITION NOTES

A. PROVIDE UPDATED, TYPE-WRITTEN PANEL DIRECTORY OF ALL CORRECT CIRCUITS WITH LOAD DEFINITIONS FOR EACH PANEL BOARD. DIRECTORY SHALL BE LOCATED INSIDE PANEL DOOR.

B. INFORMATION PROVIDED ON THESE DRAWINGS HAS BEEN TAKEN FROM DESIGN DRAWINGS AND FIELD OBSERVATIONS. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO PRICING AND COMMENCEMENT OF WORK.

C. WHERE EXISTING WALLS ARE DEMOLISHED, REMOVE ALL EXISTING ELECTRICAL DEVICES AND THEIR ASSOCIATED CONDUITS AND WIRING BACK TO THE POINT OF ORIGINATION. ENERGIZE ALL EXISTING DEVICES THAT WERE INTERRUPTED DURING DEMOLITION. WHERE ENTIRE CIRCUITS ARE REMOVED, TURN THE CIRCUIT BREAKER OFF AND LABEL AS "SPARE".

D. PROVIDE FOR ANY AND ALL DEMOLITION WORK NECESSARY TO ACCOMMODATE ALL NEW CONSTRUCTION, INCLUDING ARCHITECTURAL, MECHANICAL, PLUMBING OR ELECTRICAL WORK.

E. IF DEMOLITION IS REQUIRED TO INSTALL AN ITEM, THE CONTRACTOR SHALL RESTORE THE AREA TO PREVIOUS CONDITION, OR REPLACE DAMAGED ITEMS WITH NEW ITEMS TO MATCH EXISTING.

F. DESIGNATION 'EX' REPRESENTS EXISTING DEVICE OR LIGHT FIXTURE TO REMAIN AS CIRCUITED AND SWITCHED UNLESS NOTED OTHERWISE. EXISTING LIGHT FIXTURES SHALL BE CLEANED AND REPAIRED AS REQUIRED.

G. CONTRACTOR SHALL REMOVE ALL CONDUIT AND WIRING ASSOCIATED WITH DEVICES AND EQUIPMENT TO BE REMOVED AND/OR RELOCATED UNLESS NOTED OTHERWISE. PROVIDE AND INSTALL ALL NECESSARY DEVICES, EQUIPMENT AND ACCESSORIES REQUIRED TO MAINTAIN SERVICE TO ALL "EXISTING TO REMAIN" DEVICES AND EQUIPMENT THAT MAY BE INTERRUPTED DURING DEMOLITION.

H. WHERE EXISTING MECHANICAL/PLUMBING EQUIPMENT IS DEMOLISHED, REMOVE ALL RELATED ELECTRICAL FEEDS TO THE EQUIPMENT AND THEIR ASSOCIATED CONDUITS BACK TO THE POINT OF ORIGINATION.

I. SPACE ALLOCATIONS FOR MATERIALS, EQUIPMENT AND DEVICES HAVE BEEN MADE ON THE BASIS OF PRESENT AND KNOWN FUTURE REQUIREMENTS AND THE DIMENSIONS OF ITEMS OF EQUIPMENT OR DEVICES OF A PARTICULAR MANUFACTURER, WHETHER INDICATED OR NOT. THE CONTRACTOR SHALL VERIFY THAT ALL MATERIALS, EQUIPMENT AND DEVICES PROPOSED FOR USE ON THIS PROJECT ARE WITHIN THE CONSTRAINTS OF THE ALLOCATED SPACE.

J. REFER TO ARCHITECTURAL PLANS FOR AREAS WHERE CEILING IS DEMOLISHED. REMOVE ALL LIGHTING FIXTURES AND ASSOCIATED CONDUIT AND WIRING FROM THESE LOCATIONS.

K. ALL RECEPTACLES WITHIN THE PROJECT SCOPE SHALL BE HOSPITAL GRADE TYPE. IF A DEVICE IS INDICATED AS EXISTING TO REMAIN AND IS NOT A HOSPITAL GRADE RECEPTACLE, REPLACE THE EXISTING DEVICE WITH A HOSPITAL GRADE RECEPTACLE AND RECONNECT TO EXISTING CIRCUIT.

L. ALL LIGHTING FIXTURES DEMOLISHED UNDER THESE DRAWINGS SHALL BE RETURNED TO THE OWNER.

M. CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE ALL SERVICE OUTAGES REQUIRED TO PROPERLY EXECUTE THIS PROJECT WITH OWNERS AUTHORIZED REPRESENTATIVE AND UTILITY COMPANY. PERFORM ALL WORK AS DIRECTED. INCLUDE SUITABLE ALLOWANCE IN BASE BID FOR ALL REQUIRED PREMIUM TIME, TEMPORARY EXTRA EQUIPMENT AND/OR MATERIALS FOR A COMPLETE AND OPERABLE INSTALLATION.

PROJECT DESIGN CRITERIA

LOCATION:	
CITY/STATE	AURORA, CO
APPLICABLE CODES:	
BUILDING	2015 IBC
MECHANICAL	2015 IMC
PLUMBING	2015 IPC
ENERGY	2015 IECC
ELECTRICAL	2017 NEC
LATITUDE:	
DEG. N. LAT.	39°41 N
ELEVATION:	
FT. ABOVE SEA LEVEL	5470

POWER SYMBOLS LEGEND

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS. SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	MNTG. HT. UNO
	SINGLE RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R	18" AFF
	DUPLEX RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R	18" AFF
E	DUPLEX RECEPTACLE ON EMERGENCY CIRCUIT	18" AFF
GFI	DUPLEX RECEPTACLE GFCI - 20A/125V/2P/3W/G NEMA 5-20R	18" AFF
TP	DUPLEX RECEPTACLE, TAMPER PROOF - 20A/125V/2P/3W/G NEMA 5-20R	18" AFF
WP	DUPLEX RECEPTACLE, GFCI, TAMPER RESISTANT, WEATHER RESISTANT, HOUSED IN A "WEATHERPROOF-WHILE-IN-USE" ENCLOSURE - 20A/125V/2P/3W/G NEMA 5-20R	18" AFF
	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTERTOP	8" AFC OR 42" AFF
E	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTERTOP ON EMERGENCY CIRCUIT	8" AFC OR 42" AFF
	QUADRAPLEX RECEPTACLE (TWO DUPLEX RECEPTACLES UNDER ONE COVERPLATE)	18" AFF
E	QUADRAPLEX RECEPTACLE ON EMERGENCY CIRCUIT (TWO DUPLEX RECEPTACLES UNDER ONE COVERPLATE)	18" AFF
	QUADRAPLEX RECEPTACLE MOUNTED ABOVE COUNTERTOP (TWO DUPLEX RECEPTACLES UNDER ONE COVERPLATE)	8" AFC OR 42" AFF
E	QUADRAPLEX RECEPTACLE MOUNTED ABOVE COUNTERTOP ON EMERGENCY CIRCUIT (TWO DUPLEX RECEPTACLES UNDER ONE COVERPLATE)	8" AFC OR 42" AFF
	SPECIAL PURPOSE RECEPTACLE (NEMA NO. AS INDICATED)	18" AFF
	FLOOR MOUNTED RECEPTACLE IN FLOOR BOX OR POKE-THRU DEVICE - FLUSH MOUNTED, UNO	18" AFF
	CEILING MOUNTED RECEPTACLE - CONFIGURATION UNO	FLUSH W/ CLG SURFACE
J J	JUNCTION BOX - SIZE & MOUNTING AS REQUIRED	AS REQUIRED
J D/T	WALL MOUNTED JUNCTION BOX FOR DATA/TELEPHONE - SIZE & MOUNTING AS REQUIRED	AS REQUIRED
X/Y/Z	DISCONNECT SWITCH (X=FRAME SIZE, Y=FUSE SIZE, Z=NUMBER OF POLES)	AS REQUIRED
X/-/Z	DISCONNECT SWITCH NON-FUSED (X=FRAME SIZE, Z=NUMBER OF POLES)	AS REQUIRED
CB X/Z	ENCLOSED CIRCUIT BREAKER (X=TRIP RATING, Z=NUMBER OF POLES)	AS REQUIRED
#	MOTOR STARTER FVNR UNO (#=NEMA SIZE)	AS REQUIRED
CB	COMBINATION MOTOR CONTROLLER / DISCONNECT SWITCH	AS REQUIRED
$M	MANUAL MOTOR STARTER SWITCH WITH THERMAL OVERLOAD AND PILOT LIGHT	AS REQUIRED
	EMERGENCY POWER OFF BUTTON - WALL MOUNTED	AS REQUIRED
	CIRCUIT CONDUCTOR INDICATION (EQUIPMENT GROUND, NEUTRAL, PHASE)	--
	CIRCUIT HOMERUN TO PANELBOARD (2#12, 1#12G, 3/4"C. 20A/1P CB UNO)	--
	CONDUIT INSTALLED IN CEILING SPACE OF FLOOR BELOW.	--
X,X,X	THREE SINGLE POLE DEVICE CIRCUIT NUMBERS	--
X/X/X	MULTI-POLE DEVICE CIRCUIT NUMBERS	--
	208Y/120V PANELBOARD	--
	480Y/277V PANELBOARD	--
	208Y/120V DISTRIBUTION PANELBOARD	--
	480Y/277V DISTRIBUTION PANELBOARD	--

ELECTRCIAL ABBREVIATIONS

AAP	AREA ALARM PANEL	MH	MANHOLE
AFC	ABOVE FINISHED COUNTER	MLO	MAIN LUGS ONLY
AFF	ABOVE FINISHED FLOOR	MTD	MOUNT OR MOUNTED
ATS	AUTOMATIC TRANSFER SWITCH	N	NEW DEVICE
BFC	BELOW FINISHED CEILING	NC (N.C.)	NORMALLY CLOSED
BOF	BOTTOM OF FIXTURE	NEC	NATIONAL ELECTRIC CODE
C	CONDUIT	NF	NONFUSED
CB,C/B OR CKT BKR	CIRCUIT BREAKER	NIC	NOT IN CONTRACT
		NL	NIGHT LIGHT
CKT	CIRCUIT	NO (N.O.)	NORMALLY OPEN
CCTV	CLOSED CIRCUIT T.V.	PB	PULL BOX
CLG	CEILING	PNL	PANEL
CUH	CABINET HEATER	PWR	POWER
EC	EMPTY CONDUIT	R	REMOVE DEVICES
ELEC	ELECTRIC	RL	RELOCATED DEVICE
E	EMERGENCY	RCPT(S) OR RECEPT	RECEPTACLE(S)
EMS	ENERGY MANAGEMENT SYSTEM		
EP	EXPLOSION PROOF	RF	RETURN AIR FAN
EWC	ELECTRIC WATER COOLER	SEF	SMOKE EXHAUST FAN
EX	EXISTING	SF	SUPPLY AIR FAN
F	FUSE	SO (S.O.)	SPACE ONLY
FA	FIRE ALARM	SP	SPARE
FACP, FAP	FIRE ALARM CONTROL PANEL	ST (S.T.)	SHUNT TRIP
FCU	FAN COIL UNIT	SW	SWITCH
FIXT	FIXTURE	TEL	TELEPHONE
FLR	FLOOR	TF	TRANSFER FAN
FLUOR	FLUORESCENT	TP	TAMPER PROOF
FTP, FTS	FAN TERMINAL UNIT	TV	TELEVISION
FTU	FAN TERMINAL UNIT	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
FUT	FUTURE		
G, GND	GROUND (EQUIPMENT)	UF	UNDERFLOOR
GEF	GENERAL EXHAUST FAN	UG	UNDERGROUND
GEN	GENERATOR	UH	UNIT HEATER
GFCI, GFI	GROUND FAULT CIRCUIT INTERRUPTER	UNO (U.N.O.)	UNLESS NOTED OR INDICATED OTHERWISE
HP	HORSE POWER		
HV	HIGH VOLTAGE	V	VOLTAGE
HWAT	HEAT TRACE	VFD	VARIABLE FREQUENCY DRIVE
IC	INTERRUPTING CAPACITY	VP	VAPOR PROOF
ICAND	INCANDESCENT	VV	VARIABLE VOLUME UNIT
IG	ISOLATED GROUND	W	WIRE
JB	JUNCTION BOX	W/	WITH
KEF	KITCHEN EXHAUST FAN	WG	WIRE GUARD
LTG	LIGHTING	WP	WEATHER PROOF
LTS	LIGHTS	WT	WATER TIGHT
LV	LOW VOLTAGE	XFMR	TRANSFORMER
MCB	MAIN CIRCUIT BREAKER	+xx	MOUNTING HEIGHT IN INCHES. AFF UNO.
MDP	MAIN DISTRIBUTION PANEL		

KEY TO GENERAL NOTATIONS AND MOUNTING HEIGHTS

48" AFF INDICATES TO TOP OF DEVICE;
18" AFF INDICATES TO CENTER OF DEVICE;
60" AFF INDICATES TO BOTTOM OF DEVICE;
80" AFF INDICATES TO BOTTOM OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

ARCHITECTURAL ELEVATIONS AND MOUNTING HEIGHTS SHALL TAKE PRECEDENCE OVER VALUES IN THIS SCHEDULE

2 - LEGEND NOTES: DENOTES "SEE LEGEND NOTE NO. 2"

7 - EQUIPMENT (ID) NUMBER FOR FOOD SERVICE EQUIPMENT. REFER TO FOOD SERVICE DOCUMENTS FOR DEFINITION AND REQUIREMENTS.

717629 OR 717629 - EQUIPMENT (ID) NUMBER FOR OWNER PROVIDED EQUIPMENT. REFER TO OWNER'S EQUIPMENT BOOK / FF&E DOCUMENTS FOR DEFINITION AND REQUIREMENTS.

02/E-202 - DENOTES: REFERENCE 2 IN DRAWING (SHEET) E-202

20.4 FEEDER TAG. FEEDER SIZES ARE DETERMINED BY THE FEEDER SCHEDULE ON E-6000.

RSN: 1235013
Permit #: 17-1351383

5613 DTC PARKWAY, SUITE 500
GREENWOOD VILLAGE, CO 80111

REVISIONS

MARK	DESCRIPTION	DATE

TMCA CATH LAB LASER ISOLATION PANEL
1501 S Potamac St,
Aurora, CO 80012

KEYPLAN:

COLORADO LICENSED JONATHAN M. GRANT 48502 8/2/17 PROFESSIONAL ENGINEER

JOB NO.: B1605611	
DATE: 07/24/17	
DRAWN BY: CL	DESIGNED BY: CL
APPROVED BY: JG	CHECKED BY: JG

SHEET TITLE:
ELECTRICAL LEGENDS, GENERAL NOTES, AND ABBREVIATIONS

SHEET TITLE:
E.001

8/2/2017 12:54:02 PM

100% CD

GENERAL NOTES:

A. REFER TO SHEET E.100 FOR LEGENDS, GENERAL NOTES AND ABBREVIATIONS.

LEGEND NOTES:

1 CONNECT CIRCUIT TO 30A LASER OUTLET LOCATED WITHIN EXISTING EQUIPMENT BOOM. RECEPTACLE PROVIDED BY OTHERS.

2 BACKBOX FOR CONNECTION TO REMOTE LINE ISOLATION MONITOR FOR PANEL OP6. REFER TO SPECIFICATIONS FOR REMOTE LIM REQUIREMENTS.

1 LEVEL 01 CATH LAB - POWER PLAN.
1/4" = 1'-0"

Install electrical connections per 2017 NEC 110.14, identify disconnects per 2017 NEC 110.22 and provide working space around electrical equipment per 2017 NEC 110.26.

Indoor installations shall comply with 110.26(E)(1)(a) through (E)(1)(d) of The 2017 NEC.

Code violations that are found during inspection are required to be corrected. Permit issuance does not grant approval of a code violation.

Field Inspection consultation is available upon request. Call 303-739-7420 to request a consultation

Failure to follow approved plans may result in an hourly fee to review the field changes for code compliance.

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: Erick B.
Date: Sep 01, 2017
2015 INTERNATIONAL CODES & 2017 NEC

RSN: 1235013
Permit #: 17-1351383

5613 DTC PARKWAY, SUITE 500
GREENWOOD VILLAGE, CO 80111

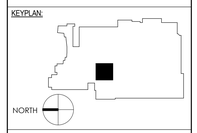
REVISIONS

MARK	DESCRIPTION	DATE

TMCA CATH LAB LASER ISOLATION PANEL

1501 S Potamac St, Aurora, CO 80012

KEYPLAN:



COLORADO LICENSED PROFESSIONAL ENGINEER
JONATHAN M. GRANT
48502
8/2/17

JOB NO.: B1605611
DATE: 08/02/17
DRAWN BY: CL
DESIGNED BY: CL
APPROVED BY: JG
CHECKED BY: JG

SHEET TITLE:
FLOOR PLAN - POWER

SHEET TITLE:
E.201

100% CD

8/2/2017 11:04:35 AM

Service Equipment shall be permanently and legibly marked to show the available fault current and date the calculation was performed. 2017 NEC 110.24(A)(B).

AVAILABLE FAULT CURRENT CALCULATIONS

UTILITY CONTRIBUTION

Utility Fault Current	45200 Amperes	kVA	=	2000
		E	=	480
I = (kVAx1000)/(Ex1.732) = trans FLA		trans FLA	=	2405.697

FAULT CURRENT FROM UTILITY TO MSBA

Feeder: 11 sets 4 # 500
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): PVC
Voltage: 480

Conductor Length (distance)	L	=	150
ASC	ISCA	=	45,200
# conductors per phase	N	=	11
Phase conductor constant	C	=	26706
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	0.083
M = 1/(1+f)	M	=	0.923
ISCA = ISCA x M	ISCA	=	41,725

FAULT CURRENT FROM PANEL MSBA TO SSB

Feeder: 6 sets 4 # 400
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): Steel
Voltage: 480

Conductor Length (distance)	L	=	24
ASC	ISCA	=	41,725
# conductors per phase	N	=	6
Phase conductor constant	C	=	20565
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	0.029
M = 1/(1+f)	M	=	0.972
ISCA = ISCA x M	ISCA	=	40,538

FAULT CURRENT FROM PANEL SSB TO ATS-CR

Feeder: 2 sets 4 # 350
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): Steel
Voltage: 480

Conductor Length (distance)	L	=	24
ASC	ISCA	=	40,538
# conductors per phase	N	=	2
Phase conductor constant	C	=	19703
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	0.089
M = 1/(1+f)	M	=	0.918
ISCA = ISCA x M	ISCA	=	37,222

FAULT CURRENT FROM ATS-CR TO PANEL CR

Feeder: 2 sets 4 # 350
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): Steel
Voltage: 480

Conductor Length (distance)	L	=	8
ASC	ISCA	=	37,222
# conductors per phase	N	=	2
Phase conductor constant	C	=	19703
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	0.027
M = 1/(1+f)	M	=	0.973
ISCA = ISCA x M	ISCA	=	36,234

FAULT CURRENT FROM PANEL CR TO CRCH-H

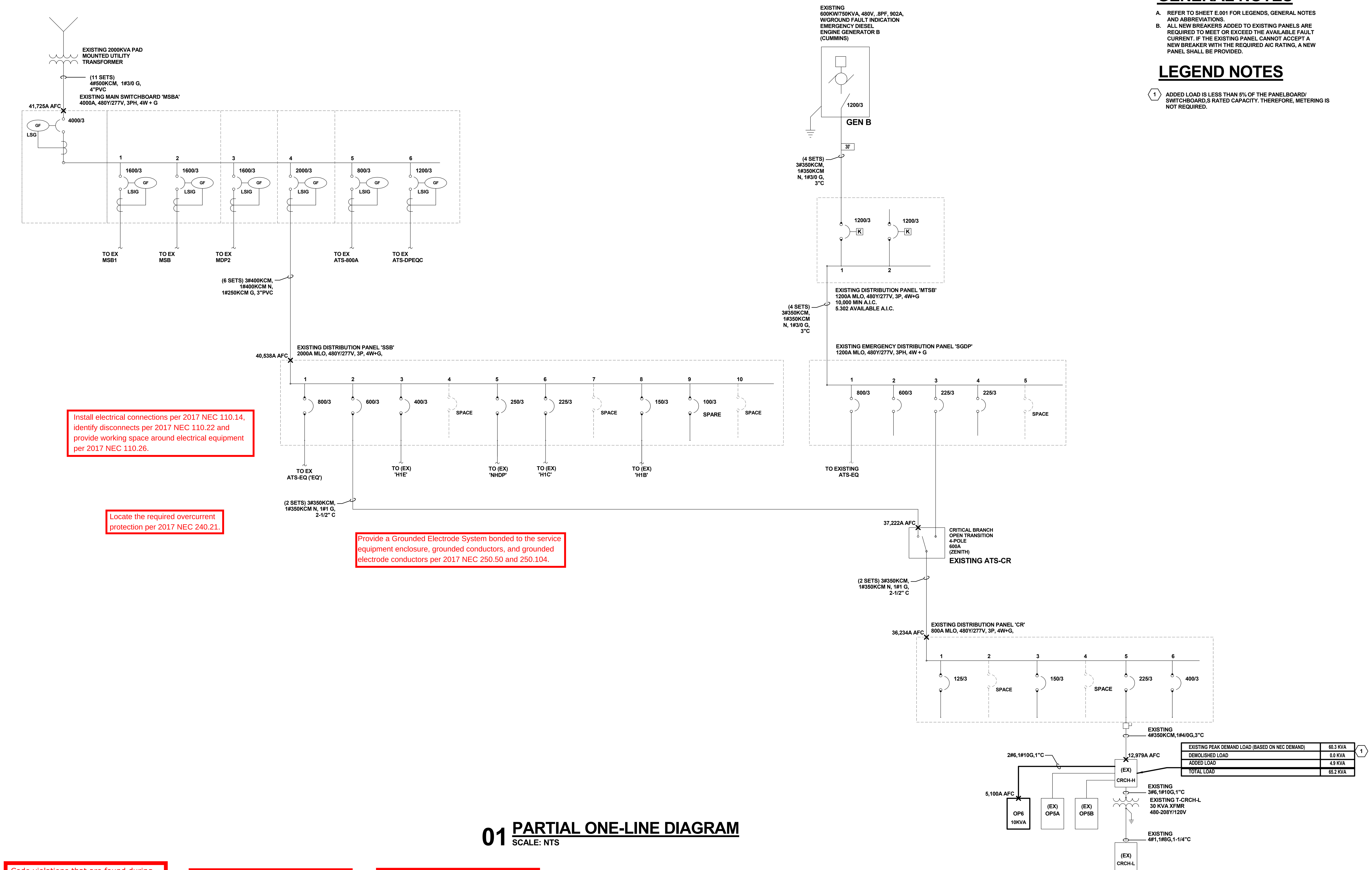
Feeder: 1 sets 4 # 350
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): Steel
Voltage: 480

Conductor Length (distance)	L	=	270
ASC	ISCA	=	36,234
# conductors per phase	N	=	1
Phase conductor constant	C	=	19703
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	1.792
M = 1/(1+f)	M	=	0.358
ISCA = ISCA x M	ISCA	=	12,979

FAULT CURRENT FROM PANEL CRCH-H TO PANELS OP6

Feeder: 1 sets 2 # 6
Conductor (Copper/Aluminum): Copper
Raceway (Steel/Aluminum): Steel
Voltage: 480

Conductor Length (distance)	L	=	80
ASC	ISCA	=	12,979
# conductors per phase	N	=	1
Phase conductor constant	C	=	2425
Voltage L-L	EL-L	=	480
f = (1.732xLxISCA)/(NxCxEL-L)	f	=	1.545
M = 1/(1+f)	M	=	0.393
ISCA = ISCA x M	ISCA	=	5,100



Install electrical connections per 2017 NEC 110.14, identify disconnects per 2017 NEC 110.22 and provide working space around electrical equipment per 2017 NEC 110.26.

Locate the required overcurrent protection per 2017 NEC 240.21.

Provide a Grounded Electrode System bonded to the service equipment enclosure, grounded conductors, and grounded electrode conductors per 2017 NEC 250.50 and 250.104.

GENERAL NOTES

A. REFER TO SHEET E.001 FOR LEGENDS, GENERAL NOTES AND ABBREVIATIONS.
B. ALL NEW BREAKERS ADDED TO EXISTING PANELS ARE REQUIRED TO MEET OR EXCEED THE AVAILABLE FAULT CURRENT. IF THE EXISTING PANEL CANNOT ACCEPT A NEW BREAKER WITH THE REQUIRED AIC RATING, A NEW PANEL SHALL BE PROVIDED.

LEGEND NOTES

1. ADDED LOAD IS LESS THAN 5% OF THE PANELBOARD/ SWITCHBOARD,S RATED CAPACITY. THEREFORE, METERING IS NOT REQUIRED.

01 PARTIAL ONE-LINE DIAGRAM

SCALE: NTS

Code violations that are found during inspection are required to be corrected. Permit issuance does not grant approval of a code violation.

Field Inspection consultation is available upon request. Call 303-739-7420 to request a consultation

Failure to follow approved plans may result in an hourly fee to review the field changes for code compliance.

EXISTING PANEL: CRCH-H. — CRITICAL

LOCATION: CATH 4 CNTRL RM
MAIN BUS: 400A
MCB: N/A
VOLTAGE: 480/277
AIC: EXISTING

FED FROM: CR
WIRES: 4W + G
ENCLOSURE: NEMA 1
BUS TYPE: Copper
MOUNTING: Surface
PANEL LUGS: Main Lugs Only

NEUTRAL BUS: Yes
GROUND BUS: Yes
ISOLATED GROUND BUS: No
200% NEUTRAL: No
FEED THROUGH LUGS: No

CKT NO.	DESCRIPTION	TOTAL LOAD (VA)	CIRCUIT BREAKER AMPS	CIRCUIT BREAKER POLES	PHASE	CIRCUIT BREAKER AMPS	CIRCUIT BREAKER POLES	TOTAL LOAD (VA)	DESCRIPTION	CKT NO
1	EXISTING LOAD	-	30	3	A	45	3	-	EXISTING LOAD	2
3	---	-	-	-	B	-	-	-	---	4
5	---	-	-	-	C	-	-	-	---	6
7	EXISTING LOAD	-	30	3	A	15	3	-	EXISTING LOAD	8
9	---	-	-	-	B	-	-	-	---	10
11	---	-	-	-	C	-	-	-	---	12
13	EXISTING LOAD	-	15	3	A	15	3	-	EXISTING LOAD	14
15	---	-	-	-	B	-	-	-	---	16
17	---	-	-	-	C	-	-	-	---	18
19	EXISTING LOAD	-	20	3	A	45	1	-	EXISTING LOAD	20
21	---	-	-	-	B	45	1	-	EXISTING LOAD	22
23	---	-	-	-	C	*50	1	4992	OP6	24

NOTES:
* INDICATES TO REPLACE EXISTING SPARE CIRCUIT BREAKER WITH NEW BREAKER AS INDICATED.

'CRCH-H.' LOAD SUMMARY

	LTS	RCPTS	HSPTL	MISC	TOTAL (KVA)	TOTAL (AMPS)
TOTAL CONNECTED LOAD	0.0	0.0	0.0	5.0	5.0	6.0
DEMAND FACTOR	SEE DEMAND FACTOR TABLE					
TOTAL DEMAND LOAD	0.0	0.0	0.0	5.0	5.0	6.0
CONTINUOUS (DESIGN) FACTOR	1.25	1.00	1.00	1.00		
TOTAL DESIGN LOAD	0.0	0.0	0.0	5.0	5.0	6.0

PANEL: OP6 — CRITICAL

LOCATION: HALL 6000-03
FED FROM: CRCH-H
INPUT VOLTAGE: 277/1
ISOLATION XFMR: 10KVA
BUS VOLTAGE/PH: 208/1

CKT NO.	DESCRIPTION	TOTAL LOAD (VA)	LOAD (VA) LTS	RCPT	X-RAY	MISC	CIRCUIT BREAKER AMPS	POLES	PHASE	CIRCUIT BREAKER AMPS	POLES	LOAD (VA) LTS	RCPT	X-RAY	MISC	TOTAL LOAD (VA)	DESCRIPTION	CKT NO
1	LASER - CATH	4992				4992	30	2	A	30	2					-	SPARE	2
3	S.O.	-						2	B		2					-	S.O.	4
5	S.O.	-						2	A		2					-	S.O.	6
7	S.O.	-						2	B		2					-	S.O.	8

'OP6' LOAD SUMMARY

	LTS	RCPTS	HSPTL	X-RAY	MISC	TOTAL (KVA)	TOTAL (AMPS)
TOTAL CONNECTED LOAD	0.0	0.0	0.0	0.0	5.0	5.0	24.0
DEMAND FACTOR	SEE DEMAND FACTOR TABLE						
TOTAL DEMAND LOAD	0.0	0.0	0.0	0.0	5.0	5.0	24.0
CONTINUOUS (DESIGN) FACTOR	1.25	1.00	1.00	1.00	1.00		
TOTAL DESIGN LOAD	0.0	0.0	0.0	0.0	5.0	5.0	24.0

Every circuit and circuit modification shall be legibly identified as to it's clear, evident and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. 2017 NEC 408.4

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: Erick B.
Date: Sep 01, 2017
2015 INTERNATIONAL CODES & 2017 NEC

RSN: 1235013
Permit #: 17-1351383

5613 DTC PARKWAY, SUITE 500
GREENWOOD VILLAGE, CO 80111

REVISIONS

MARK	DESCRIPTION	DATE

TMCA CATH LAB LASER ISOLATION PANEL

1501 S Potamac St,
Aurora, CO 80012

KEYPLAN:

COLORADO LICENSED JONATHAN M. GRANT 48502 8/2/17 PROFESSIONAL ENGINEER

JOB NO.: B1605611
DATE: 07/24/17
DRAWN BY: CL
DESIGNED BY: CL
APPROVED BY: JG
CHECKED BY: JG

SHEET TITLE:
ELECTRICAL ONE-LINE DIAGRAM & SCHEUDLES

SHEET TITLE:
E.301

100% CD

8/2/2017 10:42:50 AM