ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

A. WORK SHALL INCLUDE ALL LABOR, EQUIPMENT AND SERVICES REQUIRED TO COMPLETE (MAKE READY FOR OPERATION) ALL THE ELECTRICAL WORK INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

1. 480V, 3 PHASE, 3 WIRE FEEDER AND DISTRIBUTION.

2. FEEDERS AND BRANCH WIRING TO PANELS, RECEPTACLES, EQUIPMENT, LIGHTING FIXTURES, ETC. AS NOTED ON PLANS.

3. POWER AND TEMPERATURE CONTROL WIRING FOR HVAC EQUIPMENT.

a. FURNISH AND INSTALL ALL POWER WIRING FOR ALL HEATING, VENTILATING, PLUMBING AND AIR CONDITIONING, MOTOR AND DEVICES, INDICATED ON THE PLANS OR CALLED FOR IN THIS SPECIFICATION, EITHER ELECTRICAL OR MECHANICAL INCLUDING ALL CONTROL WIRING FOR HVAC AND CHILLER AND PLUMBING.

b. ALL WIRING, BOTH POWER AND CONTROL, FOR SUCH ITEMS AS SYSTEMS COMMAND AND CONTROL MODULE, MOTORIZED DAMPERS, ETC., NOT SPECIFICALLY CALLED FOR IN THE TEMPERATURE CONTROL SPECIFICATIONS, SHALL BE WIRED UNDER THIS DIVISION.

c. CONTROLS (BY DIV. 15) SHALL BE INSTALLED BY DIV. 15 AND WIRED BY THIS CONTRACTOR.

B. FURNISH AND INSTALL 3/4" PLYWOOD BACKBOARD FOR MOUNTING OF POWER/MECHANICAL EQUIPMENT BACKBOARDS SHALL BE PAINTED WITH TWO (2) COATS OF SEMI-GLOSS GRAY FIRE RETARDANT PAINT.

1.02. GENERAL REQUIREMENTS

A. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE MADE IN STRICT ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND REGULATIONS WHICH MAY APPLY AND NOTHING IN THESE DRAWINGS OR SPECIFICATIONS SHALL BE INTERPRETED AS AN INFRINGEMENT OF SUCH CODES OR REGULATIONS.

B. THE ELECTRICAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE COMPLETE INSTALLATION AND COORDINATION OF THE ENTIRE ELECTRICAL SCOPE OF WORK. ALL ACTIVITIES TO BE COORDINATED THROUGH CRRA REPRESENTATIVE, DESIGN ENGINEER AND OTHER AUTHORITIES HAVING JURISDICTION OF TRADES.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND PAY ALL FEES AS MAY BE REQUIRED FOR THE ELECTRICAL WORK AND FOR SCHEDULING OF ALL INSPECTIONS AS MAY BE REQUIRED BY THE LOCAL AUTHORITY.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE BUILDING OWNER FOR NEW AND/OR DEMOLITION WORK INVOLVED.

E. NO MATERIAL OTHER THAN THAT CONTAINED IN THE "LATEST LIST OF ELECTRICAL FITTINGS" APPROVED BY THE UNDERWRITERS' LABORATORIES, SHALL BE USED IN ANY PART OF THE WORK. ALL MATERIAL FOR WHICH LABEL SERVICE HAS BEEN ESTABLISHED SHALL BEAR THE U.L. LABEL.

F. THE CONTRACTOR SHALL GUARANTEE ALL MATERIAL AND LABOR FOR A PERIOD OF ONE YEAR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING WARRANTIES FROM ALL EQUIPMENT MANUFACTURERS FOR SUBMISSION TO THE OWNER.

G. DRAWINGS INDICATE GENERAL ARRANGEMENT OF WORK INCLUDED IN CONTRACT. CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS TO THE LAYOUT OF THE WORK TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND FOR PROPER INSTALLATION OF WORK. CHECK ALL DRAWINGS AND VISIT JOB SITE TO VERIFY SPACE AND TYPE OF CONDITIONS IN WHICH WORK WILL BE DONE, PRIOR TO SUBMITTAL OF BID.

H. THE ELECTRICAL CONTRACTOR SHALL SUPPLY THREE (3) COMPLETE SETS OF APPROVED DRAWINGS, ENGINEERING DATA SHEETS, MAINTENANCE AND OPERATING INSTRUCTION MANUALS FOR ALL SYSTEMS AND THEIR RESPECTIVE EQUIPMENT. THESE MANUALS SHALL BE INSERTED IN VINYL COVERED 3-RING BINDERS AND TURNED OVER TO OWNER'S REPRESENTATIVE ONE (1) WEEK PRIOR TO FINAL PUNCH LIST.

I. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER AND WILL BE SUBJECT TO THE APPROVAL OF THE OWNER'S REPRESENTATIVE.

J. ALL EQUIPMENT AND MATERIALS TO BE INSTALLED SHALL BE NEW, UNLESS OTHERWISE NOTED.

K. BEFORE FINAL PAYMENT, THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF PRINTS, LEGIBLY MARKED IN RED PENCIL TO SHOW ALL CHANGES FROM THE ORIGINAL PLANS.

L. PROVIDE TEMPORARY POWER AND LIGHTING IN WORK AREAS AS REQUIRED.

M. SHOP DRAWINGS

1. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF SHOP DRAWINGS ON ALL EQUIPMENT AND MATERIALS PROPOSED FOR USE ON THIS PROJECT, GIVING ALL DETAILS, WHICH INCLUDE DIMENSIONS, CAPACITIES, ETC.

2. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF ALL TEST REPORTS CALLED FOR IN THE SPECIFICATIONS AND DRAWINGS.

N. CONSTRUCTION ACTIVITIES WILL TAKE PLACE WHILE FACILITY REMAINS IN OPERATION. CONSTRUCTION ACTIVITIES SHALL BE COORDINATED WITH OWNER (CRRA) AND OPERATOR (MDC) AS SHOWN AND AS REQUIRED. THE CONTRACTOR SHALL NOT INTERFERE OR DISRUPT THE SERVICE OPERATION OF THE FACILITY

SECTION 16112

1.01. CONDUIT

A. MINIMUM CONDUIT SIZE FOR BRANCH CIRCUITS, LOW VOLTAGE CONTROL AND ALARM CIRCUITS SHALL BE 3/4".

CONDUITS SHALL BE PROPERLY ATTACHED TO THE WALLS AND CEILINGS AS REQUIRED BY N.E.C.

CONDUIT MATERIAL SHALL BE AS FOLLOWS:

(1) GALVANIZED RIGID CONDUIT (GRC) – FEEDERS AND CIRCUITS INSTALLED EXPOSED IN EXTERIOR AND INTERIOR LOCATIONS.

(2) LIQUID TIGHT FLEXIBLE METAL CONDUIT – FOR SHORT LENGTH (MAX. 6'-0") WIRING TO VIBRATING EQUIPMENT (HVAC UNITS, MOTORS, ETC.) IN WET AND/OR DAMP LOCATIONS.

(3) FLEXIBLE METAL CONDUIT – FOR SHORT LENGTH (MAX. 3'-0") WIRING TO VIBRATING EQUIPMENT IN DRY LOCATIONS.

SECTION 16113

1.01. WIREWAYS

A. 6" X 6" WIREWAY SHALL BE INSTALLED ALONG THE INTERIOR OF THE NEW MECHANICAL ROOM WALL AS SHOWN ON DRAWINGS SHALL BE HOFFMAN MANUFACTURER ENGINEERING CO. OR APPROVED EQUAL.

SECTION 16123

1.01. CONDUCTORS

A. ALL CONDUCTORS SHALL BE TYPE THWN/THHN 75 DEGREE C, 600 VOLT INSULATION.

#12 AWG SHALL BE THE MINIMUM SIZE CONDUCTOR FOR LINE VOLTAGE BRANCH CIRCUITS. REFER TO RISER DIAGRAM AND DRAWING FOR BRANCH CIRCUIT CONSISTENT PHASE IDENTIFICATION PER NEC: CONDUCTORS SHALL BE COLOR CODED FOR 120/240VAC-1 PHASE, 3 WIRE SYSTEM 480VAC-3 PHASE, 3 WIRE SYSTEM

B. MINIMUM BENDING RADIUS FOR CONDUCTORS SHALL BE 12 TIMES THE LARGEST DIAMETER OF BRANCH CIRCUIT CONDUCTOR.

SECTION 16130

1.01. BOXES

A. FURNISH AND INSTALL OUTLET BOXES FOR ALL DEVICES, SWITCHES, RECEPTACLES, ETC.. BOXES TO BE ZINC COATED STEEL.

B. FURNISH AND INSTALL PULL BOXES IN MAIN FEEDERS RUNS WHERE REQUIRED. PULL BOXES SHALL BE GALVANIZED STEEL WITH SCREW REMOVABLE COVERS, SIZE AND QUANTITY AS REQUIRED. PROVIDE WEATHERPROOF CONSTRUCTION IN WET LOCATIONS.

SECTION 16140

1.01. SWITCHES, PLATES AND RECEPTACLES

A. THE FOLLOWING LIST IS PROVIDED TO CONVEY THE QUALITY AND RATING OF WIRING DEVICES WHICH ARE TO BE INSTALLED. A COMPLETE LIST OF ALL DEVICES MUST BE SUBMITTED BEFORE INSTALLATION FOR APPROVAL.

GFCI DUPLEX RECEPTACLE – P&S #2091-S (GFCI) SPECIFICATION GRADE

SINGLE POLE SWITCH – P&S #5021-1 (20A-120V HARD USE) SPECIFICATION GRADE

DUPLEX RECEPTACLE – P&S #5342-1 (20A-120V HARD USE) SPECIFICATION GRADE

B. PLATES – ALL PLATES USED SHALL BE CORROSION RESISTANT TYPE 304 STAINLESS STEEL. PLATES SHALL BE FROM SAME MANUFACTURER AS SWITCHES AND RECEPTACLES. PROVIDE WEATHERPROOF HOUSING FOR DEVICES LOCATED IN WET LOCATIONS.

C. OTHER MANUFACTURERS OF THE SWITCHES, RECEPTACLES AND PLATES MAY BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

SECTION 16170

1.01. DISCONNECT SWITCHES

A. FUSIBLE AND NON-FUSIBLE, 600V, HEAVY DUTY DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY SQUARE "D". PROVIDE FUSES AS CALLED FOR ON THE CONTRACT DRAWINGS. AMPERE RATING SHALL BE CONSISTENT WITH LOAD BEING SERVED. DISCONNECT SWITCH COVER SHALL BE MECHANICALLY INTERLOCKED TO PREVENT COVER FROM OPENING WHEN THE SWITCH IS IN THE "ON" POSITION. EXTERIOR APPLICATIONS SHALL BE NEMA 3R CONSTRUCTION WITH PADLOCK FEATURE.

SECTION 16190

1.01. SEISMIC RESTRAINT

A. ALL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH ZONE 2 SEISMIC REQUIREMENTS.

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

A. CONTRACTOR SHALL FURNISH AND INSTALL NON-METALLIC ENGRAVED BAKELITE NAMEPLATES ON ALL PANELS AND MAJOR ITEMS OF ELECTRICAL EQUIPMENT.

B. LETTERS TO BE WHITE ON BLACK BACKGROUND WITH LETTERS 1-1/2 INCH HIGH WITH 1/4 INCH MARGIN.

C. ALL RECEPTACLES, SWITCHES, DISCONNECT SWITCHES, ETC. SHALL BE LABELED WITH THE CORRECT BRANCH CIRCUIT NUMBER SERVED BY MEANS OF PERMANENT PRESSED TYPE BLACK 1/4" TRANSFER LETTERING. (FOR EXAMPLE: "MDP-5", "AHU#1", ETC.).

SECTION 16450

1.01. GROUNDING

A. ALL NON-CURRENT CARRYING PARTS OF THE ELECTRICAL AND TELEPHONE CONDUIT SYSTEMS SHALL BE MECHANICALLY AND ELECTRICALLY CONNECTED TO PROVIDE AN INDEPENDENT RETURN PATH TO THE EQUIPMENT GROUNDING SOURCES.

B. GROUNDING SYSTEM WILL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND LOCAL INSPECTOR HAVING JURISDICTION.

C. GROUNDING OF PANELBOARDS:

1. CONDUIT(S) TERMINATING INTO THE PANELBOARD SHALL HAVE GROUNDING TYPE BUSHINGS. THE BUSHINGS SHALL BE BONDED TOGETHER WITH BARE #12 AWG COPPER CONDUCTOR WHICH IN TURN IS TERMINATED INTO THE PANELBOARD'S EQUIPMENT GROUND BAR KIT(S).

D. EQUIPMENT GROUNDING CONDUCTOR:

1. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122.

2. EQUIPMENT GROUND CONDUCTORS SHALL BE AS REQUIRED BY NEC.

3. EACH FEEDER OR BRANCH CIRCUIT SHALL HAVE EQUIPMENT GROUND CONDUCTOR(S) INSTALLED IN THE SAME RACEWAY(S).

SECTION 16477

1.01. FUSES

A. FUSES SHALL BE NON-RENEWABLE TYPE AS MANUFACTURED BY "BUSSMAN" OR APPROVED EQUAL. FUSES RATED 1/10 AMPERE UP TO 600 AMPERES SHALL BE EQUIVALENT TO BUSSMAN TYPE LPN-RK(600V) UL CLASS RK1, LOW PEAK, DUAL ELEMENT, TIME-DELAY FUSES. FUSES SHALL HAVE SEPARATE SHORT CIRCUIT AND OVERLOAD ELEMENTS AND HAVE AN INTERRUPTING RATING OF 200 KAIC. UPON COMPLETION OF WORK PROVIDE ONE SET OF FUSES FOR EACH TYPE INSTALLED.

SECTION 16500

1.01. LIGHTING FIXTURES

CL1. COOPER LIGHTING – METALUX SERIES ENERGY EFFICIENT INDUSTRIAL VAPORITE FIXTURE FULL METAL FIXTURE HOUSING. IMPACT DIFFUSER SUITABLE FOR INTERIOR APPLICATIONS AND CAN BE SURFACE OR CHAIN MOUNTED IN ENVIRONMENTS WHERE DUST OR CORROSIVE FUMES ARE PRESENT. 4' – VT2-232DR-120/277V (UNIVERSAL) EB81-U

EM1. LITHONIA EMERGENCY LITE – 6ELM2 6 VOLT SELF CONTAINED. ENGINEERING GRADE WHITE THERMO PLASTIC. HIGH IMPACT TWO 7.2 WATT T-5 WEDGE BASE TUNGSTEN LAMPS, DUEL VOLTAGE 120/277V. 24 HOUR BATTERY RECHARGE AND ENSURES A FULL 90 MINUTE DISCHARGE MEETS UL924, NFPA 101, NFPA 70 AND 3 YEAR WARRENTY.

CONSTRUCTION NOTES:

1. EXAMINATION OF SITE:

1.1 IT IS NOT THE INTENT OF THE DOCUMENTS TO SHOW ALL EXISTING CONDITIONS. ALL CONTRACTORS ARE ADVISED TO VISIT AND EXAMINE THE SITE PRIOR TO SUBMITTING BIDS.

1.2 CONTRACTORS SHALL INVESTIGATE AND SATISFY THEMSELVES AS TO THE CONDITIONS AFFECTING THE WORK. THE CONTRACTOR SHALL FURTHER SAFISFY THEMSELVES AS TO THE CHARACTER, QUALITY AND QUANTITY OF SURFACE AND SUBSURFACE MATERIALS OR OBSTACLES TO BE ENCOUNTERED INSOFAR AS THIS INFORMATION IS REASONABLY ASCERTAINABLE FROM EXAMINING THE SITE AS WELL AS FROM INFORMATION PRESENTED BY THE CONTRACT DOCUMENTS. ANY FAILURE BY THE CONTRACTOR TO ACQUAINT THEMSELVES WITH THE AVAILABLE INFORMATION SHALL NOT RELIEVE THEM FROM THE RESPONSIBILITY FOR ESTIMATING PROPERLY THE DIFFICULTY AND COST OF SUCCESSFULLY PERFORMING THE WORK.

1.3 CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD.

2. THE SPECIFICATIONS AND DRAWINGS ARE INTENDED TO DESCRIBE AND ILLUSTRATE THE MATERIALS AND LABOR NECESSARY FOR WORK ON THIS PROJECT.

3. SCHEDULE CONSTRUCTION OPERATIONS IN THE SEQUENCE REQUIRED TO OBTAIN THE BEST RESULTS WHERE THE INSTALLATION OF ONE PART OF THE WORK DEPENDS ON INSTALLATION OF OTHER COMPONENTS, BEFORE OR AFTER ITS OWN INSTALLATION. MAKE PROVISIONS TO ACCOMODATE ITEMS SCHEDULED FOR LATER INSTALLATION.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES EMPLOYED IN THE PERFORMANCE OF THEIR WORK AND SHALL HAVE FULL RESPONSIBILITY FOR THEIR FAILURE TO CARRY OUT ANY PART OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

5. MAINTAIN THE EXISTING BUILDING IN A WEATHER-TIGHT CONDITION THROUGHOUT THE CONSTRUCTION PERIOD. REPAIR DAMAGE CAUSED BY CONSTRUCTION OPERATIONS. TAKE ALL PRECAUTIONS NECESSARY TO PROTECT THE BUILDING AND ITS OCCUPANTS DURING THE CONSTRUCTION PERIOD.

6. PROTECT EXISTING CONSTRUCTION DURING CUTTING AND PATCHING TO PREVENT DAMAGE. PROVIDE PROTECTION FROM ADVERSE WEATHER CONDITIONS FOR PORTIONS OF THE WORK THAT MIGHT BE EXPOSED DURING CUTTING AND PATCHING OPERATIONS.

7. CLEAN AND PROTECT CONSTRUCTION IN PROGRESS AND ADJOINING MATERIALS IN PLACE, DURING HANDLING AND INSTALLATION. APPLY PROTECTIVE COVERINGS, WHERE REQUIRED, TO ASSURE PROTECTION FROM DAMAGE OR DETERIORATION.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE PREMISES CLEAN AND SHALL PICK UP RUBBISH AND DEBRIS AT THE END OF EACH DAY.

SYMBOLS

SYMBOL	DESCRIPTION
	ELECTRIC MOTOR (ID TAG AS INDICATED)
	FUSED DISCONNECT SWITCH
	MOTOR CONTROLLER
J	JUNCTION BOX – SIZE PER NEC
J N3	JUNCTION BOX – SIZE PER NEC – NEMA SIZE DENOTED
	BRANCH CIRCUIT WIRING – WIRE & CONDUIT SIZE AS INDICATED
	ELECTRICAL FINAL CONNECTION TO EQUIPMENT
LP2B-5	ELECTRICAL HOMERUN. 2#12 & 1#12G IN 3/4"C UON. PANELBOARD AND CIRCUIT # INDICATED.
X	PENDANT/CHAIN HUNG INDUSTRIAL FLUORESCENT LUMINAIRE FIXTURE TYPE DENOTED. SEE SPECIFICATION FOR FIXTURE TYPE AND DETAILED DESCRIPTION.
X1	SURFACE MOUNTED EMERGENCY LIGHT. FIXTURE TYPE DENOTED. SEE SPECIFICATION FOR FIXTURE TYPE & DETAILED DESCRIPTION.
S_M	SINGLE POLE MECHANICAL GRADE WALL SWITCH
S	SINGLE POLE WALL SWITCH
	DUPLEX RECEPTACLE @ 18" AFF, UNLESS OTHERWISE NOTED.
GFI	GROUND FAULT INTERRUPTER DUPLEX RECEPTACLE MOUNTED TO MECHANICAL EQUIPMENT (UNLESS OTHERWISE NOTED).
	DDC CONTROL PANEL (DIV.15)
	PANELBOARD – 208/120V
	PANELBOARD – 480/277V
	ELECTRICAL GRC CONDUIT RACEWAY 3/4"C (UNLESS OTHERWISE NOTED)
CCM	SYSTEM COMMAND AND COMMUNICATION MODULE (BY DIV 15) "STRION AIR"
MD	MOTORIZED DAMPER (BY DIV 15)

ABBREVIATIONS

ABBREVIATION	EXTENSION
A	AMPERE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
C	CONDUIT
C/B	CIRCUIT BREAKER
E.C.	ELECTRICAL CONTRACTOR
G	GROUND
G.C.	GENERAL CONTRACTOR
GRC	GALVANIZED RIGID CONDUIT
KV	KILO-VOLT
KVA	KILO-VOLT-AMPERE
KW	KILO-WATT
MCC	MOTOR CONTROL CENTER
NEC	NFPA 70, NATIONAL ELECTRICAL CODE
TD	TIME DELAY
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VA	VOLT-AMPERE
W	WATT
WP	WEATHERPROOF

PROJECT NORTH

CONNECTICUT RESOURCES RECOVERY AUTHORITY
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A&E FIRM

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A&E SEAL

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REVISIONS

NUMBER	DATE	REMARKS

CONTROL ROOM HVAC SYSTEMS IMPROVEMENT

300 MAXIM ROAD
HARTFORD, CT.

PROJECT NO:	36937520.00001
DRAWN BY:	JCD
CHECKED BY:	LMM
DATE:	04/28/08
CADD FILE:	AS NOTED

CONTROL ROOM/ VISITOR AREA ELECTRICAL SYMBOLS & NOTES

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