

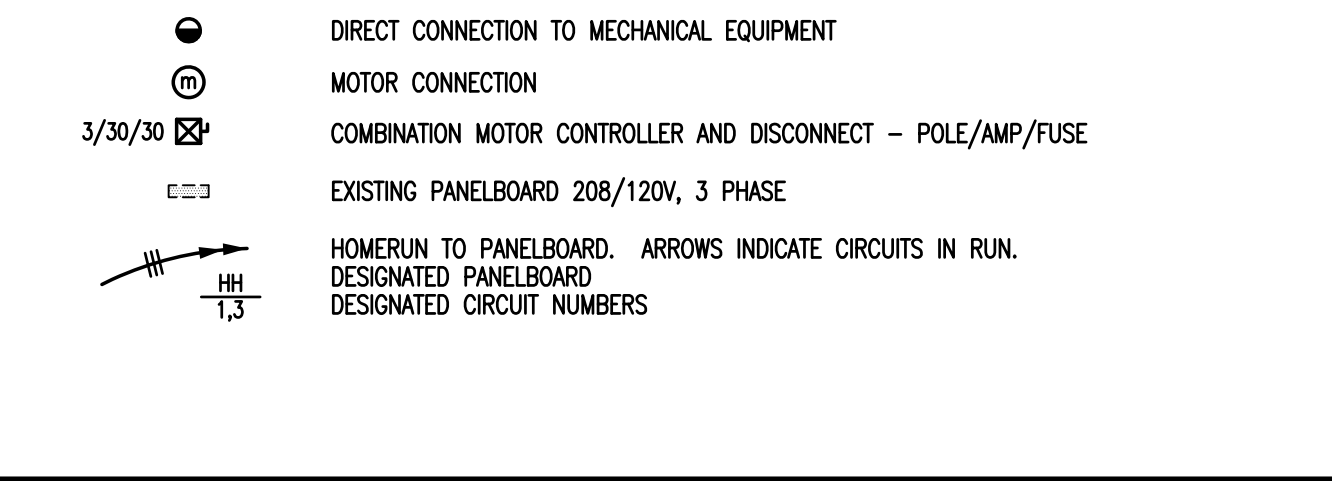
ELECTRICAL GENERAL SPECIFICATION

- I. GENERAL
- A. BASIC MATERIALS AND METHODS
- GENERAL: THE WORK INCLUDES ALL LABOR, MATERIALS, EQUIPMENT, DEVICES, PERMITS, PAYMENT OF ALL FEES AND ALL OTHER OPERATIONS NECESSARY FOR THE INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEM INDICATED OR SPECIFIED. TAKE INTO ACCOUNT ALL FACTORS AND CONDITIONS AFFECTING ELECTRICAL WORK INDICATED ON THE ASSOCIATED MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
 - CODES: COMPLY WITH THE 2020 NATIONAL ELECTRICAL CODE, 2020 NATIONAL ELECTRICAL SAFETY CODE, AND LOCAL CODES, ORDINANCES AND REGULATIONS, EXCEPT WHERE PLANS OR SPECIFICATIONS ARE STRICTER.
 - PERMITS: OBTAIN ALL REQUIRED PERMITS AND INSPECTIONS AND PAY ALL ASSOCIATED FEES UNDER THIS SECTION OF THE SPECIFICATION WITHOUT ADDITIONAL COST TO THE OWNER.
 - TEST: UPON COMPLETION OF WORK AND ADJUSTMENT OF EQUIPMENT, TEST ALL SYSTEMS UNDER DIRECTION OF THE OWNER. TEST FOR SHORT CIRCUITS, GROUNDS AND FUNCTIONAL PERFORMANCE.
 - MATERIALS: ALL MATERIALS AND EQUIPMENT SHALL BE NEW, OF FIRST CLASS QUALITY AND APPROVED UNDER APPLICABLE STANDARDS. ALL MATERIALS FOR WHICH "U.L." LABELING SERVICE IS ESTABLISHED SHALL BEAR THE "U.L." LABEL.
 - THE OWNER RESERVES THE RIGHT TO REJECT ANY MATERIAL OR WORK IF, IN HIS OPINION, IT IS NOT IN STRICT ACCORDANCE WITH THE CONTRACT DOCUMENTS.
 - GROUNDING: PROPERLY GROUND ALL ELECTRICAL EQUIPMENT IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN THE NEC.
 - BIDDERS ARE CAUTIONED TO VISIT THE SITE PRIOR TO THE PREPARATION OF THEIR BID.
 - COORDINATE ALL EQUIPMENT LOCATIONS, MOUNTING HEIGHTS, ETC., WITH MECHANICAL DRAWINGS. NOTIFY ENGINEER OF ANY CONFLICTS PRIOR TO INSTALLATIONS.
 - CERTIFICATES: PROVIDE THE OWNER WITH FINAL ELECTRICAL INSPECTION CERTIFICATE.
 - ALL DIMENSIONS ARE ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
 - ALL PANELBOARDS AND ELECTRICAL EQUIPMENT ARE EXISTING UNLESS OTHERWISE NOTED.
 - THE CONTRACTOR SHALL PROVIDE NEW TYPEWRITTEN CIRCUIT SCHEDULES ON PANEL DOOR. SCHEDULE SHALL CONTAIN CIRCUIT NUMBER, RESPECTIVELY TO CIRCUIT BREAKER NUMBER, EQUIPMENT DESIGNATION, AND ROOM NUMBER.
 - THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE IN WRITING AS TO THE CONSTRUCTION SCHEDULE TO ALLOW SUFFICIENT TIME FOR COORDINATION OF EXISTING BUILDING ACTIVITIES WITH THE WORK.
 - THE CONTRACTOR SHALL PROVIDE O&M DOCUMENTS AFTER PROJECT COMPLETION.
- II. EQUIPMENT
- A. RACEWAYS
- ELECTRICAL METALLIC TUBING: ANSI-80.3; NEPCO, WALKER, YOUNGSTOWN, REPUBLIC, OR PITTSBURGH. USE COMPRESSION TYPE CONNECTORS AND COUPLING OF ALL STEEL, RAIN-TIGHT, NYLON INSULATED, THROAT TYPE; T & B OR STEEL CITY FOR SIZES THROUGH 2 INCHES.
 - FLEXIBLE METALLIC CONDUIT: GALVANIZED, NATIONAL FLEXSTEEL.
 - LIQUID-TIGHT FLEXIBLE CONDUIT: ANACONDA "SEAL-TITE" WITH NYLON INSULATED, THROAT TYPE CONNECTORS; T & B SERIES 533L.
- B. WIRE
- ALL WIRE AND CABLE SHALL BE COPPER THW OR THHN, COLOR CODED PER I.E.C., UNLESS OTHERWISE NOTED. MINIMUM WIRE SIZE SHALL BE #12 AWG. HOMERUNS GREATER THAN 100 FEET IN LENGTH SHALL BE #10 AWG MINIMUM.
- C. JUNCTION AND PULL BOXES
- INSTALL JUNCTION OR PULL BOXES WHEREVER REQUIRED TO FACILITATE WIRE PULLING OR CONNECTION. FABRICATE BOXES FROM CODE GAUGE MINIMUM GALVANIZED STEEL AND EQUIP WITH SCREW COVER. LABEL CIRCUITS INSIDE EACH BOX AND ON COVER EXTERIOR WITH ONE-HALF INCH HIGH STENGLED LETTERS.
- D. PANELBOARDS
- PANELBOARDS ARE EXISTING TO REMAIN.
 - BRANCH CIRCUIT OVERCURRENT PROTECTIVE DEVICES SHALL BE BOLT-ON MOLDED CASE CIRCUIT BREAKERS. BRANCH CIRCUIT OVERCURRENT PROTECTIVE DEVICES SHALL ALSO MEET NEMA, ANSI, IEEE, AND U.L. STANDARD PUBLICATIONS. WHERE "EQUIPPED SPACE" OR "SPACE" IS CALLED FOR ON PANEL SCHEDULE, PROVIDE NECESSARY BUS, DEVICE SUPPORTS, AND CONNECTIONS FOR FUTURE DEVICES. PROVIDE TYPE-WRITTEN SCHEDULE OF ALL BRANCH CIRCUIT AND FEEDER CONNECTIONS IN FRAME OR INSIDE DOOR OF EACH PANEL DOOR UNDER PLASTIC COVER.
 - SEE PANELBOARD SCHEDULE FOR MINIMUM KA RATINGS.
- III. SAFETY SWITCHES
- HEAVY DUTY, FRONT OPERATED TYPE, WITH NUMBER OF POLES, FUSES, AND CAPACITIES AS INDICATED. INTERLOCK FRONT COVER WITH SWITCH. VOLTAGE RATINGS: 250 OR 600 VOLTS TO SUIT CIRCUIT VOLTAGE APPLICATION. PROVIDE NEMA 3R ENCLOSURES FOR WEATHER-PROOF SWITCHES AND NEMA 1 ENCLOSURE ELSEWHERE, EXCEPT AS OTHERWISE NOTED.
 - SWITCHES SHALL BE CAPABLE OF WITHSTANDING AVAILABLE FAULT CURRENT OR LET-THROUGH CURRENT BEFORE FUSE OPERATES WITHOUT DAMAGE OR CHANGE IN RATING. DESIGN AND COORDINATE FUSE CLIPS TO ACCOMMODATE CLASS AND TYPE OF FUSE SPECIFIED OR INDICATED TO BE USED WITH SWITCH.
 - ARRANGE SWITCHES FOR PADLOCKING IN "OPEN" POSITION.
 - ACCEPTABLE MANUFACTURERS: SQUARE D, GENERAL ELECTRIC, SIEMENS, OR CUTLER-HAMMER.
- IV. EXECUTION
- A. WIRING METHODS
- INSTALL WIRING IN METAL RACEWAY EXCEPT WHERE ARMOR CLAD CABLE IS SPECIFIED. SIZE RACEWAYS AS REQUIRED BY NATIONAL ELECTRICAL CODE, EXCEPT WHERE LARGER SIZES ARE INDICATED OR SPECIFIED. MINIMUM RACEWAY SIZE UNLESS OTHERWISE NOTED: 3/4-INCH. CONCEAL WIRING AS NECESSARY TO MEET REQUIREMENTS FOR FLUSH OUTLETS. MAKE WALL OUTLETS FLUSH.
 - FOR WIRING EXPOSED OR CONCEALED IN DRY CONSTRUCTION, USE EMT EXCEPT WHERE ANOTHER WIRING METHOD IS INDICATED OR SPECIFIED. USE EMT FOR ALL FEEDER RUNS.

ELECTRICAL ABBREVIATIONS

A.F.F.	ABOVE FINISHED FLOOR	HW	HOT WATER HEATER
A/C	AIR CONDITIONING UNIT	INCAN.	INCANDESCENT
AHU	AIR HANDLING UNIT	IG	ISOLATED GROUND
AL	ALUMINUM	KV	KILOVOLT
A.W.G.	AMERICAN WIRE GAUGE	KVA	KILOVOLT AMPERES
A	AMPERE	KW	KILOWATTS
A.L.C.	AMPERE INTERRUPTING CAPACITY	LTC	LIGHTING
ARCH.	ARCHITECT	MCB	MAIN CIRCUIT BREAKER
A.T.S.	AUTOMATIC TRANSFER SWITCH	MDF	MAIN DISTRIBUTION PANEL
BKGD.	BACKBOARD (PLYWOOD)	MLO	MAIN LUGS ONLY
BBH	BASEBOARD HEATER	MECH.	MECHANICAL
C	CIRCUIT	MV	MERCURY VAPOR
CB	CIRCUIT BREAKER	MH	METAL HALIDE
CKT	CIRCUIT	MCA	MINIMUM CIRCUIT AMPS
CLG	CEILING	MCC	MOTOR CONTROL CENTER
CP	CURRENT TRANSFORMER	MNTD.	MOUNTED
CT	CURRENT TRANSFORMER	N.E.C. OR NEC	NATIONAL ELECTRICAL CODE
CU	COPPER	N.F. OR NF	NON FUSED
Δ	DELTA	NA OR N/A	NOT APPLICABLE
DEMO.	DEMOLITION	N.I.C.	NOT IN CONTRACT
DISC.	DISCONNECT	PNL	PANELBOARD
DSL.	DOUBLE	PH	PENTHOUSE
DWG	DRAWING	Φ	PHASE
DH	DUCT HEATER	PLBS	PLUMBING
E.W.C.	ELECTRIC WATER COOLER	P	POLE(S)
ELEC.	ELECTRICAL	RECEPT.	RECEPTACLE
EMER OR E	EMERGENCY	RLA	RUNNING LOAD AMPS
GEN.	EMERGENCY GENERATOR	SCJ	SELF CONTAINED UNIT
EW	EMERGENCY WHITE (LIGHT)	SH	SHEET
E.C.	EMPTY CONDUIT	SW	SWITCH
EXIST.	EXISTING	SWBD.	SWITCHBOARD
EXT.	EXTERIOR	TELE.	TELEPHONE
FAN	FAN	TRNSFR.	TRANSFORMER
FAN COIL UNIT	FAN COIL UNIT	UH	UNIT HEATER
FA	FIRE ALARM	U.O.N.	UNLESS OTHERWISE NOTED
FAN	FIRE ALARM ANNUNCIATOR	VAV	VARIABLE AIR VOLUME
FAC	FIRE ALARM CONTROL PANEL	VD	VARIABLE FREQUENCY DRIVE
FATC	FIRE ALARM TERMINAL CABINET	V	VOLTS
FLUOR.	FLUORESCENT	WH	WALL HEATER
F.S.S.	FUSED SAFETY SWITCH	W	WATTS
G OR GND	GROUND	WP	WEATHERPROOF
GT	GROUND FAULT INTERRUPTING	WSA	WIRE SIZING AMPS
HLD.	HIGH INTENSITY DISCHARGE	W/	WITH
HPS	HIGH PRESSURE SODIUM	W/O	WITHOUT
HP	HORSEPOWER	Y	WYE

ELECTRICAL SYMBOLS LIST



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REVISIONS	
DATE	DESCRIPTION
03/31/22	ISSUED FOR REVIEW
09/13/22	BID SET

Sheet Title:
ELECTRICAL COVER SHEET

DRAWING INDEX	
E001	ELECTRICAL COVER SHEET
E201	ELECTRICAL PENTHOUSE NEW WORK PLAN
E501	ELECTRICAL PANELBOARD SCHEDULES

Job: 2022-1254-00 | Sheet No.
 Scale:
 VARIES
 Drawn: AMM
 Checked: DCU
E001

SPECIFICATIONS

A. GENERAL REQUIREMENTS

- THESE NOTES APPLY TO ALL MECHANICAL WORK FOR THIS PROJECT. CONTRACTOR SHALL COORDINATE ALL REQUIREMENTS HEREIN WITH ALL TRADES AFFECTED BY THIS WORK.
- REVIEW THE DRAWINGS FOR NOTES, DIMENSIONS, ETC., AND COORDINATE WITH OTHER TRADES INVOLVED. CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL SPACE CONDITIONS BEFORE INSTALLATION OF ANY TRADES. IF CONTRACTOR ALLOWS ONE TRADE TO INSTALL HIS WORK PRIOR TO COORDINATION WITH THE OTHER TRADES, THE CONTRACTOR SHALL MAKE ALL NECESSARY CHANGES REQUIRED TO CORRECT THE CONDITIONS AT NO ADDITIONAL COST TO THE OWNER. NOTIFY ENGINEER OF CONFLICTS BEFORE PROCEEDING WITH WORK.
- DRAWINGS SHALL BE CONSIDERED TO BE DIAGRAMMATIC ONLY. DRAWINGS ARE GENERALLY TO SCALE AND ARE DRAWN AS ACCURATELY AS SCALE WILL PERMIT; HOWEVER, CONTRACTOR SHALL DETERMINE ALL CRITICAL DIMENSIONS IN THE FIELD. DRAWINGS ARE NOT ERECTION DRAWINGS AND DO NOT INDICATE EVERY FITTING, ELBOW, OFFSET, ETC. COORDINATION WITH EXISTING STRUCTURE AND OTHER TRADES IS REQUIRED TO COMPLETE THE JOB.
- REPORT ANY ALTERATION TO AND/OR DEVIATIONS FROM THE DRAWINGS TO THE OWNER AND SECURE THEIR APPROVAL BEFORE STARTING ANY ALTERATIONS.
- INSPECT EXISTING EQUIPMENT, OWNER-FURNISHED EQUIPMENT, AND MATERIALS PRIOR TO STARTING WORK TO VERIFY CONDITION.
- PERFORM THE WORK IN ACCORDANCE WITH ALL APPLICABLE LOCAL AND NATIONAL CODES. OBTAIN WRITTEN PERMISSION FROM OWNER TO INTERRUPT UTILITIES, EXISTING LIFE SAFETY SYSTEMS, AND OTHER SERVICES.
- ALL WORK THAT AFFECTS THE EXISTING ROOF SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE CURRENT ROOFING SYSTEM MANUFACTURER'S RECOMMENDATIONS, TO PRESERVE THE ROOF WARRANTY. FAILURE TO DO SO WILL RESULT IN THE CORRECTION OF ALL DEFICIENCIES BY THE OWNER, THE COSTS OF WHICH WILL BE DEDUCTED FROM THE AMOUNTS OWED TO THE CONTRACTOR.

B. SUBMITTALS AND PROJECT CLOSE OUT

- SUBMIT 4 COPIES OF PRODUCT AND CAPACITY DATA FOR EQUIPMENT TO THE ENGINEER AS DIRECTED BEFORE ORDERING EQUIPMENT. PROVIDE INFORMATION ELECTRONICALLY IN PDF FORMAT.
- WARRANTY: ALL EQUIPMENT, LABOR AND MATERIALS PROVIDED SHALL HAVE A FULL ONE YEAR WARRANTY. CONTRACTOR SHALL PROVIDE LABOR AND MATERIALS REQUIRED TO CORRECT DEFICIENCIES DURING THE WARRANTY PERIOD. SUBMIT WARRANTY CERTIFICATES TO TENANT AND/OR BUILDING OWNER FOR RECORD PURPOSES.
- PRODUCT DATA TO BE SUBMITTED SHALL BE PUBLISHED BY THE MANUFACTURER AND SHALL CONTAIN COMPLETE AND DETAILED ENGINEERING AND DIMENSIONAL INFORMATION. PRODUCT DATA SUBMITTED SHALL CONTAIN ONLY INFORMATION RELEVANT TO THE PARTICULAR EQUIPMENT OR MATERIAL TO BE FURNISHED. THE CONTRACTOR SHALL NOT SUBMIT CATALOGS WHICH DESCRIBE SEVERAL DIFFERENT ITEMS IN ADDITION TO THOSE ITEMS TO BE USED, UNLESS ALL RELEVANT INFORMATION IS MARKED OUT OR UNLESS RELEVANT INFORMATION IS CLEARLY MARKED. PRODUCT DATA FROM EACH MANUFACTURER SHALL BE IDENTIFIED AND SUBMITTED SEPARATELY.
- THE CONTRACTOR SHALL PROVIDE ONE COPY OF OPERATING INSTRUCTIONS AND MAINTENANCE DATA BOOKS FOR ALL NEW EQUIPMENT FURNISHED. MAINTENANCE INSTRUCTION MANUALS SHALL INCLUDE COMPLETE OILING, CLEANING, AND SERVICING DATA COMPILED IN A CLEAR AND EASILY UNDERSTANDABLE FORM. THE MANUALS SHALL ALSO INCLUDE LISTS OF REPLACEMENT PARTS, MOTOR RATINGS, AND ACTUAL LOADS. INCLUDE THE FOLLOWING WHERE APPLICABLE:
 - IDENTIFYING NAME AND MARK NUMBER.
 - LOCATIONS (WHERE SEVERAL SIMILAR ITEMS ARE USED, PROVIDE A LIST).
 - COMPLETE NAMEPLATE DATA.
 - PARTS LIST.
 - PERFORMANCE CURVES AND DATA.
 - WIRING DIAGRAMS.
 - LUBRICATION CHARTS.
 - INSTALLATION INSTRUCTIONS.
 - MANUFACTURER'S START UP DOCUMENTATION.
 - MANUFACTURER'S RECOMMENDED OPERATING AND MAINTENANCE INSTRUCTIONS WITH ALL NON-APPLICABLE INFORMATION DELETED.
- CLEANING: THE CONTRACTOR SHALL AFTER SATISFACTORY COMPLETION OF ALL PRESSURE TESTS AND AFTER TEMPORARY OPERATION, PROPERLY CLEAN EVERY PIECE OF APPARATUS FURNISHED UNDER THIS CONTRACT UPON COMPLETION OF THE WORK.
- AT PROJECT COMPLETION, PROVIDE TWO (2) COMPLETED ELECTRONIC COPIES OF THE APPROVED SUBMITTALS IN PDF FORMAT.

C. PENETRATIONS

- PROVIDE 18 GAGE GALVANIZED SHEET METAL SLEEVES FOR ALL PIPE AND DUCT PENETRATIONS THROUGH EXISTING MASONRY WALLS. PACK VOID SPACE WITH U.L. LISTED 3M OR DOW CAULK-TYPE FIREPROOF AND WATERPROOF SEALANT.
- SEAL, CAULK, AND PROVIDE FIRE STOP AROUND ALL OPENINGS, PENETRATIONS, AND SLEEVES THROUGH FIRE RATED WALLS, FLOORS, PARTITIONS, CEILING, ETC. U.L. LABELED AND LISTED FIRE RATED MATERIALS, FIRE STOPS, ETC. SHALL BE USED IN ACCORDANCE WITH THIS REQUIREMENT AND OTHER SPECIFICATION SECTIONS.
- ALL ROOF MODIFICATIONS SHALL BE PERFORMED IN ACCORDANCE WITH THE ROOFING MANUFACTURER'S RECOMMENDATIONS, SO THAT THE ROOFING SYSTEM WARRANTY WILL BE MAINTAINED. SUBMIT INSTALLATION AND FLASHING DETAILS TO ARCHITECT FOR APPROVAL.

D. DEMOLITION

- GENERAL:
 - THE GENERAL EXTENT OF EXISTING MECHANICAL WORK TO BE DISMANTLED AND REMOVED IS INDICATED ON THE DRAWINGS.
 - ALL COMPONENTS OF SYSTEMS AND EQUIPMENT ARE NOT IDENTIFIED INDIVIDUALLY WHERE ITEMS ARE TO BE REMOVED. UNLESS OTHERWISE INDICATED, REMOVE ALL ASSOCIATED VALVES, ELECTRICAL COMPONENTS, PIPING, HANGERS, INSULATION, PLATFORMS, BASES, AND ALL OTHER ITEMS RELATED TO EQUIPMENT AND MATERIALS INDICATED TO BE REMOVED.
 - WHERE NOT SURE WHETHER A PARTICULAR ITEM IS TO BE REMOVED, REQUEST CLARIFICATION FROM THE OWNER'S REPRESENTATIVE PRIOR TO STARTING WORK.
- DISPOSITION: UNLESS OTHERWISE INDICATED, ALL ITEMS AND MATERIAL INDICATED TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF OFF-SITE.
- PROTECTION: PROTECT FROM DAMAGE ALL EXISTING WORK TO REMAIN AND NEW WORK. REPLACE WITH MATERIALS AND EQUIPMENT CONFORMING TO THESE SPECIFICATIONS. ANY EXISTING-TO-REMAIN MATERIALS AND EQUIPMENT DAMAGED DURING THE COURSE OF THE WORK, TERMINATIONS AND PATCHING:
 - DISCONNECT EXISTING-TO-BE-REMOVED DUCTWORK AND PIPING FROM EXISTING-TO-REMAIN AT THE POINTS INDICATED. IF NOT INDICATED, VERIFY POINT WITH THE OWNER'S REPRESENTATIVE PRIOR TO DISCONNECTION.
 - WHERE EXISTING FLOORS, WALLS AND ROOFS MUST BE CUT OR ARE DAMAGED DURING REMOVAL OF MECHANICAL WORK, PATCH AREAS TO MATCH ADJACENT CONSTRUCTION. WHERE ROOFS OR OTHER SURFACES EXPOSED TO WEATHER ARE ALTERED, CONTRACTOR SHALL REPAIR SURFACES PER RECOMMENDATIONS OF ORIGINAL ROOF INSTALLER TO MAINTAIN WARRANTY.

E. PIPING - HVAC

- HEATING HOT WATER PIPING:
 - TYPE L COPPER TUBING WITH WROUGHT COPPER FITTINGS AND 95/5 SOLDER JOINTS OR SCH 40 BLACK STEEL WITH 150 LB MALLEABLE IRON SOLDERED OR 150 LB BUTT WELDING FITTINGS. PROVIDE DIELECTRIC NIPPLES AT POINTS OF CONNECTION BETWEEN COPPER AND FERROUS PIPE. TEST WITH WATER AT 100 PSI FOR 4 HOURS.
 - INSULATE WITH 1 INCH THICK INSULATION.
- CONDENSING BOILER DRAIN PIPING AND ACID NEUTRALIZING TANK PIPING:
 - SCHEDULE 80 PVC PIPE WITH PVC FITTINGS AND SOLVENT WELDED JOINTS.
 - PVC WELDING SOLVENTS SHALL HAVE A VOC CONTENT NOT MORE THAN 510 G/L AND PRIMER SHALL NOT HAVE A VOC CONTENT MORE THAN 550 G/L.
 - PITCH AT MIN. 1 PERCENT SLOPE. PROVIDE DEEP SEAL TRAP SIZED TO SUIT SYSTEM PRESSURE AT EACH AC UNIT- SUBMIT CALCULATIONS INDICATING BASIS OF TRAP DEPTH FOR EACH UNIT.
 - INSULATE WITH 1/2 INCH THICK INSULATION.

F. PIPING - PLUMBING

- DOMESTIC WATER PIPING:
 - TYPE L COPPER TUBING WITH WROUGHT COPPER FITTINGS AND 95/5 SOLDER JOINTS.
 - INSULATE PIPE WITH 1/2 INCH THICK INSULATION.
- NATURAL GAS PIPING:
 - LOW PRESSURE (16 INCH WC AND LESS): SCHEDULE 40 BLACK STEEL PIPE, ASTM A53 OR A122 WITH CLASS 125 BLACK THREADED CAST IRON FITTINGS AND THREADED JOINTS.
 - HIGH PRESSURE (ABOVE 16 INCHES WC): SCHEDULE 40 BLACK STEEL PIPE, ASTM A53 OR A122 WITH 150 LB. FORGED STEEL, BUTT WELDING FITTINGS AND WELDED JOINTS.
 - PROVIDE PIPE IDENTIFICATION AND PAINT PER LOCAL CODES.

G. HANGERS AND SUPPORTS

- FACTORY FABRICATED HANGERS AND SUPPORTS. MSS-SP-58/2009 FOR ACCEPTABLE TYPES, INSTALLATION AND SPACING. USE PLASTIC COATED SUPPORTS FOR COPPER TUBING. EXPANSION BOLTS/SHELDS: RED HEAD, HLT OR WE-H SELF DRILLING OR STEEL SHELD, LOAD RATED. DO NOT USE DRILLED ANCHORS IN CAST CONCRETE WITHOUT APPROVAL OF OWNER. DO NOT CUT REINFORCING STEEL WITH DRILLED INSERTS.
- ROOF MOUNTED EQUIPMENT AND PIPING:
 - SUSPENDED FANS: COMBINATION STEEL SPRING/NEOPRENE IN SHEAR HANGERS EXCEPT USE NEOPRENE IN SHEAR FOR FANS LESS THAN 1/2 HP - KORFUND SERIES H.
 - MANUFACTURER: VIBRATION MOUNTING AND CONTROLS, MASON, INDUSTRIES, KORFUND.

H. THERMAL INSULATION AND DUCT LINING

- DOMESTIC WATER AND HEATING HOT WATER SYSTEMS - PIPE, FITTINGS, AND VALVE INSULATION:
 - PREMULATED FIBERGLASS PIPE INSULATION WITH PAPER-FREE VAPOR BARRIER ALL SERVICE JACKET AND FIBERGLASS FILLED ZESTON FITTING COVERS. MAKE INSULATION CONTINUOUS AT SLEEVES AND SUPPORTS.
 - JACKET SHALL BE FABRICATED ENTIRELY OF CLEANABLE MATERIALS THAT DO NOT SUPPORT MOLD GROWTH AND SHALL BE IMPROVED TO MOISTURE. PROVIDE WITH AN INTEGRAL ADHESIVE CLOSURE SYSTEM, SEALED WITH A COMPATIBLE, MANUFACTURER APPROVED MOLD-RESISTANT VAPOR BARRIER MASTIC.
 - PROVIDE 20 GAGE SHIELDS AT SUPPORTS.
 - PROVIDE WEATHERPROOF, FACTORY FABRICATED, ALUMINUM JACKET FOR PIPING, FITTINGS AND VALVES ABOVE ROOF.
- CONDENSATE DRAIN PIPING INSULATION:
 - FLEXIBLE ELASTOMERIC MATERIAL UTILIZING CLOSED-CELL SPONGE-OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS.
 - ACCEPTABLE MANUFACTURERS: ARMACELL LLC, ARMAFLEX; K-FLEX USA, INSUL-LOCK, INSUL-TUBE AND K-FLEX LS.
- ACCEPTABLE MANUFACTURERS:
 - JOHNS MANVILLE, OWENS-CORNING, KNAUF, ARMSTRONG.
 - PIPING ASU COVERING SHALL BE OWENS CORNING 'EVOLUTION' SERIES OR EQUAL.
 - PVC PIPE COVERS SHALL BE ZESTON/CELCO OR EQUAL.
 - ALL MATERIALS SHALL COMPLY WITH APPLICABLE PROVISIONS OF NFPA 90A.
- EXECUTION:
 - INSTALL ALL INSULATION, SEALANTS AND COVERINGS IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
 - MAINTAIN INTEGRITY OF VAPOR BARRIER FOR ALL COLD INSULATION SYSTEMS. DO NOT USE STAPLES OR OTHER PENETRATING FASTENERS. SEAL ALL JOINTS & SEAMS WITH COMPATIBLE MASTIC SEALANT APPROVED BY THE INSULATION MANUFACTURER FOR THE APPLICATION. SEAL AFTER BALANCING AND ADJUSTING OF SYSTEM TO AVOID DISTURBING THE INSULATION AFTER IT HAS BEEN SEALED.

I. DUCTWORK

- FABRICATE AND INSTALL IN ACCORDANCE WITH SMACNA STANDARDS FOR APPLICABLE PRESSURE AND CLASS.
- BOILER FLUE:
 - U.L. LISTED, FACTORY FABRICATED, DOUBLE WALL METALBESTOS MODEL OF OR IPS BOILER FLUE AS REQUIRED TO SUIT APPLICATION, WITH ALL REQUIRED ACCESSORIES INCLUDING ROOF CAP, WALL SUPPORT UNITS, SUPPORT PLATES, DRAIN SECTION, ELBOWS, TRANSITIONS, FLASHING AND THIMBLES.
 - INNER LINER SHALL BE TYPE 430 STAINLESS STEEL SUITABLE FOR CONDENSING ENVIRONMENTS.
 - OUTER JACKET SHALL BE ALUMINIZED STEEL.
 - PROVIDE MINIMUM 1" CERAMIC FIBER INSULATION INTERNAL TO SYSTEM, BETWEEN INNER AND OUTER WALLS. SYSTEM SHALL BE RATED FOR SERVICE WITH 1000°F CONTINUOUS OPERATION, 1400°F INTERMITTENT OPERATION.
 - MANUFACTURERS: METALBESTOS, HEAT FAB, AND DURAMENT.

J. TESTING AND BALANCING

- BALANCE NEW AND EXISTING AIR DISTRIBUTION SYSTEMS TO PROVIDE INDICATED AIR QUANTITIES, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
 - BOILERS
 - BOILER PUMPS
 - EXHAUST FANS AND VARIABLE SPEED CONTROLLERS.
 - BOILER BAROMETRIC DAMPERS.

K. EQUIPMENT

- INSTALL, TEST AND START-UP IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. STARTUP SHALL BE PERFORMED BY TECHNICIANS CURRENTLY CERTIFIED BY THE FACTORY FOR EACH EQUIPMENT ITEM.
- CLEAN, INSPECT, AND ADJUST AS REQUIRED ALL EXISTING EXHAUST FANS TO REMAIN. NOTIFY OWNER OF ANY DEFICIENCIES.
- INSTALL ALL EQUIPMENT MAINTAINING MANUFACTURER'S RECOMMENDED, AND CODE REQUIRED CLEARANCES.
- BOILER:
 - THE BOILER SHALL BEER THE ASME "H" STAMP FOR 160 PSI WORKING PRESSURE AND SHALL BE NATIONAL BOARD LISTED. THE 316L STAINLESS STEEL COMBUSTION CHAMBER SHALL BE DESIGNED TO DRAIN CONDENSATION TO THE BOTTOM OF THE HEAT EXCHANGER ASSEMBLY. A BUILT-IN TRAP SHALL ALLOW CONDENSATION TO DRAIN FROM THE HEAT EXCHANGER ASSEMBLY. THE COMPLETE HEAT EXCHANGER ASSEMBLY SHALL CARRY A TEN (10) YEAR WARRANTY.
 - THE BOILER SHALL COMPLY WITH THE ENERGY EFFICIENCY REQUIREMENTS OF THE LATEST EDITION OF THE ASHRAE 90.1 STANDARD AND THE MINIMUM EFFICIENCY REQUIREMENTS OF THE LATEST EDITION OF THE 852000 STANDARD. THE BOILER SHALL OPERATE AT A MINIMUM OF 94% THERMAL EFFICIENCY AT FULL FIRE. ALL MODELS SHALL OPERATE UP TO 96% THERMAL EFFICIENCY WITH RETURN WATER TEMPERATURES AT 100°F OR BELOW. THE BOILER SHALL BE CERTIFIED FOR INDOOR INSTALLATION. FINISHED SPACES OR EXPOSED TO WEATHER SHALL BE PRIMED AND FINISH PAINTED WITH EXTERIOR BLACK EQUIPMENT ENAMEL.
 - PIPE IDENTIFICATION MARKING FOR ALL PIPING TO MATCH EXISTING SYSTEM IN BUILDING. FOR NEW CONSTRUCTION OR WHERE NO EXISTING SYSTEM EXISTS, USE STANDARD SETON "SETMARK". MARK PIPE SERVICE AND DIRECTION OF FLOW FOR ALL PIPE. RUNS AT 50 FEET ON CENTER MAXIMUM.
 - TEST WITH WATER AND REGULATOR VALVES: WATTS OR AMTROL.
 - THREADED FLEXIBLE CONNECTOR: GALVANIZED STEEL TO SUIT APPLICATION. MINIMUM BRAZED LENGTH: 12 TIMES NOMINAL PIPE SIZE. METRIFLEX.
- ALL PIPING, METAL PARTS OF VALVES, EQUIPMENT, AND EQUIPMENT SUPPORTS EXPOSED IN FINISHED SPACES OR EXPOSED TO WEATHER OUTSIDE OF BUILDING SHALL BE PRIMED AND FINISH PAINTED WITH EXTERIOR BLACK EQUIPMENT ENAMEL.
- PIPE IDENTIFICATION MARKING FOR ALL PIPING TO MATCH EXISTING SYSTEM IN BUILDING. FOR NEW CONSTRUCTION OR WHERE NO EXISTING SYSTEM EXISTS, USE STANDARD SETON "SETMARK". MARK PIPE SERVICE AND DIRECTION OF FLOW FOR ALL PIPE. RUNS AT 50 FEET ON CENTER MAXIMUM.
- TEST WITH WATER AND REGULATOR VALVES: WATTS OR AMTROL.
- THREADED FLEXIBLE CONNECTOR: GALVANIZED STEEL TO SUIT APPLICATION. MINIMUM BRAZED LENGTH: 12 TIMES NOMINAL PIPE SIZE. METRIFLEX.

L. AUTOMATIC TEMPERATURE CONTROLS

- PROVIDE AUTOMATIC TEMPERATURE CONTROL SYSTEMS TO AFFECT COMPLETE OPERATING SYSTEMS PER OPERATING SEQUENCES INDICATED.
- PROVIDE REQUIRED A/C POWER CONNECTIONS TO CIRCUIT BREAKER PANELS.
- COMPLY WITH LATEST EDITION ON THE NEC. RUN ALL EXPOSED WIRING IN EMT. USE PLENUM RATED CABLE FOR LOW VOLTAGE WIRING (24V & LESS) CONCEALED IN WALLS.
- DEMONSTRATE SYSTEM OPERATION TO OWNER.
- AUTOMATIC TEMPERATURE CONTROL SYSTEM AND EQUIPMENT SHALL BE OF SAME MANUFACTURER AS EXISTING BUILDING TEMPERATURE CONTROL SYSTEM (DELTA-SOUTHLAND).
- UPDATE GRAPHICS OF EXISTING BUILDING CONTROLS SYSTEM TO INDICATE NEW COMPONENTS ADDED, IN IDENTICAL FASHION TO SIMILAR EXISTING EQUIPMENT CURRENTLY CONTROLLED BY THE SYSTEM.
- EXTEND EXISTING BUILDING CONTROLS SYSTEM TO NEW EQUIPMENT AS FOLLOWS:
 - PROVIDE MONITORING AND SETPOINT ADJUSTMENT OF HEAT-TIMER BOILER CONTROLLER THROUGH EXISTING BCS.

M. TEMPERATURE CONTROL SEQUENCES

- BOILER:
 - BOILER SHALL BE ENERGIZED THROUGH THE BCS. CONTROLS CONTRACTOR TO COORDINATE TIE-IN TO EXISTING BOILER CONTROL PANEL.
 - BOILER PANEL ALARM SIGNAL SHALL BE MONITORED BY BCS.
 - WHEN BOILER IS ENERGIZED, EXHAUST EF-1 SHALL BE ENERGIZED.

N. COMMISSIONING

- CONTRACTOR TO DEVELOP A COMMISSIONING PLAN FOR THE PROJECT TO DOCUMENT OPERATION OF ALL EQUIPMENT. SUBMIT PLAN TO THE OWNER AND ENGINEER FOR APPROVAL PRIOR TO THE COMMISSIONING. ALL SYSTEMS TO BE DEMONSTRATED TO THE OWNER'S REPRESENTATIVES AND ALL CONTRACTORS TO BE ON SITE DURING THE DEMONSTRATION(S). PROVIDE REMOTE COMMUNICATIONS DEVICES, AS NEEDED TO PERFORM THE DEMONSTRATIONS.
- EQUIPMENT TO BE DEMONSTRATED ARE AS FOLLOWS:
 - BOILER VENTING FAN
 - BOILERS (CONTROL INTEGRATION PER DRAWING M501)
 - BOILER PUMPS
 - BOILER SEQUENCING
 - GAZ DETECTION SYSTEM (ALARM STAGES AND REMOTE SIGNALS)
 - CONTROLS INTERFACE AND OPERATION
- CONTRACTOR TO PROVIDE WRITTEN REPORT OF COMMISSIONING PLAN FOR REVIEW AND APPROVAL BY THE OWNER AND ENGINEER.

SYMBOLS AND ABBREVIATIONS

	SUPPLY AIR		CONDENSATE DRAIN PIPING		A/C	AIR CONDITIONING
	RETURN AIR, OUTSIDE AIR		LOW PRESSURE STEAM		AHU	AIR HANDLING UNIT
	RETURN GRILLE		PUMPED CONDENSATE RETURN		ATC	ARCHITECTURAL AUTOMATIC TEMPERATURE CONTROL
	EXHAUST AIR		BOILER FEED WATER		BTU	BRITISH THERMAL UNIT
	EXISTING DUCTWORK		CHILLED WATER SUPPLY		CD	CEILING DIFFUSER
	EXISTING TO BE REMOVED OR RELOCATED		CHILLED WATER RETURN		CFM C/C	CUBIC FEET MINUTE CEILING, COOLING
	NEW SHEETMETAL DUCTWORK		HOT WATER SUPPLY		DB	CONDENSATE DRY BULB
	DUCTWORK WITH SOUND LINING		HOT WATER RETURN		DE	DRYER EXHAUST DIAMETER
	FLEXIBLE DUCTWORK		BOILER HOT WATER SUPPLY		DN	DOWN
	FLEXIBLE DUCT CONNECTION		BOILER HOT WATER RETURN		E	EXHAUST
	DUCT ELBOW WITH TURNING VANES		GATE VALVE		(E)	EXISTING TO REMAIN
	RADIUS DUCT ELBOW		CHECK VALVE		EAT	ENTERING AIR TEMPERATURE
	DUCT TEE WITH TURNING VANES		BALANCING VALVE		EER	ENERGY EFFICIENCY RATIO
	DUCT TURNING DOWN		BUTTERFLY VALVE		EG	EXHAUST GRILLE
	DUCT TURNING UP		BALL VALVE		EH	ELECTRIC HEATING COIL
	DUCT CHANGE IN ELEVATION R = RISE, D = DROP		CONCENTRIC REDUCER		ER	EXHAUST REGISTER
	DESIGNATES KEY NOTE NUMBER		ECCENTRIC REDUCER		ESP	EXTERNAL STATIC PRESSURE
	DIRECTION OF AIR FLOW		RELIEF OR SAFETY VALVE		F	FAN
	POINT OF CONNECTION, NEW TO EXISTING		PRESSURE REDUCING VALVE		FD	FULL DAMPER
	POINT OF DISCONNECTION FROM EXISTING		AIR VENT		FLD	FULL LOAD AMPS
	RISER DESIGNATION		FLEXIBLE PIPE CONNECTION		FD	FLOOR DRAIN
	RISER NUMBER		TWO WAY MOTOR OPERATED VALVE		FO	FLAT OVAL DUCT, FUEL OIL
	FLOW SENSING DEVICE		THREE WAY MOTOR OPERATED VALVE		FPM	FEET PER MINUTE
	PRESSURE SENSING DEVICE		BACK FLOW PREVENTER		GALV GC	GALVANIZED GENERAL CONTRACTOR
	TEMPERATURE SENSING DEVICE		PRESSURE/TEMPERATURE TAPPING		GPH	GALLONS PER HOUR
			FLANGED UNION		GPM	GALLONS PER MINUTE
			PITCH OF PIPE		GV	GRAVITY VENTILATOR
			ARROW INDICATES DIRECTION OF FLOW		HP	HEAT PUMP, HORSEPOWER
			PIPE UP		ID	INSIDE DIAMETER
			PIPE DOWN		KE	KITCHEN EXHAUST
			TOP PIPE TAKE-OFF		KW	KILOWATT
			BOTTOM PIPE TAKE-OFF		LAT	LEAVING AIR TEMPERATURE
			PIPE CAP		LD	LINEAR DIFFUSER
					LPS	LOW PRESSURE STEAM
					LRA	LOCKED ROTOR AMPS
					LWT	LEAVING WATER TEMPERATURE
					MBH	BTU PER HOUR (THOUSANDS)
					MOD	MANUAL OPERATED DAMPER
					NC	NORMALLY CLOSED
					N/C	NOT IN CONTRACT
					N/O	NORMALLY OPEN
					NRL	NEW LOCATION OF RELOCATED MATERIAL
					NTS	NOT TO SCALE
					OA	OUTSIDE AIR
					ODD	OPPOSED BLADE DAMPER
					OC	ON CENTER
					OD	OUTSIDE DIAMETER
					PC PH	PUMPED CONDENSATE PHASE
					PRV	POWER ROOF VENTILATOR
					PSI	POUNDS PER SQUARE INCH
					R	EXISTING TO BE REMOVED
					RA	RETURN AIR
					RG	RETURN GRILLE
					RH	RELATIVE HUMIDITY
					(R)	EXISTING TO BE RELOCATED
					RTU	ROOF TOP A/C UNIT
					SA	SUPPLY AIR
					SD	SMOKE DETECTOR
					SL	SOUND LINING
					SP	STATIC PRESSURE, STAIRWELL PRESSURIZATION
					SR	SUPPLY REGISTER
					T-STAT	THERMOSTAT
					TE	TOLEY EXHAUST
					TSP	TOTAL STATIC PRESSURE
					TYP	TYPICAL
					UH	UNIT HEATER
					UL	UNDERWRITERS LABORATORY
					UNO	UNLESS NOTED OTHERWISE
					V	VOLT
					VD	VOLUME DAMPER
					W	WET BULB
					WG	WATER GAUGE
					WMS	WIRE MESH SCREEN

GENERAL NOTES

- ALL EXISTING WORK TO REMAIN IS SHOWN WITH DASHED LINES. ALL NEW WORK AND RELOCATED WORK IS SHOWN WITH SOLID LINES. CROSS-HATCHING INDICATES ALL WORK TO BE REMOVED OR RELOCATED.
- INSPECT, CALIBRATE AND VERIFY OPERATION OF ALL EXISTING HEAT HOT WATER SYSTEM COMPONENTS; INCLUDING VALVES, PRIMARY/STANDBY LOOP PUMPS, SEPARATORS, CONTROL VALVES, STRAINERS, ETC. REPORT ANY DEFICIENCIES TO OWNER AND REPLACE UPON OWNER'S APPROVAL.
- EXISTING THERMOSTATS AND SENSORS ARE INTEGRATED TO BASE BUILDING BCS NETWORK. MAINTAIN ALL EXISTING SENSORS, CONTROL WIRING AND CONTROL VALVES ASSOCIATED WITH HEATING HOT WATER SYSTEM.
- COORDINATE ALL HEATING HOT WATER SYSTEM SHUT DOWN, DRAIN DOWN AND REFILL SCOPE WITH BUILDING OWNER AND FACILITIES MANAGEMENT GROUP.

SHEET LIST

M001	MECHANICAL SYMBOLS AND ABBREVIATIONS
M101	PENTHOUSE - MECHANICAL DEMOLITION PLANS
M201	PENTHOUSE - MECHANICAL NEW WORK PLANS
M501	MECHANICAL SCHEDULES AND DETAILS

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