SECTION 15500 – HVAC SPECIFICATIONS

I) GENERAL

A) WORK INCLUDED:

1) THESE SPECIFICATIONS INCLUDE GENERAL REQUIREMENTS FOR ALL WORK REPRESENTED ON THESE DRAWINGS. NOT ALL SYSTEMS OR SYSTEM COMPONENTS DESCRIBED IN THESE SPECIFICATIONS ARE NECESSARILY INCLUDED AS A PART OF THIS PROJECT.

2) THE HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) CONTRACTOR SHALL HEREAFTER BE DESCRIBED AS "THE CONTRACTOR" IN THIS HVAC SPECIFICATION. THE CONTRACTOR SHALL PROVIDE, INSTALL, PIPE, DUCT, AND WIRE, AS REQUIRED, HVAC SYSTEMS AS DESCRIBED BELOW, AND SHOWN OR DESCRIBED ON THESE PLANS AND SPECIFICATIONS.

B) QUALITY ASSURANCE:

1) THE INTERNATIONAL MECHANICAL CODE (IMC) 2009, AND THE INTERNATIONAL ENERGY CONSERVATION CODE (IEEC) 2009 ARE THE GOVERNING CODES FOR ALL HVAC WORK. THE CODES AND STANDARDS REFERENCED IN THE MECHANICAL CODE SHALL BE CONSIDERED A PART OF THE REQUIREMENTS OF CODE TO THE PRESCRIBED EXTENT OF EACH SUCH REFERENCE. WHERE DIFFERENCES OCCUR BETWEEN PROVISIONS OF THE CODE AND THE REFERENCED STANDARDS, THE PROVISIONS OF THE CODE SHALL APPLY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BE FAMILIAR WITH THE REQUIREMENTS OF ALL CODES AS THEY HAVE BEEN ADOPTED BY THE STATE AND LOCAL JURISDICTIONS.

2) EXCEPT AS SPECIFICALLY DESCRIBED OTHERWISE IN THESE SPECIFICATIONS, ALL COMPONENTS ALLOWED WITHIN THE ABOVE REFERENCED CODES SHALL BE ALLOWED AS A PART OF THE WORK.

3) THE WORKMANSHIP AND MATERIALS COVERED BY THESE SPECIFICATIONS SHALL CONFORM TO ALL ORDINANCES AND REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION, INCLUDING BUT NOT LIMITED TO, ALL APPLICABLE REGULATIONS OF THE CITY, COUNTY, AND STATE.

4) THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AND PAYING FOR HVAC PERMITS, INVESTMENT FEES, TAXES, CONNECTION AND INSPECTION FEES AS REQUIRED FOR THE COMPLETE INSTALLATION OF THE HVAC SYSTEM. THE CONTRACTOR SHALL PROVIDE TO THE OWNER ALL CERTIFICATES OF INSPECTION ISSUED BY THE JURISDICTION.

5) THE CONTRACTOR SHALL VISIT THE SITE AND EXAMINE ALL CONDITIONS AFFECTING THE PROPER EXECUTION OF THE CONTRACT, VERIFY ALL EXISTING CONDITIONS IN THE FIELD AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.

6) DURING THE PROGRESS OF THE WORK, THE CONTRACTOR SHALL MAINTAIN AN ACCURATE RECORD OF ALL CHANGES MADE IN THE HVAC INSTALLATION FROM THE LAYOUT AND MATERIALS CONTAINED IN THE APPROVED DRAWINGS AND SPECIFICATIONS.

7) DRAWINGS AND CATALOG CUTS, SHOWING ALL HVAC EQUIPMENT AND SYSTEM COMPONENTS, SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. FIELD MEASURE AND COORDINATE WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS AND ALL OTHER TRADES THE PROPOSED LOCATIONS FOR NEW EQUIPMENT AND COMPONENTS BEFORE PRODUCING SUBMITTALS. NO ITEMS SHALL BE PURCHASED OR ORDERED BEFORE APPROVAL IS GIVEN BY THE ENGINEER IN WRITING.

8) THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL OTHER TRADES.

C) RELATED DOCUMENTS:

1) THE GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTAL GENERAL CONDITIONS OF THE CONTRACT AND DIVISION 1 SPECIFICATION SECTIONS PROVIDED BY THE ARCHITECT, AND ALL OTHER DRAWINGS AND SPECIFICATIONS PROVIDED AS A PART OF THIS PROJECT, APPLY TO THIS DIVISION 15 AND TO ALL CONTRACTORS, SUBCONTRACTORS, OR OTHER PERSONS SUPPLYING MATERIALS AND/OR LABOR, ENTERING INTO THE PROJECT SITE AND/OR PREMISES, DIRECTLY OR INDIRECTLY.

2) THE SPECIFICATIONS AND DRAWINGS ARE INTENDED TO BE COMPLEMENTARY. A PARTICULAR SECTION, PARAGRAPH OR HEADING IN A DIVISION MAY NOT DESCRIBE EACH AND EVERY DETAIL CONCERNING WORK TO BE DONE AND MATERIALS TO BE FURNISHED. THE DRAWINGS ARE DIAGRAMMATIC AND MAY NOT SHOW ALL OF THE WORK REQUIRED OR ALL CONSTRUCTION DETAILS. DIMENSIONS ARE SHOWN FOR CRITICAL AREAS ONLY AS AN AID TO THE CONTRACTOR; ALL DIMENSIONS AND ACTUAL PLACEMENTS ARE TO BE VERIFIED IN THE FIELD. IT IS TO BE UNDERSTOOD THAT THE BEST TRADE PRACTICES OF THE DIVISION WILL PREVAIL.

3) ALL TRADE SUBCONTRACTORS ARE TO NOTE THAT THE ORGANIZATION OF SPECIFICATIONS INTO DIVISIONS, AND LIKEWISE THE ARRANGEMENT OF THE DRAWINGS, IS SET UP FOR THE CONVENIENCE OF UNDERSTANDING THE SCOPE OF THE WORK ONLY. THIS STRUCTURING SHALL NOT CONTROL THE GENERAL CONTRACTOR IN DIVIDING THE WORK AMONG TRADE SUBCONTRACTORS OR IN ESTABLISHING THE EXTENT OF THE WORK TO BE PERFORMED BY ANY TRADE. REFER TO GENERAL CONDITIONS.

II) PRODUCTS

A) GENERAL MECHANICAL MATERIALS:

1) ESCUTCHEONS: AT ALL FINISHED WALL PENETRATIONS, PROVIDE CHROME-PLATED SPLIT-RING ESCUTCHEON. INSIDE DIAMETER SHALL CLOSELY FIT PIPE OUTSIDE DIAMETER OR OUTSIDE OF PIPE INSULATION WHERE PIPE IS INSULATED. OUTSIDE DIAMETER SHALL COMPLETELY COVER THE OPENING IN FLOORS, WALLS, OR CEILINGS.

2) UNIONS: MALLEABLE-IRON, CLASS 150 FOR LOW PRESSURE SERVICE AND CLASS 250 FOR HIGH PRESSURE SERVICE; HEXAGONAL STOCK, WITH BALL-AND-SOCKET JOINTS, METAL-TO- METAL BRONZE SEATING SURFACES; FEMALE THREADED ENDS.

3) DIELECTRIC UNIONS: PROVIDE DIELECTRIC UNIONS WITH APPROPRIATE END CONNECTIONS FOR THE PIPE MATERIALS IN WHICH INSTALLED (SCREWED, SOLDERED, OR FLANGED), WHICH EFFECTIVELY ISOLATE DISSIMILAR METALS, TO PREVENT GALVANIC ACTION, AND STOP CORROSION.

4) SLEEVES: GALVANIZED STEELMETAL OR SCHEDULE 40 STEEL PIPE AS APPROPRIATE FOR THE WALL CONSTRUCTION.

5) SLEEVE SEALS: MODULAR TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO CONTINUOUSLY FILL ANNULAR SPACE BETWEEN PIPE AND SLEEVE, CONNECTED WITH BOLTS AND PRESSURE PLATES WHICH CAUSE RUBBER SEALING ELEMENTS TO EXPAND WHEN TIGHTENED, PROVIDING WATERTIGHT SEAL AND ELECTRICAL INSULATION.

6) DRIP PANS: WHERE REQUIRED, PROVIDE DRIP PANS FABRICATED FROM CORROSION-RESISTANT SHEET METAL WITH WATERTIGHT JOINTS, AND WITH EDGES TURNED UP A MINIMUM OF 2-1/2". REINFORCE TOP, EITHER BY STRUCTURAL ANGLES OR BY ROLLING TOP OVER 1/4" STEEL ROD. PROVIDE HOLE, GASKET, AND FLANGE AT LOW POINT FOR WATERTIGHT JOINT AND 1" DRAIN LINE CONNECTION.

7) FIRESTOPPING/FIRE-RESISTANT SEALANT: WHERE REQUIRED, PROVIDE A FIRESTOP SYSTEM APPROPRIATE FOR THE ASSEMBLY PENETRATED AND THE PENETRATING ELEMENT. USE ONLY FIRESTOP PRODUCTS THAT HAVE BEEN UL 1479 OR ASTM E 814 TESTED FOR SPECIFIC FIRE-RATED CONDITIONS CONFORMING TO CONSTRUCTION ASSEMBLY TYPE, PENETRATING ITEM TYPE, ANNULAR SPACE REQUIREMENT AND FIRE-RATING INVOLVED FOR EACH SEPARATE INSTANCE. SUBMIT MANUFACTUER'S SPECIFIC DETAIL FOR EACH TYPE OF PENETRATION.

8) ACCESS DOORS: WHERE REQUIRED FOR PROPER SERVICE AND MAINTENANCE OF ALL MECHANICAL COMPONENTS, PROVIDE STEEL ACCESS DOORS AND FRAMES, FACTORY-FABRICATED AND ASSEMBLED UNITS, COMPLETE WITH ATTACHMENT DEVICES AND FASTENERS SUITABLE FOR THE SERVICE.

9) VALVES – PRESSURE AND TEMPERATURE RATED AS REQUIRED TO SUIT SYSTEM PRESSURES AND TEMPERATURES. UNLESS OTHERWISE INDICATED, PROVIDE VALVES OF SAME SIZE AS UPSTREAM PIPE SIZE.

10) THERMOMETERS: PROVIDE DIRECT MOUNT THERMOMETERS 9" ADJUSTABLE ANGLE TYPE, ALUMINUM CASE, ACRYLIC LENS, ORGANIC SPIRIT FILL OR SOLAR TYPE, SUITABLE FOR SERVICE REQUIRED. SELECT RANGE SUCH THAT NORMAL FLUID TEMPERATURES FALL WIITHIN THE MIDDLE THIRD OF THE DISPLAY. ACCURACY OF THERMOMETERS SHALL BE PLUS OR MINUS 1 PERCENT FULL SCALE. PROVIDE THERMOMETER WELLS, BRASS OR STAINLESS STEEL, PRESSURE RATED TO MATCH PIPING SYSTEM DESIGN PRESSURE.

11) PRESSURE GAUGES: PRESSURE GAUGES SHALL BE PHOSPHOR BRONZE BOURDON-TUBE TYPE, ALUMINUM OR BRASS CASE, GLASS LENS, SUITABLE FOR SERVICE REQUIRED. SELECT RANGE SUCH THAT NORMAL FLUID PRESSURES FALL WIITHIN THE MIDDLE THIRD OF THE DISPLAY. ACCURACY OF PRESSURE GAUGES SHALL BE PLUS OR MINUS 1 PERCENT FULL SCALE. PROVIDE PRESSURE GAUGE COCKS BETWEEN PRESSURE GAUGES AND GAUGE TEES, CONSTRUCTED OF BRASS WITH 1/4" FEMALE NPT ON EACH END, AND "T" HANDLE BRASS PLUG, WITH 1/4" BRASS BUSHING SNUBBER WITH CORROSION RESISTANT POROUS METAL DISC, THROUGH WHICH PRESSURE FLUID IS FILTERED. SELECT DISC MATERIAL FOR FLUID SERVED AND PRESSURE RATING.

12) SUPPORTS AND ANCHORS: HANGERS FOR PIPE UP TO AND INCLUDING 4" SHALL BE SWIVEL RING, SPLIT RING, WROUGHT PIPE CLAMP, BAND, ADJUSTABLE WROUGHT CLEVIS TYPE OR TRAPEZE. HANGERS FOR PIPES ABOVE 4" SHALL BE STANDARD CLEVIS, ROLLER OR TRAPEZE.

13) SADDLES AND SHIELDS: PROVIDE SADDLES AND SHIELDS UNDER PIPING HANGERS AND SUPPORTS, FACTORY-FABRICATED, FOR ALL INSULATED PIPING. SIZE SADDLES AND SHIELDS FOR EXACT FIT TO MATE WITH PIPE INSULATION.

B) ELECTRICAL REQUIREMENTS OF MECHANICAL WORK:

1) BASIC ELECTRICAL COMPONENTS INCLUDE, BUT ARE NOT LIMITED TO ALL REQUIRED STARTERS, DISCONNECT SWITCHES, CONTROL DEVICES, AND MOTORS. IT INCLUDES MOTORS THAT ARE FACTORY-INSTALLED AS PART OF EQUIPMENT AND APPLIANCES AS WELL AS FIELD-INSTALLED MOTORS.

2) STARTERS AND DISCONNECTS: WHERE AVAILABLE, PROVIDE FACTORY MOUNTED DISCONNECTS AND STARTERS, OR, WHEN FACTORY MOUNTED STARTERS AND DISCONNECTS ARE NOT AVAILABLE PROVIDE COMBINATION STARTERS AND DISCONNECT SWITCHES, OR, WHERE COMBINATION STARTERS AND DISCONNECT SWITCHES ARE NOT SUITABLE OR AVAILABLE, PROVIDE SEPARATE STARTERS AND DISCONNECTS FOR ALL HVAC EQUIPMENT, AS REQUIRED FOR PROPER INSTALLATION AND OPERATION OF EQUIPMENT.

C) MECHANICAL IDENTIFICATION:

1) PROVIDE PIPE MARKERS, LINE MARKERS, VALVE TAGS, VALVE SCHEDULE FRAMES, AND EQUIPMENT MARKERS COMPLYING WITH ANSI A13.1 FOR LETTERING SIZE, LENGTH OF COLOR FIELD, COLORS, AND INSTALLED VIEWING ANGLES OF IDENTIFICATION DEVICES.

2) SCHEDULES: SUBMIT VALVE SCHEDULE FOR EACH PIPING SYSTEM, TYPEWRITTEN AND REPRODUCED ON 8-1/2" X 11" BOND PAPER. TABULATE VALVE NUMBER, PIPING SYSTEM, SYSTEM ABBREVIATION (AS SHOWN ON TAG), LOCATION OF VALVE (ROOM OR SPACE), AND VARIATIONS FOR IDENTIFICATION (IF ANY). MARK VALVES WHICH ARE INTENDED FOR EMERGENCY SHUT-OFF AND SIMILAR SPECIAL USES, BY SPECIAL "FLAGS", IN MARGIN OF SCHEDULE.

3) PIPE MARKERS

(a) SNAP-ON TYPE: PROVIDE MANUFACTURER'S STANDARD PRE-PRINTED, SEMI-RIGID, SNAP- ON, COLOR-CODED, PIPE MARKERS.

(b) PRESSURE-SENSITIVE TYPE: PROVIDE MANUFACTURER'S STANDARD PRE-PRINTED, PERMANENT ADHESIVE, COLOR-CODED, PRESSURE-SENSITIVE VINYL PIPE MARKERS.

(c) INSTALL EVERY 40 FEET AND AT EACH CHANGE IN DIRECTION.

4) LINE MARKERS – UNDERGROUND TYPE: MANUFACTURER'S STANDARD PERMANENT, BRIGHT-COLORED, CONTINUOUS-PRINTED PLASTIC TYPE, INTENDED FOR DIRECT-BURIAL SERVICE; NOT LESS THAN 6" WIDE X 4 MILS THICK. PROVIDE TAPE WITH PRINTING WHICH MOST ACCURATELY INDICATES TYPE OF SERVICE OF BURIED PIPE.

5) VALVE TAGS: PROVIDE MANUFACTURER'S STANDARD BRASS OR PLASTIC VALVE TAGS WITH PRINTED ENAMEL LETTERING, WITH PIPING SYSTEM ABBREVIATION IN APPROXIMATELY 3/16" HIGH LETTERS AND SEQUENCED VALVE NUMBERS APPROXIMATELY 3/8" HIGH, AND WITH 5/32" HOLE FOR FASTENER.

6) VALVE TAG FASTENERS: MANUFACTURER'S STANDARD SOLID BRASS CHAIN (WIRE LINK OR BEADED TYPE), OR SOLID BRASS S-HOOKS OF THE SIZES REQUIRED FOR PROPER ATTACHMENT OF TAGS TO VALVES, AND MANUFACTURED SPECIFICALLY FOR THAT PURPOSE.

7) VALVE SCHEDULES: PROVIDE VALVE SCHEDULES IN EITHER A 3-RING BINDER OR IN DISPLAY FRAMES, DISPLAY FRAME, WITH SCREWS FOR REMOVABLE MOUNTING ON MASONRY WALLS. PROVIDE FRAMES OF EXTRUDED ALUMINUM OR PLASTIC WITH SSB-GRADE SHEET GLASS OR PLASTIC.

8) PLASTIC EQUIPMENT MARKERS: PROVIDE MANUFACTURER'S STANDARD LAMINATED PLASTIC, COLOR CODED EQUIPMENT MARKERS.

9) LETTERING AND GRAPHICS: COORDINATE NAMES, ABBREVIATIONS AND OTHER DESIGNATIONS USED IN MECHANICAL IDENTIFICATION WORK, WITH CORRESPONDING DESIGNATIONS SHOWN, SPECIFIED OR SCHEDULED. PROVIDE NUMBERS, LETTERING AND WORDING AS INDICATED OR, IF NOT OTHERWISE INDICATED, AS RECOMMENDED BY MANUFACTURERS OR AS REQUIRED FOR PROPER IDENTIFICATION AND OPERATION/MAINTENANCE OF MECHANICAL SYSTEMS AND EQUIPMENT.

D) VIBRATION CONTROL AND SEISMIC RESTRAINTS:

1) FIBERGLASS PADS AND SHAPES, NEOPRENE PADS, VIBRATION ISOLATION SPRINGS, PAD-TYPE ISOLATORS, PLATE-TYPE ISOLATORS, DOUBLE-PLATE-TYPE ISOLATORS, THREADED DOUBLE- PLATE-TYPE ISOLATORS, ALL-DIRECTIONAL ANCHORS, NEOPRENE MOUNTINGS, FREE STANDING SPRING ISOLATORS, HOUSED SPRING ISOLATORS, VERTICALLY-RESTRAINED SPRING ISOLATORS, EARTHQUAKE-RESISTANT SPRING ISOLATORS, SEISMIC SNUBBERS, THRUST RESTRAINTS, EQUIPMENT RAILS, FABRICATED EQUIPMENT BASES, INERTIA BASE FRAMES, ROOF-CURB ISOLATORS, ISOLATION HANGERS, RISER ISOLATORS, FLEXIBLE PIPE CONNECTORS SHALL BE PROVIDED AS REQUIRED AND AS SUITABLE FOR USE AND SERVICE.

2) WHERE SEISMIC RESTRAINTS ARE REQUIRED, THE CONTRACTOR SHALL PROVIDE CALCULATIONS, DETAILS AND LOCATIONS THAT ARE STAMPED BY A PROFESSIONAL ENGINEER.

E) DUCTWORK:

1) UNLESS OTHERWISE SPECIFIED, ALL RIGID DUCTWORK SHALL BE SHEET METAL MATERIALS AS SPECIFIED IN ASTM A700, WITH GALVANIZED SHEET STEEL: LOCK-FORMING QUALITY, ASTM A527, COATING DESIGNATION G90; MILL PHOSPHATIZED FINISH

2) RECTANGULAR DUCT FABRICATION: FABRICATE RECTANGULAR DUCTS WITH GALVANIZED SHEET STEEL, IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", TABLES 1-3 THROUGH 1-19, INCLUDING THEIR ASSOCIATED DETAILS. CONFORM TO THE REQUIREMENTS IN THE REFERENCED STANDARD FOR METAL THICKNESS, REINFORCING TYPES AND INTERVALS, TIE ROD APPLICATIONS, AND JOINT TYPES AND INTERVALS.

3) WHERE DUCT SUPPORTS ARE REQUIRED BETWEEN THE BUILDING STRUCTURAL FRAMING, SUITABLE INTERMEDIATE STEEL FRAMING SHALL BE PROVIDED BY THE CONTRACTOR.

4) WATER BASED LIQUID RUBBER DUCT SEALANT OR FLANGED JOINT MASTICS SHALL BE ONE-PART, ACID-CURING, SILICONE ELASTOMERIC JOINT SEALANTS, COMPLYING WITH ASTM C920, TYPE S, GRADE NS, CLASS 25, USE O.

5) FLEXIBLE DUCT CONNECTORS SHALL BE INSTALLED AT POINTS AS CLOSE AS POSSIBLE TO AIR HANDLERS AND FANS. THE CONNECTOR SHALL BE AT LEAST FOUR (4") INCHES WIDE, AND FABRICATED SPECIFICALLY FOR USE AS A FLEXIBLE CONNECTOR. ALL CONNECTIONS SHALL BE AIR TIGHT AND MADE SO THE CONNECTOR IS UNDAMAGED WHEN THE JOINT IS REMOVED.

6) FLEXIBLE DUCTS: LIMITED TO 6 FEET MAXIMUM STRAIGHT. DO NOT USE FLEX AS AN ELBOW.

(a) NORMAL DUTY (UP TO 2" PRESSURE CLASS): TRILAMINATE OF ALUMINUM FOIL, FIBERGLASS AND ALUMINZED POLYESTER MECHANICALLY LOCKED WITH A HELIX OF GALVANIZED STEEL. UL 181, CLASS 1. EQUIVALENT TO BUCKLEY FABRI-FLEX TYPE 3 (BARE) OR 3M (INSULATED WITH ALUMINUM JACKET).

(b) HEAVY DUTY (ABOVE 2" PRESSURE CLASS): HEAVY COATED FIBERGLASS CLOTH FABRIC, MECHANICALLY INTERLOCKED WITHOUT ADHESIVES BY A CORROSION RESISTANT METAL SPIRAL HELIX ON THE OUTSIDE OF THE FABRIC. EQUIVALENT TO BUCKLEY FABRI-FLEX TYPE 4 (BARE) OR 4M (INSULATED WITH ALUMINUM JACKET).

7) BELLMOUTH OR 45 DEGREE TAKEOFFS SHALL BE USED FOR DUCT TAKEOFFS TO MINIMIZE PRESSURE DROP.

8) MANUAL VOLUME DAMPERS SHALL BE INSTALLED AT ALL DUCT TAKEOFFS AND AS NEEDED ELSEWHERE TO PROPERLY BALANCE THE SYSTEMS.

9) WHERE NOTED ON THE DRAWINGS, INSTALL 1-1/2" ACOUSTICAL DUCT LINER SIMILAR TO JOHNS MANVILLE LINACOUSTIC RC.

10) FIRE, SMOKE, COMBINATION FIRE/SMOKE DAMPERS AND CEILING RADIATION DAMPERS

(a) FIRE DAMPERS: UL 555 LISTED TYPE "B" (OUT OF AIRSTREAM) 1-1/2 HOUR RATED FOR LESS THAN 3-HOUR FIRE-RESISTANCE RATED ASSEMBLIES AND 3 HOUR RATED FOR 3-HOUR OR GREATER FIRE-RESISTANCE RATED ASSEMBLIES

(1) DYNAMIC FIRE DAMPERS SHALL BE USED IN SYSTEMS DESIGNED TO OPERATE WITH FANS ON DURING A FIRE.

(2) STATIC FIRE DAMPERS MAY BE USED IN SYSTEMS NOT OPERATIONAL DURING A FIRE.

(b) SMOKE DAMPERS: UL 555S LISTED.

(c) COMBINATION FIRE/SMOKE DAMPERS: UL 555 AND UL 555S LISTED

(d) CEILING RADIATION DAMPERS: UL 555C LISTED.

(e) REFER TO BOTH MECHANICAL AND ARCHITECTURAL DRAWINGS FOR THE LOCATION OF RATED ASSEMBLIES.

11) SMOKE DETECTORS IN AIR SYSTEMS GREATER THAN 2000 CFM SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR IN BOTH THE SUPPLY AND RETURN AIR DUCTWORK AS PER 2009 IMC AND NFPA 90A.

(a) IF THERE IS A FIRE ALARM SYSTEM IN THE BUILDING, THIS CONTRACTOR SHALL NOTIFY THE FIRE ALARM CONTRACTOR TO PROVIDE DUCT SMOKE DETECTORS WHERE REQUIRED.

F) STEAM, STEAM CONDENSATE, HYDRONIC AND AIR CONDITIONING CONDENSATE PIPING:

1) STEAM PIPING SHALL BE SCHEDULE 40 ASTM A53, GRADE B, TYPE E (ERW) STEEL WITH THE FOLLOWING JOINING METHODS:

(a) THROUGH 2" SHALL USE STEEL CLASS 150 THREADED FITTINGS PER ASME B16.11.

(b) 2-1/2" AND UP SHALL USE STEEL WELDED (ASME B16.9, STD WEIGHT) OR FLANGED (ASME B16.5, CLASS 150, RAISED FACE) FITTINGS.

2) STEAM CONDENSATE PIPING SHALL BE SCHEDULE 80 ASTM A53, GRADE B, TYPE E (ERW) STEEL WITH THE FOLLOWING JOINING METHODS:

(a) THROUGH 2" SHALL USE STEEL CLASS 300 THREADED FITTINGS PER ASME B16.11.

(b) 2-1/2" AND UP SHALL USE STEEL WELDED (ASME B16.9, EXTRA STRONG) OR FLANGED (ASME B16.5, CLASS 300, RAISED FACE) FITTINGS.

3) STEAM AND CONDENSATE VALVES:

(a) THROUGH 2", STEEL THREADED, CLASS TO MATCH PIPING.

(b) 2-1/2" AND UP, STEEL FLANGED, CLASS TO MATCH PIPING.

4) HYDRONIC PIPING (HOT WATER AND CHILLED WATER) SHALL BE SCHEDULE 40 ASTM A53, GRADE B, TYPE E (ERW) STEEL OR ASTM B88, TYPE L COPPER TUBE (COPPER THROUGH 2" ONLY) WITH THE FOLLOWING JOINING METHODS:

(a) THROUGH 2" SHALL USE CAST IRON CLASS 150 THREADED FITTINGS PER ASME B16.3 FOR STEEL PIPE OR COPPER SOLDERED FITTINGS FOR COPPER TUBE.

(b) 2-1/2" AND UP SHALL USE STEEL WELDED (ASME B16.9, STD WEIGHT), GROOVED OR FLANGED (ASME B16.5, CLASS 150, RAISED FACE) FITTINGS.

(c) UPONOR ASTM F876/F877 SDR9 CROSSLINKED POLYETHYLENE (PEX-a) PIPING WITH ASTM F1960 COLD EXPANSION FITTINGS AND PEX REINFORCING RINGS INSTALLED PER MANUFACTURER'S INSTRUCTIONS IS ALSO ALLOWED.

5) HYDRONIC VALVES:

(a) THROUGH 2" BRONZE BALL VALVES EQUAL TO APOLLO 70 SERIES.

(b) 2-1/2" AND UP DUCTILE IRON LUG STYLE BUTTERFLY VALVE WITH LEVER EQUAL TO CENTERLINE 200 SERIES.

6) HEAT PUMP LOOP PIPING, NOT INCLUDING THE CLOSELY COUPLED TEES ASSOCIATED WITH HOT WATER PIPING INJECTION FROM THE BOILER PLANT, SHALL BE SCHEDULE 80 PVC WITH FUSION WELDED FITTINGS.

7) AIR CONDITIONING CONDENSATE PIPING SHALL BE SCHEDULE 40 PVC.

(a) ROOF TOP UNITS SHALL DRAIN CONDENSATE ONTO ROOF.

(b) INDOOR UNITS SHALL DRAIN CONDENSATE TO SANITARY OR STORM VIA INDIRECT CONNECTION.

8) GEOTHERMAL WELL PIPING SHALL BE GEOTHERMAL GRADE HDPE CONFORMING TO ASTM D3035 WITH FACTORY INSTALLED U BENDS IN THE BORE HOLES MOLDED FROM PE 3408 HDPE, WITH A WORKING PRESSURE OF SDR 11, 160 PSI AT 73°F. GROUT SHALL A CONDUCTIVITY OF NO LESS THAN

9) PROVIDE AND INSTALL ISOLATION VALVES, UNIONS/FLANGES, MANUAL AIR VENTS, AND DRAIN VALVES AT ALL PIECES OF EQUIPMENT.

10) PITCH WATER PIPING UP IN THE DIRECTION OF FLOW, 1 INCH PER 40 FEET MINIMUM. PROVIDE AN AIR VENT AT ALL HIGH POINTS AND A DRAIN VALVE AT ALL LOW POINTS.

11) CUT ALL HOLES OF SUFFICIENT SIZE AND HANG ALL PIPE SO THAT THERE WILL BE NO COPPER OR STEEL TO METAL CONTACT AND RESULTANT NOISE DURING PIPE EXPANSION AND CONTRACTION. PROVIDE EXPANSION LOOPS WITH ROLLERS, GUIDES AND ANCHORS WHERE STRAIGHT RUNS OF PIPE EXCEED 100 FEET.

12) BEFORE SYSTEM OPERATION, CLEAN AND FLUSH ALL PIPING SYSTEMS TO REMOVE GREASE, OIL, SCALE, ETC. OPERATE SYSTEM FOR A MINIMUM OF 24 HOURS WITH STARTUP STRAINERS TO REMOVE DEBRIS, THEN REMOVE AND DISPOSE OF STARTUP STRAINER.

13) PROVIDE CHEMICAL WATER TREATMENT CHEMICALS TO PROHIBIT CORROSION FOR WATER SYSTEMS. PROPYLENE GLYCOL (CONCENTRATION SHALL PROVIDE FREEZE PROTECTION TO 5°F BELOW THE LOWEST ANTICIPATED AMBIENT TEMPERATURE) IS SUFFICIENT FOR WATER TREATMENT FOR SYSTEMS NEEDING FREEZE PROTECTION.

B) REFRIGERATION PIPING SYSTEMS:

1) COPPER TUBE AND FITTINGS:

(a) DRAWN-TEMPER OR ANNEALED COPPER TUBE: ASTM B280, TYPE ACR.

(b) WROUGHT-COPPER FITTINGS: ASME B16.22.

(c) BRAZING FILLER METALS: AWS A5.8, CLASSIFICATION BAG-1 (SILVER)

2) PROVIDE AND INSTALL ALL REFRIGERANT PIPING SPECIALTIES REQUIRED AND RECOMMENDED BY THE REFRIGERATION EQUIPMENT MANUFACTURER.

C) INSULATION:

1) ALL INSULATION SHALL BE UL APPROVED FOR A FLAME SPREAD RATING OF NOT OVER 25 AND A SMOKE DEVELOPED RATING OF NOT OVER 50.

2) ALL INSULATION SHALL CONFORM TO THE REQUIREMENTS OF THE ENERGY CODE.

3) HYDRONIC PIPING: ALL HYDRONIC PIPING SERVING AS PART OF A HEATING OR COOLING SYSTEM SHALL BE THERMALLY INSULATED WITH FIBERGLASS INSULATION IN ACCORDANCE WITH THE THICKNESS LISTED BELOW, BASED ON THE PIPE INSULATION HAVING A CONDUCTIVITY NOT EXCEEDING 0.27 BTU PER INCH/H*FT2*°F. PROVIDE ASJ OR OTHER JACKET TO PROTECT INSULATION. SIMILAR TO JOHNS MANVILLE MICRO-LOK.

(a) FITTINGS SHALL HAVE PVC COVERS WITH FIBERGLASS INSERTS.

(b) NOTE THAT ALL PIPES CONTAINING FLUIDS AT TEMPERATURES LESS THAN LOCAL DEWPOINT MUST BE INSULATED FOR CONDENSATION CONTROL.

(c) MINIMUM PIPE INSULATION

(1) PIPE DIAMETER 1.5" AND LESS:

(i) STEAM AND STEAM CONDENSATE: 1.5" THICK

(ii) HOT AND CHILLED WATER: 1.5" THICK

(2) PIPE DIAMETER 2" AND GREATER:

(i) STEAM AND STEAM CONDENSATE: 3" THICK

(ii) HOT WATER: 2.0" THICK

(iii) CHILLED WATER: 1.5" THICK

4) REFRIGERANT PIPING INSULATION SHALL BE FLEXIBLE ELASTOMERIC THERMAL INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS AND TYPE II FOR SHEET MATERIALS.

(a) ADHESIVE: AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.

(b) PROVIDE UV PROTECTIVE COATING ON ELASTOMERIC INSULATION THAT IS EXPOSED TO SUNLIGHT.

(c) MINIMUM PIPE INSULATION

(1) PIPE DIAMETER LESS THAN 1½": ½" THICK.

(2) PIPE DIAMETER 1½" AND LARGER: 1" THICK.

5) DUCTWORK: ALL INDOOR SUPPLY AND OUTDOOR AIR DUCTS AND PLENUMS SHALL BE INSULATED WITH FIBERGLASS WITH FSK JACKET WITH AN INSTALLED MINIMUM R-6 INSULATION, SIMILAR TO JOHNS MANVILLE MICROLITE EQ TYPE 100, 2" THICK.

(a) ROOF MOUNTED SUPPLY, RETURN AND EXHAUST AIR DUCTS SHALL BE INSULATED WITH 3.0 PCF FIBERGLASS INSULATION BOARD WITH FSK JACKET WITH A MINIMUM INSTALLED R-8 INSULATION, SIMILAR TO JOHNS MANVILLE 814, 2" THICK OR WITH 1-1/2" POLYISOCYANURATE FOAM SHEATHING, SIMILAR TO JOHNS MANVILLE AP. PITCHED TOP AND COVERED WITH POLYGUARD ALUMAGUARD ALL-WEATHER WITH COOL WRAP FINISH OR SIMILAR WATERPROOF COVERING.

(b) EXHAUST DUCTS SHALL BE INSULATED WITH R-6 TO TEN FEET BACK FROM BUILDING EXTERIOR.

II) EXECUTION

A) THE CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, EQUIPMENT, MATERIAL, MACHINERY, PLANS, RIGGING, AND ANY AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE MECHANICAL SYSTEM. SMALL DETAILS NOT USUALLY INDICATED ON THE DRAWINGS OR SPECIFIED, BUT WHICH ARE NECESSARY FOR THE PROPER INSTALLATION AND OPERATION OF THE MECHANICAL SYSTEM SHALL BE INCLUDED IN THE WORK AND IN THE CONTRACTOR'S ESTIMATE THE SAME AS IF HEREIN SPECIFIED OR SHOWN ON THE DRAWINGS.

B) THE CONTRACTOR SHALL INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. THIS INCLUDES CHECKING THE MANUFACTURER'S INSTRUCTIONS TO DETERMINE WHAT TYPE OF GLYCOL SYSTEM MAY BE USED WITHI EQUIPMENT SO AS NOT TO VOID THE WARRANTY OR IMPAIR THE OPERATION OF THE EQUIPMENT. WHERE THE DRAWINGS AND SPECIFICATIONS CONFLICT WITH THE MANUFACTURER'S RECOMMENDATIONS, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO BRING THIS TO THE ATTENTION OF THE ENGINEER.

C) THE HVAC EQUIPMENT MAY NOT BE USED FOR TEMPORARY HEAT DURING CONSTRUCTION. THE HVAC EQUIPMENT SHALL NOT BE STARTED AND TESTED UNTIL ALL CONSTRUCTION ACTIVITY THAT HAS THE POTENTIAL OF CREATING AIR BORNE PARTICULATES THAT COULD BE DRAWN INTO THE HVAC EQUIPMENT AND DUCTWORK SYSTEMS HAS BEEN COMPLETED. IN ADDITION, ALL DUTWORK OPENINGS SHALL BE SEALED UNTIL THE TIME WHEN THE HVAC EQUIPMENT IS TO BE STARTED AND TESTED.

D) DUCTWORK AND FITTINGS SHALL HAVE ENDS COVERED WITH PLASTIC AT ALL TIMES.

E) UPON COMPLETION OF WORK, THE CONTRACTOR SHALL CLEAN, OIL AND GREASE (UNLESS FACTORY LUBRICATED) ALL FANS, PUMPS, MOTORS, ALL OTHER RUNNING EQUIPMENT AND APPARATUS AND MAKE CERTAIN THAT ALL SUCH APPARATUS AND MECHANISMS ARE IN PROPER WORKING ORDER AND MADE READY FOR TESTING.

F) REPLACE ALL FILTERS USED DURING CONSTRUCTION.

G) EQUIPMENT SHALL BE STARTED, TESTED, ADJUSTED AND PLACED IN SATISFACTORY OPERATING CONDITION BY THE CONTRACTOR.

H) THE CONTRACTOR SHALL INSTRUCT OWNER IN THE PROPER OPERATION OF EQUIPMENT, EXPLAIN THE PROPER OPERATING AND MAINTENANCE PROCEDURES AND SHALL FURNISH THE OWNER WITH ALL INSTRUCTION PAMPHLETS, BOOKS AND OTHER MATERIAL FURNISHED BY THE VARIOUS MANUFACTURERS

I) ALL VIBRATING EQUIPMENT NOT MOUNTED ON THE GROUND FLOOR SHALL BE MOUNTED ON OR SUSPENDED FROM VIBRATION ISOLATORS.

J) EQUIPMENT SHALL BE INSTALLED WITH CLEARANCE FOR PROPER MAINTENANCE. FILTERS, COILS, DRIVES, VALVES, AND CONTROLS SHALL BE ACCESSIBLE FOR SERVICING AND/OR REPLACEMENT.

K) EQUIPMENT SHALL BE COVERED FOR ONE YEAR FROM THE REVIEWING ENGINEER'S DATE OF ACCEPTANCE AND/OR THE DURATION OF THE MANUFACTURER'S GUARANTEE OR WARRANTY, WHICH EVER IS LONGER. THE CONTRACTOR SHALL FURNISH THE OWNER WITH ALL MANUFACTURER'S GUARANTEES OR WARRANTIES.

L) THE WATER AND AIR SYSTEMS SHALL BE BALANCED FROM -5% TO + 10% OF THE GPM AND CFM VALUES SHOWN ON THE APPROVED HVAC PLANS. BALANCING SHALL BE DONE IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE AABC OR NEBB USING REPORT SHEETS DEVELOPED BY THE AABC OR NEBB. SUBMIT REPORTS TO THE ENGINEER.

END OF SECTION 15500

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DESIGN DAY
MECHANICALS INC
THE PROJECT MANAGER FOR THIS PROJECT IS NOTED BELOW. PLEASE REFER ALL QUESTIONS, SUBMITTALS AND CORRESPONDENCE TO THE PROJECT MANAGER.
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HVAC Specifications

SCALE: None

revisions:

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M201

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