

MECHANICAL, ELECTRICAL AND PLUMBING SPECIFICATIONS

GENERAL SECTION 152020

CODES: ALL WORK SHALL BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL CODES AND REGULATIONS, AND IS SUBJECT TO INSPECTION.

MATERIALS AND EQUIPMENT SUBSTITUTIONS: THE BID PRICE SHALL BE BASED ON DRAWINGS.

CUTTING AND PATCHING: THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING, CHANNELING, CHASING OR DRILLING AT FLOORS AS NECESSARY FOR PROPER INSTALLATION OR SUPPORT OF DUCTS, PIPING, OR OTHER MECHANICAL OR PLUMBING EQUIPMENT. WORK SHOULD BE COORDINATED WITH ARCHITECT. ANY DAMAGE TO BUILDING, PIPING, EQUIPMENT, PLASTER, WOODWORK OR METAL WORK SHALL BE REPLACED BY SKILLED MECHANICS OF TRADES INVOLVED AT NO EXTRA COST TO THE OWNER.

CONTRACTOR SHALL BE RESPONSIBLE FOR ALL UTILITY FEES AND COSTS INCURRED DURING CONSTRUCTION. COORDINATE WITH OWNER AND UTILITY COMPANIES.

CONTRACTOR SHALL CHECK EXISTING CONDITIONS FOR COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES AND REGULATIONS.

PLUMBING SYSTEM SECTION 154200

THE WORK INCLUDES INSTALLATION OF THE PLUMBING SYSTEM AND PROVIDING NEW MATERIALS, FITTINGS AND ACCESSORIES NECESSARY FOR A COMPLETE FUNCTIONING PLUMBING SYSTEM. THE WORK ALSO INCLUDES ROUGH-IN AND FINAL CONNECTION.

THE INTENT OF THE DRAWINGS IS TO INDICATE THE GENERAL EXTENT OF WORK REQUIRED FOR THE PROJECT. THE DRAWINGS FOR PLUMBING WORK ARE DIAGRAMMATIC, SHOWING THE GENERAL LOCATION, TYPE, FIXTURES AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. REFER TO MANUFACTURER'S STANDARD ROUGH-IN DRAWINGS FOR PLUMBING FIXTURE INSTALLATION REQUIREMENTS. COMPLY WITH ALL APPLICABLE ADA INSTALLATION REQUIREMENTS.

COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

PIPING SYSTEMS - GENERAL: ALL PIPING SHALL BE RUN PARALLEL TO BUILDING LINES AND SUPPORTED AND ANCHORED AS REQUIRED TO FACILITATE EXPANSION AND CONTRACTION. ALL PIPING SHALL BE CONCEALED EXCEPT IN UNFINISHED SPACES. INSTALL AS REQUIRED TO MEET ALL CONSTRUCTION CONDITIONS AND TO ALLOW FOR INSTALLATION OF OTHER WORK SUCH AS DUCTS AND ELECTRICAL CONDUIT. AT ALL CONNECTIONS BETWEEN FERROUS PIPING AND NONFERROUS PIPING, PROVIDE AN ISOLATING DIALECTIC UNION. ALL HANGERS SHALL BE COMPATIBLE WITH PIPING MATERIAL TO PREVENT CORROSION.

PROVIDE ALL FITTINGS, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY TO FACILITATE THE PLUMBING SYSTEM'S FUNCTIONING AS INDICATED BY THE DESIGN AND THE EQUIPMENT INDICATED.

SEWER AND WASTE PIPING: SANITARY DRAINAGE PIPING ABOVE FLOOR SHALL BE HUBLESS CAST-IRON PIPE, FITTINGS AND CONNECTIONS. SANITARY DRAINAGE PIPING BELOW GRADE SHALL BE SERVICE-WEIGHT HUB AND SPIGOT TYPE CAST-IRON WITH NEOPRENE GASKET JOINTS. SCHEDULE 40 PVC IS ALLOWED FOR ALL WASTE AND VENT PIPING WHERE APPROVED BY LOCAL CODE AND ALL DRAINAGE PIPING SHALL BE PROVIDED WITH PITCHED, 1/4" PER FOOT UNLESS OTHERWISE REQUIRED BY EXISTING CONDITIONS, OR INDICATED ON THE DRAWINGS.

VENTS: PROVIDE A COMPLETE VENT RISER SYSTEM OF STANDARD WEIGHT CAST IRON NO-HUB, OR TYPE DUVY PLASTIC AS APPLICABLE. THE VENT SYSTEM SHALL BE CARRIED THROUGH THE ROOF WITH APPROPRIATE FLASHING.

CONDENSATE AND INDIRECT DRAIN PIPING: TYPE M COPPER TUBING UP TO 1" ID, TYPE DUVY TUBING AND FITTINGS FOR 1-1/4" AND LARGER SIZES.

GAS PIPING: GAS PIPING ABOVE GRADE SHALL BE BLACK STEEL PIPE SCHEDULE 40. PIPE INSIDE BUILDING SHALL BE WELDED OR MALLEABLE IRON SCREWED AT THE CONTRACTOR'S OPTION. PROVIDE FLANGED LUBRICATED PLUG GAS COCK WITH INSULATING FLANGE AND BOLTS, ABOVE GRADE WHERE GAS LINE ENTERS THE BUILDING. INSTALL A GAS COCK FOR EACH INDIVIDUAL APPLIANCE OR PIECE OF EQUIPMENT INSTALLED. A UNION SHALL BE INSTALLED BETWEEN THE GAS COCK AND THE EQUIPMENT INSTALLED.

CLEANOUTS: PROVIDE CLEANOUTS AT THE END OF EACH HORIZONTAL RUN, AND AT THE BASE OF ALL VERTICAL WASTE AND DRAIN PIPES. CLEANOUTS SHALL BE OF THE SAME SIZE AS THE PIPES THEY SERVE, CONFORMING TO CODE REQUIREMENTS. PROVIDE SUITABLE WALL OR FLOOR CLEANOUTS WITH ACCESSORIES TO OBSERVE FROM VIEW. ALL FLOOR CLEANOUTS SHALL BE FLUSH WITH FLOOR.

WATER DISTRIBUTION PIPING: LAYOUT WATER PIPING SO THAT THE ENTIRE SYSTEM CAN BE DRAINED. HOT AND COLD WATER PIPING SHALL BE 1/2" MIN. TYPE L COPPER TUBING WITH WROUGHT COPPER FITTINGS AND SWEAT CONNECTIONS. PROVIDE MIN. 16" HIGH FULL AIR CHAMBER AT EACH FIXTURE STOP. INSTALL CHROME PLATED BRASS ESCUTCHEON PLATES AT ALL PENETRATIONS THROUGH FINISHED SURFACES (INCLUDING CABINET INTERIORS). USE TIN-ANTIMONY SOLDER, 95/5 FOR ALL SWEAT FITTINGS OF COPPER PIPING.

PIPE INSULATION: INSULATE ALL HOT AND COLD WATER PIPING. PROVIDE 1/2" PRE-FORMED FIBERGLASS, A8J-VB, FLAME SPREAD 25, SMOKE DEVELOPED 50, ASTM C-847 OR FIBERGLASS, WHERE PERMITTED BY LOCAL CODES, 1/2" SELF-ADHESIVE UNICELLULAR FOAM PIPE INSULATION WITH PRE-FORMED PVC FITTING COVERS - EQUAL TO SELF-ADHESIVE ARMSTRONG 2020 WITH K FACTOR OF 0.21 AT 75 DEGREES MEAN TEMPERATURE. INSULATE ANY EXPOSED CONDENSATE PIPING WITH WASTE TEMPERATURES BELOW 60 DEGREES F.

SHUTOFF VALVES, WITH UNIONS SHALL BE PROVIDED FOR SERVICE TO EACH PLUMBING FIXTURE ITEM OR OTHER EQUIPMENT ITEM, TO FACILITATE ISOLATION FOR REPAIR OR REPLACEMENT. VALVES SHALL BE EQUAL TO JENKINS #202-T BALL VALVE, CHROME-FINISHED BRONZE, TEFLON SEATS AND PACKING, 4200 LB. W.O.G., SOLDER END.

ACCESS PANELS SHALL BE PROVIDED WHERE CONCEALED CONTROL DEVICES, VALVES ETC. ARE CONCEALED WITHIN WALLS, WHERE ACCESS FOR ADJUSTMENT AND MAINTENANCE IS POSSIBLE THROUGH LAY-IN SUSPENDED CEILINGS. ACCESS PANELS ARE NOT REQUIRED. COORDINATE LOCATION WITH OWNER.

SUPPLIES AND TRAPS: PROVIDE WATER SEALED TRAPS AND/OR SUPPLIES INSTALLED AS CLOSE AS POSSIBLE TO ALL PLUMBING FIXTURES, DRAINS AND FOOD SERVICE EQUIPMENT OR BEVERAGE DISPENSING EQUIPMENT ITEMS FURNISHED BY OTHERS, HAVING A WASTE CONNECTION, OR REQUIRING WATER SERVICE. EXPOSED TRAPS AND SUPPLIES IN EXPOSED AREAS (INCLUDING CABINET INTERIORS) SHALL BE CHROMIUM PLATED BRASS, WITH CHROME PLATED ESCUTCHEON PLATES. PROVIDE TYPE DUVY PLASTIC WASTE PIPING AND FITTINGS FOR THE THREE COMPARTMENT SINK. REMOVE ALL MARKING FROM ALL PIPING WHEN INSTALLATION IS COMPLETE. USE SUITABLE CLEANER AND JOINT GLUE COMPATIBLE WITH DUVY PIPING.

INSTALLATION: THOROUGHLY CLEAN ITEMS BEFORE INSTALLATION. CAP PIPE OPENINGS TO EXCLUDE DIRT UNTIL FIXTURES ARE INSTALLED AND FINAL CONNECTIONS HAVE BEEN MADE. PROCEED AS RAPIDLY AS CONSTRUCTION WILL PERMIT. SET FIXTURES LEVEL AND IN PROPER ALIGNMENT. INSTALL SUPPLIES IN PROPER ALIGNMENT WITH FIXTURES. IN PLACE. SEALANT BETWEEN FIXTURES AND ADJACENT MATERIAL, FOR SANITARY JOINT, AND OMIT ESCUTCHEON.

REPAIR EXISTING PLUMBING SYSTEM COMPONENTS DAMAGED BY CONSTRUCTION OPERATIONS AND RESTORE TO ORIGINAL CONDITIONS.

TEST WATER SYSTEM UNDER 150 PSIG HYDROSTATIC PRESSURE, FOR FOUR (4) HOURS MINIMUM. WHEN TESTING INDICATED MATERIALS OR WORKMANSHIP IS DEFICIENT, REPLACE OR REPAIR AS REQUIRED, AND REPEAT TEST UNTIL STANDARDS ARE ACHIEVED.

HVAC SYSTEM SECTION 155200

THE WORK INCLUDES INSTALLATION OF THE HVAC SYSTEM AND PROVIDING NEW DUCTWORK, DIFFUSERS AND GRILLES. INSULATION, CONTROLS, AND EQUIPMENT NECESSARY FOR A COMPLETE FUNCTIONING SYSTEM. HVAC SYSTEM INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

- HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) UNITS.
- SUPPLY AND RETURN DUCTWORK SYSTEM WITH GRILLES, DIFFUSERS, FILTERS, AND DAMPERS.
- TEMPERATURE CONTROL SYSTEM INCLUDING LOW VOLTAGE WIRING AND CONDUIT.
- DUCT, PIPING, AND EQUIPMENT INSULATION, WHERE INDICATED HEREIN.
- ROOF CURBS, ROOFING AND FLASHING OF ROOF PENETRATIONS FOR EQUIPMENT NOTED.
- CONTROLS AND WIRING FOR CONNECTION TO OWNER FIRE-SMOKE ALARM SYSTEM WHERE APPLICABLE.

EQUIPMENT INDICATED ON THE DRAWINGS OR AS REQUIRED FOR A COMPLETE INSTALLATION, SUCH AS AIR HANDLING UNIT, DUCTWORK, EXHAUST FANS, SUPPLY AND RETURN DIFFUSERS, ETC, SHALL BE PROVIDED WITHIN THE SCOPE OF WORK OF THIS SECTION.

WARRANTY: PROVIDE LABOR AND MATERIALS TO REPAIR OR REPLACE DEFECTIVE PARTS AND MATERIALS AS REQUIRED FOR ONE YEAR AFTER SUBSTANTIAL COMPLETION OR OWNER ACCEPTANCE OF THE COMPLETED PROJECT. PROVIDE A SEPARATE LINE ITEM DEDUCT AMOUNT ON THE PROPOSAL FORM TO DELETE WARRANTY SERVICE, AT THE OWNER'S OPTION.

DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC, SHOWING THE GENERAL LOCATION, TYPE, LAYOUT, AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. REFER TO MANUFACTURER'S STANDARD INSTALLATION DRAWINGS FOR EQUIPMENT CONNECTIONS AND INSTALLATION REQUIREMENTS AS REQUIRED. PROVIDE ALL DUCTWORK, CONNECTIONS, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY TO FACILITATE THE SYSTEM FUNCTIONING AS INDICATED BY THE DESIGN AND THE EQUIPMENT INDICATED. THE WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES OR ORDINANCES AND SUBJECT TO INSPECTION.

COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF THE OWNER, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

EXTRA STOCK: PROVIDE TWO SETS OF REPLACEMENT FILTERS PER EACH INSTALLED FOR ALL THE ROOFTOP UNITS, AND OTHER EQUIPMENT AND DEVICES, AND PROVIDE AN ITEMIZED LIST OF THE NUMBER, TYPE, REQUIRED, AND WHERE USED. OBTAIN RECEIPT FROM OWNER THAT THESE ITEMS HAVE BEEN DELIVERED AND ACCEPTED BY THE OWNER'S REPRESENTATIVE.

EVAPORATOR SECTION: SUPPLY FAN TO BE FORWARD CURVED CENTRIFUGAL TYPE WITH BELT OR DIRECT DRIVE AS INDICATE ON SCHEDULE. BELT DRIVE TO INCLUDE AN ADJUSTABLE-PITCH MOTOR PULLEY. FAN AND MOTOR ASSEMBLY TO BE COMPLETELY ISOLATED. FAN CONSTRUCTION TO BE STEEL WITH CORROSION RESISTANT FINISH. FAN TO BE DYNAMICALLY AND STATIONARILY BALANCED. BEARINGS SHALL BE SEALED AND PERMANENTLY LUBRICATED BALL-BEARING TYPE. EVAPORATOR COILS SHALL BE CAPILLARY TUBE EXPANSION TYPE WITH COPPER COILS AND ALUMINUM FINS. PROVIDE COIL SECTION WITH GALVANIZED DRAIN PAN AND CONNECTION. REFRIGERANT CIRCUIT PROTECTION SHALL INCLUDE LOW-PRESSURE CUTOFF SWITCH, AND HIGH-PRESSURE SWITCH.

CONDENSER SECTION: FAN SHALL BE DIRECT DRIVE PROP TYPE DYNAMICALLY BALANCED, DISCHARGE OF FAN VERTICALLY UPWARD. THE CONDENSER FAN SHALL HAVE ALUMINUM BLADES RIVETED TO CORROSION RESISTANT STEEL SPINDERS AND DYNAMICALLY BALANCED. CONDENSER COIL FINS SHALL BE ALUMINUM AND MECHANICALLY BONDED TO SEAMLESS COPPER TUBES WITH ALL JOINTS BRAZED.

COMPRESSOR SECTION: RECIPROCATING COMPRESSOR SHALL BE HERMETICALLY SEALED, PROVIDE WITH INTERNAL SPRING ISOLATION. PROVIDE CRANKCASE HEATER, LOW AMBIENT CONTROL, 5 MINUTE COMPRESSOR TIME DELAY, THERMAL OVERLOAD SWITCH, AND INTERNAL HIGH PRESSURE RELIEF.

HEATING SECTION: SAFETIES FOR HEATING SECTION SHALL INCLUDE HIGH TEMP LIMIT SWITCH, OVERCURRENT PROTECTION, SINGLE POINT CONNECTION.

CONTROLS: PROVIDE UNIT WITH REMOTE 1-STAGE HEATING/1-STAGE COOLING 1-STAT WITH AUTOMATIC CHANGE-OVER SYSTEM HEAT/COOL/AUTO/OFF SETTING AND FAN SWITCH ON/AUTO SETTINGS. UNIT SHALL BE COMPLETE FOR SINGLE POINT CONNECTION INCLUDING DISCONNECT (PER NEC). COORDINATE WITH SUPPLIER FOR ANY FIELD WIRING REQUIREMENTS INCLUDING THERMOSTAT. PROVIDE START-UP AND TRAINING TO OWNER. CONTROLS SHALL BE AS MANUFACTURED BY THE SAME MANUFACTURER AS THE MECHANICAL EQUIPMENT BEING SERVED. DUCT DIMENSIONS: UNLESS OTHERWISE NOTED, DUCT DIMENSIONS ON DRAWINGS ARE SHEET METAL DIMENSIONS ON UNLINED DUCTS.

SHEET METAL DUCTWORK: SHEET METAL SHALL BE FABRICATED AND INSTALLED TO ASHRAE AND SMACNA STANDARDS FOR 1" WATER GAUGE PRESSURE CLASS. SHEET METAL SHALL BE GALVANIZED SHEET STEEL OF LOCK FORMING QUALITY, ASTM A-525, ALL DUCTWORK VISIBLE TO THE PUBLIC SHALL BE A ROUND, SPIRAL TYPE, ALL ANGLE IRON USED FOR SUPPORT SHALL BE GALVANIZED. CONNECTIONS TO WALLS OR FLOOR SHALL BE AIRTIGHT WITH ANGLE IRON AND CAULKING. SEAL ALL DUCT SEAMS, TRANSVERSE AND LONGITUDINAL, AIRTIGHT. PROVIDE TURNING VANES AT ALL ELBOWS OR OFFSETS EXCEEDING 45 DEGREES.

NO DUCTWORK SHALL BE FABRICATED PRIOR TO APPROVAL BY THE CONSTRUCTION MANAGER. SIGNIFICANT DEVIATIONS FROM DESIGN MUST BE APPROVED BY THE CONSTRUCTION MANAGER PRIOR TO FABRICATION OR INSTALLATION.

TRAPEZE DUCT HANGERS: MINIMUM 2" X 2" X 1/8 GAUGE CHANNELS WITH 1" X 1/8 GAUGE STRAPS TO STRUCTURAL SUPPORT ABOVE.

DUCT WRAP/AS INSULATION (ON ALL SUPPLY AIR DUCTWORK): PROVIDE 2" THICK FIBERGLASS AS DUCT WRAP WITH VAPOR SEAL ON ALL SUPPLY DUCTWORK ABOVE THE CEILING. CONFORM TO FEDERAL SPEC. HH-1-B555 (AMMEN 3) TYPE 15, FORM B, TYPE 1, CLASS B-2.

DUCT LINER: DUCT LINER SHALL COMPLY WITH ASTM C1071 LINER SHALL BE LONG TEXTILE-TYPE FIBER TYPE AND 3 LB. PER CUBIC FOOT DENSITY. LINER SHALL HAVE A COATING ON THE AIR STREAM SIDE CONFORMING TO THE REQUIREMENTS OF NFPA 90A. PROVIDE 1/2" THICK LINER WITH A K' FACTOR OF 0.24 AT 75 DEGREES F. LINER MUST MEET (ZERO) FLAME SPREAD PER ASTM C669 AND/OR ASTM G21. LINER SURFACE SHALL BE CLEANABLE PER NAIMA DUCT CLEANING GUIDELINES.

RIGID ROUND GALVANIZED DUCT SHALL BE SPIRAL OR SNAP LOCK GALVANIZED SHEETMETAL COMPLYING WITH SMACNA (SNAP LOCK IS NOT ALLOWED IN THE DINING AREA)

FLEX DUCT: PROVIDE FACTORY ASSEMBLED CLASS 1 AIR DUCT (UL 181) WITH 1" THICK 1" PFC FIBERGLASS INSULATION AND REINFORCED OUTER PROTECTIVE COVER OR VAPOR BARRIER. FLEX DUCT SHALL MEET NFPA 90A WITH FLAME SPREAD UNDER 25, SMOKE DEVELOPED UNDER 50, AND SHALL BE RATED FOR 2" WG. PRESSURE AND 0 TO 250 DEGREE FAHRENHEIT. PROVIDE METAL ADJUSTABLE CLAMPING DEVICES, SCREW OPERATED. USE TUBST-LOCK CONICAL TAP COLLARS AT CONNECTIONS INTO SHEET METAL DUCTWORK. DO NOT EXCEED FIVE (5) FEET IN LENGTH FOR ANY FLEX DUCT. REFER TO DETAILS FOR ADDITIONAL REQUIREMENTS.

ROUND BALANCING DAMPERS: FABRICATED OF SAME MATERIAL AS DUCT. TWO METAL GAUGES HEAVIER THAN DUCT, MOUNT ON 3/8" SQUARE ROD WITH BALL SLOT POSITION INDICATOR. PIVOT BEARING, LOOKING POSITION REGULATOR, YOUNG REGULATOR CO, SERIES 443. REGULATOR SHALL BE POSITIONED WITH SHEETMETAL BRACKET BEYOND DUCT COVERING.

CEILING DIFFUSERS/RETURNS: PROVIDE SUPPLY DIFFUSERS AND DAMPER IN SIZES, CAPACITIES, MATERIALS, AND PATTERN INDICATED ON THE DRAWINGS.

PROVIDE WHERE APPLICABLE, DUCT MOUNTED SUPPLY AND/OR RETURN AIR PHOTOELECTRIC TYPE UL LISTED SMOKE DETECTORS. DETECTORS SHALL HAVE TWO FORM C CONTACTS. CONTACT ONE FOR POWER, CONTACT TWO FOR FIRE ALARM. DETECTORS SHALL BE LISTED FOR THE AIR VELOCITIES ENCOUNTERED.

TEST AND ADJUST EACH PIECE OF EQUIPMENT AND EACH SYSTEM AS REQUIRED TO ASSURE PROPER BALANCE AND OPERATION. TEST SHALL BE PER NEBB OR AABC, AND AS PER STANDARDS. OR ELIMINATE NOISE AND VIBRATION, AND ASSURE PROPER FUNCTION OF ALL CONTROLS, MAINTENANCE OF TEMPERATURE, AND OPERATION. BALANCE MECHANICAL SYSTEM, AND SUBMIT COMPLETED TEST REPORT TO CONSTRUCTION MANAGER, PRIOR TO REQUEST FOR FINAL PAYMENT. BALANCING CONTRACTOR SHALL BE AN INDEPENDENT CERTIFIED TEST AND BALANCE CONTRACTOR. NEBB OR AABC. ALL SYSTEMS SHALL BE BALANCED TO WITHIN 5 PER CENT OF AIR VOLUMES INDICATED. ANY DISCREPANCY SHALL BE REPORTED TO HVAC INSTALLER FOR DUCT CORRECTION, PRIOR TO FINAL REPORT. AFTER FINAL DUCT ADJUSTMENTS HAVE BEEN MADE, FINAL BALANCING SHALL BE PERFORMED AND THE RESULTS REPORTED IN A CERTIFIED BALANCE REPORT. FINAL BALANCED POSITIONS SHALL BE MARKED ON THE DAMPER WITH A PERMANENT MARKER. NOTE ALL AIR QUANTITIES OUTSIDE OF TOLERANCE IN REPORT.

ELECTRICAL SYSTEM SECTION 162020

THE WORK INCLUDES PROVIDING NEW MATERIALS, FIXTURES, DEVICES AND ACCESSORIES NECESSARY FOR A COMPLETE FUNCTIONING ELECTRICAL SYSTEM. ALL WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES OR ORDINANCES AND SUBJECT TO INSPECTION.

COMPLY WITH ALL LAWS APPLYING TO ELECTRICAL INSTALLATIONS IN EFFECT, AND WITH THE MOST RECENT EDITION OF THE NATIONAL ELECTRICAL CODE, ADA, APPLICABLE SECTIONS OF OTHER NFPA, OSHA, LIFE SAFETY CODES AND RECOMMENDATIONS, AND THE INTERIM AMENDMENTS IN EFFECT AT THE TIME OF THE PROPOSAL. ALL MATERIALS USED SHALL BE NEW AND SHALL CONFORM TO THE STANDARDS ESTABLISHED BY THE UNDERWRITERS LABORATORIES INCORPORATED.

THE INTENT OF THE DRAWINGS IS TO INDICATE THE GENERAL EXTENT OF WORK REQUIRED FOR THE PROJECT. THE DRAWINGS FOR ELECTRICAL WORK ARE DIAGRAMMATIC, SHOWING THE LOCATION, TYPE, DEVICES AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. PROVIDE ALL FIXTURES, DEVICES, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY TO FACILITATE THE SYSTEM'S FUNCTIONING AS INDICATED BY THE DESIGN AND THE EQUIPMENT FURNISHED BY OTHERS.

TEMPORARY SERVICES: ARRANGE FOR SOURCES OF TEMPORARY CONSTRUCTION SERVICES. SUCH SERVICES SHALL BE NOMINALLY 120/240 VOLT, SINGLE-PHASE, THREE-WIRE FROM WHICH A COMPLETE SYSTEM OF TEMPORARY POWER AND LIGHTING CAN BE PROVIDED FOR ALL CONSTRUCTION NEEDS.

ELECTRICAL DESIGN FOR THIS INSTALLATION IS BASED ON FIELD INSPECTIONS FOR THE EXISTING BUILDING. ELECTRICAL CONTRACTOR IS TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO BIDDING. ALLOWANCES ARE TO BE INCLUDED FOR UNFORESEEN EXISTING CONDITIONS THAT MAY AFFECT THE SCOPE OF WORK. MINOR DEVIATIONS REQUIRED FOR ACCOMPLISHING THE INTENT OF THIS DESIGN IS TO BE INCLUDED IN THIS ALLOWANCE.

ELECTRICAL CONTRACTOR TO FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES. ANY ITEM DAMAGED BY THIS CONTRACTOR IS TO BE REPAIRED IMMEDIATELY AND AT NO COST TO THE OWNER.

ROOF PENETRATIONS SHALL COMPLY WITH 'SMACNA' AND 'NRCA' STANDARDS, AND WITH THE REQUIREMENTS OF THE EXISTING ROOFING WARRANTY, IF APPLICABLE. DO NOT PERFORM ROOFING PENETRATIONS IN A MANNER WHICH WOULD VOID OR OTHERWISE LIMIT THE EXISTING ROOFING WARRANTY.

ELECTRICAL CONTRACTOR TO FIELD VERIFY ALL EXISTING EQUIPMENT AS SHOWN ON DESIGN DRAWINGS AND ARE IN GOOD WORKING CONDITION PRIOR TO RE-USING. IF EXISTING CONDITIONS ARE NOT AS SHOWN OR ARE NOT IN GOOD WORKING CONDITION, CONTRACTOR SHALL PROVIDE EQUIPMENT, CONDUIT, AND/OR WIRE AS INDICATED TO PROVIDE A 'LIKE-NEW' AND CODE COMPLIANT INSTALLATION. CONTRACTOR IS RESPONSIBLE FOR RELOCATING ANY EXISTING ITEMS BEING REUSED. ANY EXISTING EQUIPMENT, CONDUIT OR WIRE NOT BEING REUSED SHALL BE REMOVED BY THIS CONTRACTOR.

ELECTRICAL DESIGN HAS BEEN BASED ON THE INSTALLATION OF 75 DEGREES C CONDUCTORS CONNECTED TO TERMINAL LUGS AND EQUIPMENT. UL LISTED FOR A MINIMUM 75 DEGREES C. CONDUCTORS TERMINATED ON EQUIPMENT OR DEVICES WITH A LOWER RATING (60 DEGREES C) OR NO RATING SHOWN, SHALL HAVE CONDUCTOR SIZE INCREASED TO CONFORM TO SECTION 310-16 AND U.L. NO. 489 REQUIREMENTS.

DISCONNECT SWITCHES SHALL BE HEAVY-DUTY, QUICK-MAKE, QUICK-BREAK TYPE, NEMA 1 ENCLOSURE FOR INDOOR LOCATIONS (NEMA 3R FOR OUTDOOR LOCATIONS). SWITCHES SHALL BE AS MANUFACTURED BY SQUARE D, GENERAL ELECTRIC, OR SIEMENS (I.T.E.) PROVIDED THESE AS MANUFACTURED BY BUSBACH (GOLD-SHAUNIT, OR LITTLE-FLUE. ALL CONDUCTOR TERMINALS TO BE UL LISTED FOR A MINIMUM OF 75 DEGREES C. SWITCHES USED AS SERVICE ENTRANCE EQUIPMENT TO BE UL LISTED AS '9ER' RATED EQUIPMENT.

PANELBOARDS SHALL BE AS MANUFACTURED BY SQUARE D, GENERAL ELECTRIC, SIEMENS OR EATON CORP. MEETING UL STANDARDS 50 AND 67, WITH U.L. LABEL. PANELS USED AS SERVICE ENTRANCE EQUIPMENT TO BE UL LISTED AS '9ER' RATED EQUIPMENT.

BREAKERS: THERMAL MAGNETIC TYPE, QUICK-MAKE, QUICK-BREAK, BOLT-IN TYPE OF SINGLE UNIT CONSTRUCTION. TWO AND THREE POLE BREAKERS SHALL BE SINGLE UNIT COMMON TRIP TYPE. BREAKERS USED AS SWITCHES FOR 120V LIGHTING CIRCUITS SHALL BE APPROVED FOR THAT USE AND MARKED '8UD'. ALL BREAKERS FOR HVAC AND REFRIGERATION EQUIPMENT SHALL BE 'HACR' RATED BREAKERS.

CABINETS SHALL BE ONE PIECE CODE GAUGE GALVANIZED STEEL WITH MOUNTING STUDS. WIRING GUTTERS OF AMPLE SIZE AND KNOCKOUT FOR CONDUIT CONNECTIONS AS REQUIRED. BUS BARS SHALL BE 98 PER CENT CONDUCTIVE COPPER, ALUMINUM, OR COPPER-CLAD ALUMINUM. FRONTS SHALL BE ONE PIECE CODE GAUGE FURNITURE STEEL WITH ADJUSTABLE FASTENERS. PROVIDE A PLASTIC COVERED TYPEWRITTEN SCHEDULE IDENTIFYING ALL BRANCH CIRCUITS INSIDE EACH CABINET. RECESSED CABINETS TO BE INSTALLED WITH A MINIMUM (2) 3/4" SQUARE CONDUITS STUBBED UP TO ACCESSIBLE CEILING SPACE.

GROUNDING SYSTEM: PERMANENTLY AND EFFECTIVELY GROUND ALL METALLIC CONDUIT, SUPPORTS, CABINETS, PANELBOARDS AND SYSTEM NEUTRAL CONDUCTORS. MAINTAIN CONTINUITY OF EQUIPMENT GROUND THROUGHOUT THE SYSTEM. GROUND LAMPS SHALL BE APPROVED TYPE, SPECIFICALLY DESIGNED FOR GROUNDING. WHERE GROUNDING CONDUCTOR IS ENCLOSED IN CONDUIT, GROUND CLAMP SHALL BE OF A TYPE WHICH GROUND BOTH CONDUCTOR AND CONDUIT. ALL CIRCUITS IN FLEXIBLE METAL OR PLASTIC CONDUIT SHALL INCLUDE A GROUND WIRE SIZED IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.

CONDUIT SHALL BE SIZED TO COMPLY WITH NEC FOR NUMBER AND SIZE OF CONDUCTORS INSTALLED. MINIMUM 24" BELOW GRADE. PROVIDE SCHEDULE 40 PVC PLASTIC OR RIGID STEEL CONDUIT BELOW GRADE, MINIMUM 3/4" PLASTIC ELECTRICAL METAL TUBING (EMT) MEETING FS U-C563, OR FLEXIBLE CONDUIT (IN LENGTHS 6' OR LESS) FOR INTERIOR LOCATIONS. EMT CONNECTORS AND COUPLING SHALL BE SET-SCREW TYPE. CLAMP CONDUIT TO BOXES WITH BUSHING INSIDE AND LOCKOUT OUTSIDE.

ALL CONDUIT AND RACEWAY SYSTEMS TO BE INSTALLED WITH SEPARATE GROUND CONDUCTOR. CONDUIT SYSTEM IS NOT TO BE USED AS THE SOLE GROUNDING MEANS.

ALL SWITCHBOARDS, PANELBOARDS, DISCONNECT SWITCHES, CONTACTORS, AND TRANSFORMERS SHALL BE PROVIDED WITH LUGS LABELED AND RATED FOR A MINIMUM 75 DEGREES C. SWITCHBOARDS, PANELBOARDS, DISCONNECT SWITCHES, CONTACTORS, AND TRANSFORMERS ARE TO BE 'LISTED' AND 'IDENTIFIED' AS RATED FOR A MINIMUM OF 75 DEGREES C CONDUCTOR TERMINATION.

CONDUCTORS: INSULATED SOFT ANNEALED 98 PER CENT PURE COPPER WITH COLOR CODING, IS AND 5 GAUGE, #10 AND SMALLER TO BE SOLID, #8 AND LARGER TO BE STRANDED, MINIMUM #2 UNLESS OTHERWISE INDICATED. ALUMINUM CONDUCTOR WILL NOT BE ALLOWED. THIN MAY NOT BE USED UNDERGROUND. AT SERVICE ENTRANCE, OUTSIDE, OR IN UET LOCATIONS, ALL INSULATION TO BE RATED FOR 600 V AND TYPES AS FOLLOWS:

- #2 AND SMALLER: THIN OR THIN
- #2 TO #4/0: THIN OR THIN
- SERVICE ENTRANCE: USE-RHW
- OVER #4/0 ORDINARY SERVICE: THIN OR XHHN
- OVER #4/0 EXTRA SERVICE: XHHW
- WIRE THRU FLUORESCENT FIXTURES OR WITHIN 3' OF HEATING EQUIPMENT: THHN

FLEXIBLE METALLIC TUBING (FMT) AND NON METALLIC SHEATHED BY CODE. COPPER CABLE MAY BE USED WHERE PERMITTED.

DEVICES SHALL BE MANUFACTURED BY LEVITON 'INDUSTRIAL SPECIFICATION GRADE' OR EQUAL. ALL DEVICES AND COVER PLATES SHALL BE IVORY COLORED STANDARD DUPLEX. RECEPTACLES SHALL BE GROUNDING TYPE, 20A, NEMA WD-2 STANDARD 5-20R, SIDE WIRED, LEVITON #342. LIGHT SWITCHES SHALL BE 20 AMP, 120 VOLT, LEVITON #221-2. WHERE SWITCHES ARE GROUPEED, PROVIDE GANG PLATES.

LIGHT FIXTURES AND LAMPS ARE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR ACCORDING TO U.B.C. STANDARDS SECTION 25-2, 1994 EDITION. THE ELECTRICAL CONTRACTOR SHALL REVIEW MATERIALS AT THE TIME OF DELIVERY AND IMMEDIATELY REPORT ANY DAMAGE OR MISSING PIECES.

EMERGENCY LIGHTING SHALL HAVE A MINIMUM OF 90 MIN. BATTERY BACK-UP, OR AS REQUIRED BY LOCAL CODE AUTHORITY.

LAYOUT BRANCH CIRCUIT WIRING AND ARRANGEMENT OF HOME RUNS FOR MAXIMUM ECONOMY AND EFFICIENCY. INCREASE WIRE SIZE IF VOLTAGE DROP EXCEEDS 3 PER CENT OR 100 FEET OF LENGTH.

CONCEAL WIRING SYSTEM ABOVE SUSPENDED CEILING OR IN WALL OR FLOOR CONSTRUCTION WHERE POSSIBLE. INSTALL CONDUITS PARALLEL TO BUILDING LINES, AND TO CLEAR ALL OPENING, DEPRESSIONS, PIPES, DUCTS, STRUCTURE, ETC.

INSTALL CONDUIT CONTINUOUS BETWEEN BOXES AND CABINETS WITH NO MORE THAN FOUR (4) 90 DEGREE BENDS. SECURELY FASTEN IN PLACE WITH STRAPS, HANGERS AND STEEL SUPPORTS AS REQUIRED. DO NOT SUPPORT CONDUIT FROM SUSPENDED CEILING GRID OR SUSPENSION WIRES. REAM CONDUIT ENDS BEFORE INSTALLATION AND THOROUGHLY CLEAN BEFORE INSTALLATION. OPENINGS SHALL BE PLUGGED OR COVERED TO KEEP CONDUIT CLEAN. TERMINALS ON SWITCHES AND OUTLET SHALL NOT BE USED TO 'FEED THRU' TO THE NEXT SWITCH OR OUTLET.

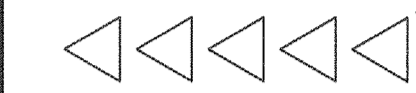
ADJUSTING AND TESTING: ALL ELECTRICAL EQUIPMENT SHALL BE ADJUSTED AND TESTED FOR PROPER OPERATION. COMPLETED WIRING SYSTEM SHALL BE FREE FROM SHORT CIRCUITS.

TOUCH-UP OR REFINISH DAMAGED SURFACES OF FIXTURES AND EQUIPMENT, EXPOSED TO VIEW.

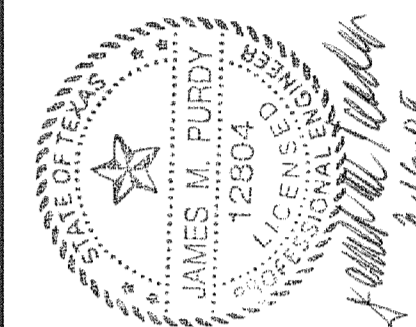
TELEPHONE CABLE TO BE FURNISHED AND INSTALLED BY OTHERS. ALL CABLEING TO BE PLENUM RATED. ELECTRICAL CONTRACTOR TO PROVIDE NEW FLUOUD BACKBOARD FOR NEW TELEPHONE TERMINAL BOARD. COORDINATE EXACT REQUIREMENTS WITH LOCAL TELEPHONE UTILITY REPRESENTATIVE AND OWNER.

REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT LOCATION OF LIGHTING FIXTURES AND OTHER CEILING MOUNTED EQUIPMENT.

FOR EQUIPMENT FURNISHED BY OWNER OR OTHER CONTRACTORS: ELECTRICAL CONTRACTOR TO VERIFY EXACT LOAD, TYPE OF CONNECTION AND MOUNTING HEIGHT FOR EACH BOX OR EQUIPMENT ITEM TO BE INSTALLED. ALL HARD-WIRED CONNECTIONS TO EQUIPMENT TO BE MADE WITH FLEXIBLE LIQUID-TITE METAL CONDUIT WITH GREEN GROUND CONDUCTOR INSTALLED INSIDE RACEWAY. GROUND CONDUCTOR TO BE BONDED AT BOTH ENDS. CONTRACTOR SHALL COORDINATE FINAL CONNECTION TO EQUIPMENT WITH EQUIPMENT INSTALLER.



CONTRACTOR SHALL VERIFY ALL DIMENSIONS AT THE JOB SITE AND NOTIFY THE ARCHITECTS OF ANY DIMENSIONAL ERRORS, OMISSIONS OR DISCREPANCIES BEFORE BEGINNING OR FABRICATING ANY WORK. DO NOT SCALE DRAWINGS.



DEVICES SHALL BE MANUFACTURED BY LEVITON 'INDUSTRIAL SPECIFICATION GRADE' OR EQUAL. ALL DEVICES AND COVER PLATES SHALL BE IVORY COLORED STANDARD DUPLEX. RECEPTACLES SHALL BE GROUNDING TYPE, 20A, NEMA WD-2 STANDARD 5-20R, SIDE WIRED, LEVITON #342. LIGHT SWITCHES SHALL BE 20 AMP, 120 VOLT, LEVITON #221-2. WHERE SWITCHES ARE GROUPEED, PROVIDE GANG PLATES.

LIGHT FIXTURES AND LAMPS ARE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR ACCORDING TO U.B.C. STANDARDS SECTION 25-2, 1994 EDITION. THE ELECTRICAL CONTRACTOR SHALL REVIEW MATERIALS AT THE TIME OF DELIVERY AND IMMEDIATELY REPORT ANY DAMAGE OR MISSING PIECES.

EMERGENCY LIGHTING SHALL HAVE A MINIMUM OF 90 MIN. BATTERY BACK-UP, OR AS REQUIRED BY LOCAL CODE AUTHORITY.

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JOB NUMBER
09.016

SHEET TITLE

MEP SPECIFICATION

SHEET NUMBER

MEP1

DATE OF ORIGINAL ISSUE
© MARCH 16, 2009

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