

DRILLING, NON-REFUNDABLE. AMERICAN STANDARD COLONY PRO #7075.000.002 SINGLE HANDLE FAUCET, POLISHED CHROME FINISH, WASHLESS 35 MM CERAMIC DISC VALVE CARTRIDGE, 4.5 L/MIN (1.2 GAL/MIN) AERATOR OUTLET, METAL SPOUT, 114 MM (4-1/2") PROJECTION REACH, METAL LEVER HANDLES, METAL POP-UP DRAIN, LAWLOR #1MM-1070, BELOW DECK MECHANICAL WATER MIXING VALVE, BRONZE BODY, TEMPERATURE ADJUSTING DIAL, 10 MM (3/8") INLETS AND OUTLET COMPRESSION FITTINGS, HIGH TEMPERATURE THERMOSTATIC LIMIT STOP, SHUT-OFF WITH AUTOMATIC RESET WHEN TEMPERATURE EXCEEDS 120 °F (48.8 °C), INTEGRAL CHECKS, OFFER TEMPERATURE RANGE FROM FULL COLD THROUGH 46 °C (114.8 °F). PROVIDE TEE, ADAPTORS AND FLEX. COPPER TUBING TO SUIT INSTALLATION. PROVIDE TEMPERED WATER TO HOT SIDE OF FAUCET. MCGUIRE #LH165LNK3 FAUCET SUPPLIES, CHROME PLATED FINISH POLISHED BRASS, HEAVY DUTY ANGLE STOPS, 10 MM (3/8") I.P.S. INLET X 76 MM (3") LONG RIGID HORIZONTAL NIPPLES, V.P. LOOSE KEYS, ESCUTCHEON AND FLEXIBLE COPPER RISERS. MCGUIRE #0872C P-TRAP, HEAVY CAST BRASS ADJUSTABLE BODY, WITH SLIP NUT, 32 MM (1-1/4") SIZE, SHALLOW WALL FLANGE AND SEAMLESS TUBULAR WALL BEND. MCGUIRE PROWRAP #PW2000 SANITARY COVERING VANDAL-RESISTANT, FLEXIBLE SEAMLESS MOULDED, CLOSED-CELL PVC RESIN, FORMULATED WITH ANTI-MICROBIAL ADDITIVE TO LIMIT THE GROWTH OF FUNGUS AND BACTERIA, TO EXPOSED PIPING (TO PROTECT AGAINST HEAT/CONTUSIONS) AS PER LOCAL CODES. WATTS #CA-311 FIXTURE CARRIER, MOUNTED ON CONCRETE FLOOR, STEEL HANGER PLATE, HEAVY GAUGE EPOXY COATED STEEL OFFSET UPRIGHTS WITH WELDED FEET SUPPORTS. FOR ONE UNIT: 102 MM (4") FOR TWO TO SIX UNITS IN A ROW: 152 MM (6") FINISHED METAL STUD WALL TO BACK OF PIPE SPACE.

PLATE, SHEET, AND STRIP
 2.3.3. ASTM A653 / A653M STANDARD SPECIFICATION FOR STEEL SHEET, ZINC-COATED (GALVANIZED) OR ZINC-IRON ALLOY-COATED (GALVANNEALED) BY THE HOT-DIP PROCESS
 2.4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):
 2.4.1. NFPA 90A INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS
 2.4.2. NFPA 90B INSTALLATION OF WARM AIR HEATING AND AIR CONDITIONING SYSTEMS
 2.5. SHEET METAL AND AIR CONDITIONING SUBCONTRACTORS NATIONAL ASSOCIATION (SMACNA):
 2.5.1. SMACNA HVAC DUCT CONSTRUCTION STANDARDS
 2.5.2. SMACNA ROUND INDUSTRIAL DUCT CONSTRUCTION STANDARDS
 2.5.3. SMACNA RECTANGULAR DUCT CONSTRUCTION STANDARDS
 2.5.4. IAQ GUIDELINES FOR OCCUPIED BUILDINGS UNDER CONSTRUCTION.
 2.6. UNDERWRITERS LABORATORIES INC. (UL):
 2.6.1. UL 181 FACTORY-MADE AIR DUCTS AND AIR CONNECTORS

(+1) REQUIRED ON FOUR SIDES. WELD OR BOLT ANGLES WHERE THEY JOIN. MILD STEEL.
 (+2) PROVIDE 3/8" (10MM) DIAMETER TIE RODS MAXIMUM 36" (914MM) O.C. AT EACH JOINT.
 (+3) WELD 24 (610 MM) LONG 3/4" (18 MM) ROUND KNEE BRACE INSIDE DUCT AT EACH CORNER TO INTERMEDIATE STIFFENER 8 FEET (2.4 M) ON CENTER. (C.F. = COMPANION ANGLE FLANGES.)

440, OR EQUAL, MINIMUM 3/16" THICK BY 1/2" WIDE.

3. DUCTWORK PRESSURE DEFINITIONS:
 3.1. MEDIUM PRESSURE DUCTWORK INCLUDES:
 3.1.1. ALL DUCT RISERS ENCLOSED IN SHAFTS.
 3.1.2. ALL EXHAUST DUCTWORK CONNECTED TO FANS WITH SCHEDULED STATIC PRESSURE EXCEEDING 2" WATER COLUMN.
 3.1.3. ALL SUPPLY DUCTWORK UPSTREAM OF AIRFLOW CONTROL (OR VAV) TERMINALS OR REHEAT COILS.
 3.1.4. OTHER DUCTWORK NOTED OR SPECIFIED AS MEDIUM PRESSURE CONSTRUCTION.
 3.2. LOW PRESSURE DUCTWORK INCLUDES:
 3.2.1. ALL GALVANIZED DUCTWORK DOWNSTREAM OF AIR TERMINALS AND REHEAT COILS, HORIZONTAL TOILET EXHAUST DUCT, AND DUCTS NOT INCLUDED UNDER MEDIUM PRESSURE DUCTWORK ABOVE.
 4. QUALITY ASSURANCE
 4.1. ASHRAE COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE 62.1-2004, SECTION 5 - "SYSTEMS AND EQUIPMENT" AND SECTION 7 - "CONSTRUCTION AND SYSTEM START-UP."
 4.2. ASHRAE/AESNA COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE/AESNA 90.1-2004, SECTION 6.4.4 - "HVAC SYSTEM CONSTRUCTION AND INSULATION."
 5. PERFORMANCE REQUIREMENTS
 5.1. AIRSTREAM SURFACES SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1-2004.
 6. THIS CONTRACTOR SHALL SUPPLY AND INSTALL ALL DUCTWORK INCLUDING APPURTENANCES, HANGERS, DAMPERS, ETC.
 7. DUCT CONSTRUCTION:
 7.1. LOW PRESSURE RECTANGULAR DUCTWORK:
 7.1.1. LONGITUDINAL SEAMS: FLAT CRIMPED PITTSBURGH LOCK WITH SPECIFIED SEALANT, APPLIED OVER SEAM.
 7.1.2. TRANSVERSE JOINTS: DUCTMATE 35, TDC, OR EQUAL WITH SPECIFIED GASKET.
 7.1.3. CROSS BREAK OR BEAD SIDES.
 7.1.4. CONSTRUCTION AND REINFORCEMENT:

ROUND DUCT SIZE	LOW PRESSURE GAUGE	MEDIUM PRESSURE GAUGE
THRU 8" (THRU 200MM)	26	26
9"-14" (230-255MM)	26	26
15"-26" (381-660MM)	26	24

7.2.3. FITTINGS: UNITED MCGILL, WESTERN ENGINEERING CO., LINDAB, OR EQUAL.
 7.2.3.1. LOW PRESSURE:
 7.2.3.1.1. ELBOWS: 26 GAUGE SMOOTH. PLEATED NOT ALLOWED.
 7.2.3.1.2. OTHER: 26 GAUGE UNWELDED. SPOT WELDED AND SEALED JOINTS.
 7.2.3.2. MEDIUM PRESSURE:
 7.2.3.2.1. ELBOWS: 20 GAUGE DIE-STAMPED. ALL-WELDED JOINTS.
 7.2.3.2.2. OTHER: 20 GAUGE UNIFORM. ALL-WELDED JOINTS.
 7.2.3.3. ELBOWS: RADIUS TO CENTER OF DUCT SHALL NOT BE LESS THAN 1.5 TIMES THE DIAMETER OF THE DUCT.
 7.2.3.4. REDUCERS: MACHINE FORMED TO ASME SHORT FLOW NOZZLE SHAPE.
 7.2.3.5. TEES: CONICAL TAP MACHINE FORMED TO SHORT FLOW NOZZLE SHAPE.
 7.2.3.6. LATERALS: MACHINE FORMED TO ASME SHORT FLOW NOZZLE, CONICAL TAP AT 45 DEGREES F.
 7.2.3.7. ROUND TAP FITTINGS: SADDLE TYPE FOR ROUND DUCT OR CONICAL FOR RECTANGULAR DUCTS AS SHOWN ON THE DRAWINGS.
 7.2.4. ROUND DUCT JOINTS: JOIN BY MEANS OF COUPLINGS WITH SWAGED BEAD IN CENTER AND SECURED WITH SHEET METAL SCREWS AT EACH END OF COUPLING. MAKE DUCT-TO-FITTINGS JOINTS BY EITHER A TIGHT SLIP FIT OR THE FITTING LAPPED INSIDE THE DUCT OR BY MEANS OF COUPLINGS WITH SWAGED BEAD IN CENTER, SECURED WITH SHEET METAL SCREWS. SCREW SPACING: 6 INCHES (150 MM) UNLESS OTHERWISE SHOWN ON THE DRAWINGS. SEAL JOINTS AND SEAMS WITH SPECIFIED INTERNAL SEALANT APPLIED CONTINUOUSLY AROUND THE COUPLING.

8. BALANCING DAMPERS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL 2 GAUGES HEAVIER THAN THE DUCTWORK IN WHICH THEY ARE INSTALLED C/W LOCKING QUADRANT AND INDICATING DEVICE. FABRICATE AS SPECIFIED. LEAVE 1/8 (3 MM) MAXIMUM GAP BETWEEN BLADE AND DUCT WALL. INSTALL DAMPERS IN SEPARATE, FLANGED, BOLTED, REMOVABLE DUCT SECTIONS.

9. TURNING VANES SHALL BE CONSTRUCTED TO THE FOLLOWING REQUIREMENTS:
 9.1. USE ONLY WHERE SHOWN OR REQUIRED FOR TIGHT TURNS. VANES SHALL BE MINIMUM 16 GAUGE (1.61 MM) CONTINUOUSLY WELDED TO DUCT AT BOTH ENDS. WELDED JOINTS SHALL BE GROUND SMOOTH AND SAND BLASTED BEFORE APPLYING COATING.
 9.2. USE DUCT ELBOWS WHICH HAVE A THROAT RADIUS OF 1-1/2 TIMES THE DUCT DIAMETER.
 9.3. WHERE SPACE IS LIMITED, USE DUCT ELBOWS FABRICATED WITH SQUARE THROATS AND BACKS AND FITTED WITH TURNING VANES.

10. THE FOLLOWING DUCT JOINING METHODS SHALL BE USED:
 10.1. PITTSBURGH LOCK OR DOUBLE SLIDE LOCK HAMMERED FLAT FOR LONGITUDINAL JOINTS ON STRAIGHT DUCTWORK.
 10.2. PITTSBURGH LOCK FOR CORNER LOCK OF FITTING.
 10.3. FLAT DRIVE CLEAT JOINT ON ALL SIDE JOINTS 18" (450MM) AND UNDER IN LENGTH.
 10.4. FLAT SLIP CLEAT JOINT ON ALL TRANSVERSE JOINTS 18" (450MM) AND UNDER IN LENGTH.
 10.5. ANGLE "S" OR STANDING DRIVE CLEATS ON ALL SIDE JOINTS 19"(475MM) TO 30"(750MM) ON HEIGHT.
 10.6. STANDING "S" OR STANDING DRIVE CLEATS ON ALL TRANSVERSE JOINTS 19"(475MM) TO 30"(750MM) IN LENGTH.
 10.7. ANGLE "S" OR STANDING DRIVE CLEATS ON ALL TRANSVERSE AND SIDE JOINTS 31"(725MM) TO 72"(1800MM).
 10.8. STANDING "S" OR STANDING DRIVE CLEATS REINFORCED WITH 1 1/2"(38MM) X 5/32" (4.5MM) MILD STEEL BAR ON ALL TRANSVERSE JOINTS AND SIDE JOINTS 73" (1825MM) AND OVER.

11. PROVIDE FIRE DAMPERS WHICH CONFORM TO NFPA REGULATIONS, BE MINIMUM 2-HOUR RATED, DYNAMIC (SPRING) TYPE, BEAR ULC LABEL, AND HAVE APPROVAL OF AUTHORITY HAVING JURISDICTION. DAMPERS TO BE TYPE "B" AND "C" (UNLESS OTHERWISE NOTED) AND INSTALLED IN DUCTWORK AT FIRE SEPARATIONS WHETHER SHOWN OR NOT. VERIFY LOCATIONS ON ARCHITECTURAL DRAWINGS. ALL FIRE DAMPERS SHALL BE BY ONE MANUFACTURER. STANDARD OF ACCEPTANCE: NAUTICAL, PRICE, RUSKIN.

12. ALL NEW DUCTWORK SHALL BE SEALED USING DUCT BOND II HIGH PRESSURE, NON-TOXIC, DUCT SEALER THROUGHOUT ALL SEAMS AND JOINTS. DUCT SEALANT SHALL BE TO MEET THE FOLLOWING REQUIREMENTS:
 12.1. FOR NON-FUME EXHAUST DUTY AND GALVANIZED FUME EXHAUST DUTY: UNITED DUCT SEALER, 3M #800, OR EQUAL, NON-FLAMMABLE, U.L. LABELED.
 12.2. TWO-PART TAPE SEALING SYSTEM:
 12.2.1. FOR INDOOR APPLICATIONS, USE SEALANT THAT HAS A VOC CONTENT OF 250 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).
 12.2.2. FOR INDOOR APPLICATIONS, USE SEALANT THAT HAS A VOC CONTENT OF 250 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24). VOC: MAXIMUM 395 G/L.
 12.3.1. FOR INDOOR APPLICATIONS, USE SEALANT THAT HAS A VOC CONTENT OF 250 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24). VOC: MAXIMUM 395 G/L.
 12.3.2. FLANGED JOINT SEALANT: COMPLY WITH ASTM C 920.
 12.3.2.1. FOR INDOOR APPLICATIONS, USE SEALANT THAT HAS A VOC CONTENT OF 250 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

12.4. SEALING:
 12.4.1. WHERE FIRESTOPPING IS NOT REQUIRED, SEAL DUCT, PIPE, AND CONDUIT PENETRATIONS THROUGH PARTITIONS WITH G.E. SILICONE SANITARY SEALANT, DOW CORNING 8650 INTERIOR SEALANT, OR EQUAL.
 12.4.1.1. PROVIDE 0.125- TO 0.25-INCH (3 MM TO 6 MM) GAP TO BE FILLED WITH SPECIFIED SEALANT FOR NOISE CONTROL.
 12.4.2. SEAL DUCTS TO THE FOLLOWING SEAL CLASSES ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE":
 12.4.3. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."
 12.4.3.1. OUTDOOR, SUPPLY-AIR DUCTS: SEAL CLASS A.
 12.4.3.2. OUTDOOR, EXHAUST DUCTS: SEAL CLASS C.
 12.4.3.3. OUTDOOR, RETURN-AIR DUCTS: SEAL CLASS C.
 12.4.3.4. UNCONDITIONED SPACE, SUPPLY-AIR DUCTS IN PRESSURE CLASSES 2-INCH WG AND LOWER: SEAL CLASS B.
 12.4.3.5. UNCONDITIONED SPACE, SUPPLY-AIR DUCTS IN PRESSURE CLASSES HIGHER THAN 2-INCH WG: SEAL CLASS A.
 12.4.3.6. UNCONDITIONED SPACE, EXHAUST DUCTS: SEAL CLASS C.
 12.4.3.7. UNCONDITIONED SPACE, RETURN-AIR DUCTS: SEAL CLASS B.
 12.4.3.8. CONDITIONED SPACE, SUPPLY-AIR DUCTS IN PRESSURE CLASSES 2-INCH WG AND LOWER: SEAL CLASS C.
 12.4.3.9. CONDITIONED SPACE, SUPPLY-AIR DUCTS IN PRESSURE CLASSES HIGHER THAN 2-INCH WG SEAL CLASS B.
 12.4.3.10. CONDITIONED SPACE, EXHAUST DUCTS: SEAL CLASS B.
 12.4.3.11. CONDITIONED SPACE, RETURN-AIR DUCTS: SEAL CLASS C.
 12.4.3.12. DO NOT SEAL AT FIRE DAMPERS IN A WAY THAT VIOLATES UL OR CODE INSTALLATION REQUIREMENTS.

13. GASKET MATERIAL
 13.1. FOR NON-FUME EXHAUST DUTY AND GALVANIZED FUME EXHAUST DUCT DUTY: TREMCO 440, DUCTMATE

14. DUCT SUPPORT:
 14.1. ATTACHMENTS TO STRUCTURE: SEE DIVISION 23 SECTION "HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT". MINIMUM ROD OR BOLT SIZE IS 3/8 (9 MM).
 14.2. SUSPEND HORIZONTAL GALVANIZED RECTANGULAR DUCTWORK 48 INCHES (1220 MM) OR LESS IN LARGEST DIMENSION FROM CONSTRUCTION BY 1 INCH BY 18 GAUGE (25 MM BY 1.3 MM) GALVANIZED STRAP HANGERS SCREWED 8 INCHES (200 MM) O.C. TO DUCTS. USE THREE SCREWS MINIMUM PER STRAP. BEND STRAP UNDER DUCT AND SCREW INTO BOTTOM OF DUCT.
 14.3. SUSPEND HORIZONTAL RECTANGULAR STAINLESS STEEL AND COATED DUCTWORK 48 INCHES (1220 MM) OR LESS IN LARGEST DIMENSION FROM CONSTRUCTION BY 1 INCH BY 18 GAUGE (25 MM BY 1.3 MM) GALVANIZED STEEL STRAP HANGERS BOLTED TO MATING FLANGES AT MINIMUM OF THREE LOCATIONS. (TOP, MIDDLE, AND BOTTOM).
 14.4. DUCTS OVER 48 INCHES (1220 MM) IN LARGEST DIMENSION SUPPORT FROM UNISTRUT, SUPERSTRUT, OR EQUAL, TRAPEZE HANGERS SIZED FOR THE LOAD, PER SMACNA STANDARDS.
 14.5. SUPPORT ROUND STEEL DUCTWORK FROM CONSTRUCTION BY 1 INCH BY 18 GAUGE (25 MM BY 1.3 MM) GALVANIZED STRAP HANGERS WITH INSIDE RADIUS OF LOOP HANGER EQUAL TO OUTSIDE RADIUS OF DUCT. FOR DUCTS UNDER 12" DIAMETER, PROVIDE SUPPORTS 10 FEET (3 M) O.C.; 12 FEET (3.6 M) AND OVER, 6 FEET (1.8 M) O.C. PROVIDE NOT LESS THAN ONE HANGER PER BRANCH AND AT EACH CHANGE OF DIRECTION.
 14.6. SUPPORT ROUND FLEXIBLE DUCTWORK FROM CONSTRUCTION BY 2 INCHES BY 26 GAUGE (50 MM BY 0.55 MM) GALVANIZED STRAP HANGERS WITH INSIDE RADIUS OF LOOP HANGER EQUAL TO OUTSIDE RADIUS OF DUCT. LOCATE SUPPORTS TO AVOID KINKS AND SHARP BENDS.
 14.7. DOUBLE FOLD STRAPS AT ATTACHMENT TO STRUCTURE.
 14.8. SPACE HANGERS NOT OVER 96 INCHES (2440 MM) ON CENTER FOR DUCTS SMALLER THAN 18 INCHES (457 MM) IN LARGEST DIMENSION; 60 INCHES (1524 MM) O.C. FOR DUCTS 18 INCHES (457 MM) AND OVER.

15. DUCT AND PLENUM LEAK TESTING:
 15.1. LEAK TEST 100% OF DUCTS, COATED DUCTS, WELDED STEEL (GREASE) DUCTS, AND PLENUMS: USE EXTREME CARE IN THE FABRICATION AND INSTALLATION OF THE DUCTWORK AND PLENUMS TO ENSURE THAT IT WILL BE AIRTIGHT. TEST DUCTWORK AND PLENUMS FOR LEAKS IN SECTIONS AS THE WORK PROGRESSES BEFORE INSULATING. FIRE DAMPERS, SMOKE/FIRE DAMPERS, ACCESS PANELS AND APPROPRIATE BRANCH DUCTS SHALL BE IN PLACE DURING THE TESTING. SEAL OFF OPEN ENDS AND THEN TEST BY THE FOLLOWING:
 15.1.1. DUCT LEAK TEST FOR MEDIUM PRESSURE DUCTWORK: THE EQUIPMENT REQUIRED FOR THIS TESTING COMPRISES A HIGH PRESSURE BLOWER, ORIFICE TEST PIPE ASSEMBLY AND MANOMETER WITH NECESSARY VALVES AND TUBING. THE DUCTWORK SECTION SHALL BE PLACED UNDER AN AIR PRESSURE OF 6 INCHES (150 MM) OF WATER WITH THE BLOWER, WHILE LEAKAGE FLOW THROUGH THE ORIFICE IS MEASURED ON THE MANOMETER. THE MANOMETER READINGS SHALL BE CONVERTED TO CFM FROM A CALIBRATED TEST CURVE. THE LEAKAGE SHALL NOT EXCEED 6 CFM/100 S.F. FOR RECTANGULAR SEAL CLASS "A" DUCTWORK AND 3 CFM/100 SF FOR ROUND SEAL CLASS "A" DUCTWORK. NO LESS THAN SQUARE FEET OF DUCT SHALL BE TESTED AT ONE TIME. THE SUBCONTRACTOR SHALL PROVIDE TEST CONDITIONS, INCLUDING THE TOTAL SQUARE FEET OF DUCTWORK UNDER TEST. FIRE DAMPERS AND ACCESS PANELS SHALL BE INSTALLED. TESTING OF COMPLETE SECTIONS OF THE DUCTWORK MUST BE MADE BEFORE INSTALLATION OF THE FINISHED CEILING OR BEFORE THE DUCTWORK IS FURRED IN INACCESSIBLE SPACE. LEAKS FOUND MUST BE REPAIRED, OR JOINTS REMADE AND THE SECTION RETESTED UNTIL TIGHT. LEAKS THAT CAUSE OBJECTIONABLE NOISE MUST BE REPAIRED, REGARDLESS OF THE AMOUNT OF THE LEAKAGE. MAINTAIN A SET OF DRAWINGS FOR RECORDING AND SIGN OFF OF EACH TESTED SECTION.
 15.1.2. DUCT LEAK TEST FOR LOW PRESSURE DUCTWORK: TESTS AND LEAKAGE REQUIREMENTS ARE THE SAME AS FOR MEDIUM PRESSURE DUCTWORK EXCEPT TEST AT AN AIR PRESSURE OF 2 INCHES (50 MM) OF WATER. TEST ONE REPRESENTATIVE LOW PRESSURE SUPPLY AIR DUCT SECTION ON EACH FLOOR CONSISTING OF DUCTWORK BETWEEN THE TERMINAL (REHEAT COIL, OR VAV TERMINAL) AND THE OUTLETS. SECTION TESTED SHALL NOT HAVE LESS THAN TWO OUTLETS. TEST ONE REPRESENTATIVE LOW PRESSURE EXHAUST DUCT BRANCH AT EACH FLOOR FROM THE INLETS TO THE RISER.
 15.1.3. LEAK TEST FOR NON-FUME EXHAUST PLENUMS: SAME AS FOR MEDIUM PRESSURE DUCTWORK.

16. PROVIDE ACCESS DOORS WHERE REQUIRED FOR SERVING OF EQUIPMENT AND FIRE DAMPERS.
 17. PROVIDE 4" (100 MM) FLEXIBLE DUCT CONNECTIONS ON BOTH INLET AND OUTLET DISCHARGE SIDES OF ALL FANS AND AIR HANDLING EQUIPMENT.
 18. PROVIDE ONE SPARE SET OF FILTERS FOR EACH AIR HANDLING UNIT.
 19. DUCT MOUNTED MOTORIZED DAMPERS SHALL BE PROVIDED WITH THE FOLLOWING REQUIREMENTS:
 19.1. ALL MOTORIZED DAMPERS SHALL BE INSULATED LOW LEAKAGE TYPE.
 19.2. MOTORIZED DAMPERS SHALL BE LOCATED AS NEAR AS POSSIBLE TO THE PLANE OF THE BUILDING ENVELOPE FOR ALL AIR INTAKE AND OUTLET TYPES.
 19.3. MOTORIZED DAMPERS SHALL CLOSE AUTOMATICALLY WHEN HVAC SYSTEM IS NOT IN OPERATION.
 19.4. STANDARD OF ACCEPTANCE: TAMCO 9000, GREENHECK ICD.

20. PROVIDE VIBRATION ISOLATORS FOR ALL MECHANICAL EQUIPMENT, INCLUDING PUMPS, UTILITY FANS, AND VENT SETS, AIR HANDLERS, ROOF-TOPS UNITS, CONDENSING UNITS, COMPRESSED, ETC. AS APPLICABLE. SUBMIT SHOP DRAWINGS PRIOR TO INSTALLATION.
 21. PROVIDE WALL CAPS IN ALL SIDEWALL DISCHARGE APPLICATIONS AS INDICATED ON DRAWINGS. WALL CAPS TO BE OF STEEL CONSTRUCTION AND BE BY ONE MANUFACTURER. STANDARD OF ACCEPTANCE: REVERSONATIC.

22. ALL AIR AND WATER SYSTEMS SHALL BE BALANCED AND TESTED BY A CERTIFIED A.A.B.C. INDEPENDENT BALANCING AGENCY TO PROVIDE QUANTITIES AS SHOWN. PROVIDE ELECTRONIC SET OF BALANCE AND TESTING REPORTS FOR REVIEW BY THE CONTRACT ADMINISTRATOR. ALL BALANCING REPORTS SHALL INCLUDE FIRE DAMPER TESTING AND CERTIFICATION.
 23. AUTOMATIC SPACE TEMPERATURE CONTROL DEVICES SHALL BE PROVIDED WITH THE FOLLOWING REQUIREMENTS:
 23.1. SHALL BE INSTALLED WITH TOP OF THERMOSTAT AT 3'-11" (1200 MM) AFF.

CONTROLS

THE POINTS BELOW DESCRIBE THE CONTROL SEQUENCE OF THE H.V.A.C. EQUIPMENT SPECIFIED IN THE SCHEDULES. ALL CONTROLS TO BE SUPPLIED BY MECHANICAL SUB CONTRACTOR AND WIRED BY MECHANICAL SUB CONTRACTOR UNLESS OTHERWISE SPECIFIED. CONTROLS CONTRACTOR SHALL BE A SUBCONTRACTOR OF THE MECHANICAL SUB CONTRACTOR. PROVIDE LOCKABLE COVERS FOR ALL THERMOSTATS, NEW OR EXISTING. ALL CONTROL WIRING SHALL BE PLENUM RATED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE TO MEET THE DEVELOPED SMOKE/FLAME SPREAD RATINGS OF 25/50.

- HRV CONTROL:
 - UNIT SHALL CYCLE BY TIME CLOCK BY UNIT SUPPLIER.
 - WIRE CONTROL FOR DEFROST ELECTRIC COIL BY UNIT SUPPLIER. TO ENERGIZE COIL WHEN SUPPLY TEMPERATURE IS BELOW 30F(0C).
 - PROVIDE CONTROLS TRANSFORMERS.

MECHANICAL EQUIPMENT SCHEDULES:

EQUIPMENT THAT IS SUPPLIED WITH A FACTORY-INSTALLED DISCONNECTING MEANS FOR THE CONNECTION OF THE SUPPLY SIDE FEEDER CONDUCTORS MUST BE CERTIFIED SO THAT THESE CONDUCTORS CAN BE OF EITHER ALUMINUM OR COPPER.

MECHANICAL AND ELECTRICAL SUB CONTRACTORS ARE RESPONSIBLE FOR THE MUTUAL COORDINATION OF ALL ELECTRICAL REQUIREMENTS OF MECHANICAL EQUIPMENT. COORDINATION IS TO INCLUDE THE COMMUNICATION OF ALL FINAL ELECTRICAL NAMEPLATE INFORMATION FROM THE MECHANICAL SUB CONTRACTOR TO THE ELECTRICAL SUB CONTRACTOR, THE COMMUNICATION OF THE DETAILED CONTROL INFORMATION AS WELL AS ANY ANCLLARY INFORMATION REQUIRED FOR THE FINAL SYSTEMS TO OPERATE AS INTENDED BY THE RESPONSIBLE PROFESSIONAL

MS-1 SERVICE / MOP SINK - TWO HANDLES FAUCET

STERN WILLIAMS #EB-54 SQUARE SERVICE / MOP SINK, 610 MM (24") WIDE X 610 MM (24") LONG X 152 MM (6") HIGH DEEP, FLOOR MOUNTED, TERRAZZO COMPOSED OF PEARL GRAY MARBLE CHIPS AND PORTLAND CEMENT GROUND SMOOTH, SEALED TO RESIST STAIN FINISH, CAST BRASS DRAIN WITH STAINLESS STEEL STRAINER, 3"(75 MM) OUTLET.
 COMPLETE WITH DRAIN GASKET, AMERICAN STANDARD YOKE #0350.243.002 WALL MOUNTED TWO HANDLES FAUCET, POLISHED CHROME FINISH, CAST BRASS BODY, SLOW COMPRESSION CARTRIDGE, UNRESTRICTED HOSE END OUTLET, ATMOSPHERIC VACUUM BREAKER AND BUCKET HOOK, 184 MM (7-1/4") FROM WALL TO OUTLET REACH, LEVER HANDLES. STERN WILLIAMS T-35 HOSE AND WALL HOOK 36" (914 MM) LONG HOSE WITH 3/4" (19 MM) CHROME COUPLING, STAINLESS STEEL WALL BRACKET, STERN WILLIAMS #T-40 MOP HANGER, STAINLESS STEEL #4 FINISH, 24" (610 MM) LONG WITH 3 RUBBER SPRING LOADED CLIPS. STERN WILLIAMS BP BACK SPLASH PANEL 20 GA. (0.9 MM) TYPE 304 STAINLESS STEEL. PROVIDE P-TRAP, SAME MATERIAL AS THE CONNECTING PIPE DRAIN.

DF-1 DRINKING FOUNTAIN

ELKAY FILTERED WALL MOUNT DRINKING FOUNTAIN #LSDQL WALL HUNG DRINKING FOUNTAIN, SINGLE, NON-CHILLED WATER DELIVERED, LIGHT GRAY GRANITE VINYL CLAD STEEL COOLER CABINET, GALVANIZED STRUCTURAL STEEL COOLER CHASSIS FRAME PROVIDES STRUCTURAL INTEGRITY, LEAD-FREE DESIGN, EASY-TOUCH FRONT AND SIDE PUSHBAR CONTROLS, FLEXI-GUARD SAFETY BUBBLER UTILIZES AN INFUSED ANTI-MICROBIAL PLIABLE POLYESTER ELASTOMER TO PREVENT MOUTH INJURIES. VOLTAGE REQUIREMENT: 115V AT 60 HZ, CURRENT OF 4.0 AMPS, POWER CONSUMPTION: 370W, WATER ENTRY VII 1500-GALLON CAPACITY FILTRATION SYSTEM, NSF/ANSI 42 & 53 CERTIFIED, VALVE WITH BUILT-IN FLOW REGULATOR TO PROVIDE CONSTANT STREAM FROM 20 TO 105 PSI WATER PRESSURE. PROVIDE ELECTRICAL DUPLEX BOX WITH GFMCGUIRE #LHSTLTK DRINKING FOUNTAIN SUPPLY, CHROME PLATED FINISH POLISHED BRASS, STRAIGHT STOPS, V.P. LOOSE KEYS, LOW LEAD. MCGUIRE #8872C P-TRAP, HEAVY CAST BRASS ADJUSTABLE BODY, WITH SLIP NUT, 32 MM (1-1/4") SIZE, SHALLOW WALL FLANGE AND SEAMLESS TUBULAR WALL BEND. WATTS #CA-311 FIXTURE CARRIER, MOUNTED ON CONCRETE FLOOR, STEEL HANGER PLATE, HEAVY GAUGE EPOXY COATED STEEL OFFSET UPRIGHTS WITH WELDED FEET SUPPORTS. FOR ONE UNIT: 102 MM (4") FOR TWO TO SIX UNITS IN A ROW: 152 MM (6") FINISHED METAL STUD WALL TO BACK OF PIPE SPACE.

WH-1 HYDRANT - NON-FREEZE, DUAL-TEMP WALL HYDRANT WITH NB BOX

WATTS #HY-700-2 HYDRANT NON-FREEZE HYDRANT, DUAL-TEMP, ALL BRONZE HEAD, SEAT CASTING AND INTERNAL WORKING PARTS, WALL MOUNT HYDRANT, CONCEALED, POLISHED BRONZE HYDRANT FACE, INTEGRAL VACUUM BREAKER, 8-1/2" X 8-1/2" (216 MM X 165 MM), GALVANIZED CASING, NICKEL BRONZE BOX AND DOOR, LOOSE KEY, 3/4"Ø(19 MM) HOSE CONNECTION, 3/4"Ø(19 MM) FEMALE X 1"Ø(25 MM) MALE PIPE CONNECTION.

FD-1 FLOOR DRAINS - FIN. AREAS - MED. DUTY STRAINER

SMITH SERIES 2005A FLOOR DRAIN, ALL DUCO COATED CAST IRON BODY, REVERSIBLE FLASHING CLAMP WITH SEAPAGE OPENINGS AND ADJUSTABLE 5" (127MM) DIAMETER NICKEL BRONZE 1/2" (6.35MM) THICK STRAINER, SECURED WITH S.S. SCREWS, 4" (100MM) THROAT ON STRAINER. (WHERE REQUIRED BY LOCAL CODE PROVIDE TRAP SEAL).

CO-1 FLOOR CLEANOUT (UNFINISHED AND OUTSIDE AREAS)

SMITH "TWS-TO-FLOOR" SERIES 4220 FLOOR CLEANOUT, DUOCO COATED CAST IRON BODY AND REMOVABLE POSITIVE GASKET SEAL CLOSURE PLUG AND HEAVY DUTY 6" (150MM) ROUND ADJUSTABLE SCORIATED CAST IRON COVER SECURED WITH STAINLESS STEEL SCREWS, C.O. CAST IN COVER. (FOR WATER-PROOFED AREAS PROVIDE "FC" FLANGE WITH FLASHING CLAMP).

CO-2 STACK CLEANOUT

SMITH SERIES 4510 STACK CLEANOUT, IN BASE OF CAST IRON STACKS WITH NEOPRENE GASKETED PLUG. WHERE CLEANOUTS ARE CONCEALED BEHIND FINISHED WALLS ACCESS SHALL BE MADE BY SMITH 4530 ROUND STAINLESS STEEL PLATE AND SLOTTED FLAT HEAD STAINLESS STEEL SCREW.

TS-1 TRAP SEAL DEVICE

WADE MODEL #440S TRAP SEAL DEVICE (OR EQUAL), REGULARLY FURNISHED: ELASTOMERIC TRAP SEAL DEVICE WITH FITTING.

WHA WATER HAMMER ARRESTORS

SMITH "HYDROTROL" WATER HAMMER ARRESTORS SERIES #5000, STAINLESS STEEL, PRESSURIZED CHAMBERS, BELLOWES, SIZE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS CHART BELOW TO ELIMINATE WATER HAMMER AND SHOCK FROM PIPING SYSTEM. PROVIDE WATER HAMMER ARRESTORS ON HOT AND COLD WATER SUPPLIES TO ALL QUICK VALVES, SOLENOIDS, AND PLUMBING FIXTURES, AND LOCATE IN AN UPRIGHT POSITION BETWEEN THE LAST TWO FIXTURES ON A LINE, OR HORIZONTALLY AT THE END OF LINE CLOSEST TO SUPPLY SOURCE.

SIZE	FIXTURE UNITS	MODEL NO.	CONN. SIZE
A	1 - 11	5005	1/2" (12MM)
B	12 - 32	5010	3/4" (19MM)
C	33 - 60	5020	1" (25MM)
D	61 - 113	5030	1-1/4"(32MM)
E	114 - 154	5040	1-1/2"(38MM)
F	155 - 330	5050	2" (50MM)

HEATING, VENTILATION & AIR CONDITIONING

- PROVIDE SUPPLY, RETURN, RELIEF, AND/OR EXHAUST AIR DUCT SYSTEMS FROM AIR HANDLING EQUIPMENT AND FANS AS SHOWN.
- ALL DUCTWORK INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING STANDARDS:
 - AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH):
 - ACGIH INDUSTRIAL VENTILATION
 - AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (ASHRAE):
 - ASHRAE HANDBOOK SERIES FUNDAMENTALS: CH. 2. DUCT DESIGN
 - ASHRAE HANDBOOK SERIES EQUIPMENT: CH 6. DUCT CONSTRUCTION
 - ASTM INTERNATIONAL:
 - ASTM A90 / A90M STANDARD TEST METHOD FOR WEIGHT [MASS] OF COATING ON IRON AND STEEL ARTICLES WITH ZINC OR ZINC-ALLOY COATINGS
 - ASTM A 167 STANDARD SPECIFICATION FOR STAINLESS AND HEAT-RESISTING CHROMIUM-NICKEL STEEL

LARGEST DIMENSION OF DUCT	US STD. GAUGE GSM	MAX. JOINT SPACING	TRANSVERSE JOINT SIZE	INTERMEDIATE ANGLE STIFFENER (+1)
THRU 12" (THRU 355MM)	25 (0.7MM)	96" (2438MM)	AS SPECIFIED	NONE
13" - 30" (330-762MM)	24 (0.7MM)	60" (1524MM)	AS SPECIFIED	NONE
31" - 36" (787-914MM)	22 (0.85MM)	60" (1524MM)	AS SPECIFIED	NONE
37" - 48" (940-1220MM)	20 (1.00MM)	60" (1524MM)	AS SPECIFIED	NONE
49" - 60" (1245-1524MM)	18 (1.31MM)	60" (1524MM)	AS SPECIFIED	NONE
61" - 84" (+2) (1550-2134MM)	18 (1.31MM)	60" (1524MM)	AS SPECIFIED	1 1/2" BY 1 1/2" BY 3/8"

(+1) REQUIRED ON FOUR SIDES. WELD OR BOLT ANGLES WHERE THEY JOIN. MILD STEEL.
 (+2) PROVIDE 3/8" (10MM) DIAMETER TIE RODS MAXIMUM 36" (914MM) O.C. AT EACH JOINT.

7.2. MEDIUM PRESSURE RECTANGULAR DUCTWORK:
 7.1.1. LONGITUDINAL SEAMS: SAME AS FOR LOW PRESSURE DUCTWORK.
 7.1.2. TRANSVERSE JOINTS DUCTMATE 35, TDC, OR EQUAL, WITH SPECIFIED GASKETS.
 7.1.3. CROSS BREAK OR BEAD SIDES OF DUCTS.
 7.1.4. SEAL FLANGED JOINTS, COMPANION ANGLE JOINTS, AND DUCTMATE JOINTS WITH SPECIFIED GASKET MATERIAL, TRIPLE LAPPED AT CORNERS. TORQUE BOLTS EVENLY TO 1/16" COMPRESSION OF TAPE. ALTERNATE: APPLY 3/8" BEAD OF SPECIFIED SEALANT TO BOTH FACES BEFORE BOLTING.
 7.1.5. CONSTRUCTION AND REINFORCEMENT:

LARGEST DIMENSION OF DUCT	US STD. GAUGE GSM	MAX. JOINT SPACING	TRANSVERSE JOINT SIZE	INTERMEDIATE ANGLE STIFFENER (+1)
THRU 12" (THRU 355MM)	24 (0.7MM)	60" (1524MM)	AS SPECIFIED	NONE
13" - 18" (330-457MM)	22 (0.85MM)	60" (1524MM)	AS SPECIFIED	NONE
19" - 24" (483-610MM)	22 (0.85MM)	60" (1524MM)	AS SPECIFIED	NONE
25" - 36" (635-914MM)	24 (0.70MM)	60" (1524MM)	AS SPECIFIED	1 1/2" BY 1 1/2" BY 3/8"
37" - 48" (940-1220MM)	22 (0.85MM)	60" (1524MM)	AS SPECIFIED	1 1/2" BY 1 1/2" BY 3/8"
49" - 60" (1245-1524MM)	20 (1.00MM)	60" (1524MM)	AS SPECIFIED	2" BY 2" BY 3/8"
61" - 96" (+2) (1550-2438MM)	18 (1.31MM)	60" (1524MM)</		