MECHANICAL SPECIFICATIONS

SECTION 15010: GENERAL REQUIREMENTS

1.1 DRAWINGS

A. THE GENERAL LOCATION OF THE APPARATUS AND THE DETAILS OF THE WORK ARE SHOWN ON THE DRAWINGS. EXACT LOCATIONS NOT INDICATED SHALL SHALL BE DETERMINED AT THE SITE AS THE WORK PROGRESSES AND SHALL BE SUBJECT TO THE ARCHITECT'S APPROVAL.

B. IT IS NOT INTENDED THAT THE DRAWINGS SHALL SHOW EVERY PIPE, FITTING OR APPLIANCE, BUT SHALL BE A REQUIREMENT TO FURNISH, WITHOUT ADDITIONAL EXPENSE, ALL MATERIAL AND LABOR NECESSARY TO COMPLETE THE SYSTEMS IN ACCORDANCE WITH THE DESIGN INTENT AND WITH THE HIGHEST POSSIBLE QUALITY AVAILABLE.

1.2 ELECTRIC WORK

A. FURNISH AND INSTALL ALL MOTORS, CONTROLLERS, LIMIT SWITCHES AND ALL OTHER RELATED ITEMS FOR EQUIP. PROVIDED UNDER DIVISION 15. EXCEPT AS NOTED, ALL REQUIRED LINE SWITCHES, FUSED SWITCHES, AND ALL OTHER RELATED ITEMS AND ALL NECESSARY WIRING TO PROPERLY CONNECT ALL EQUIPMENT TO MOTORS AND SWITCHES SHALL BE FURNISHED AND INSTALLED UNDER DIVISION 16, ELECTRIC.

B. PROVIDE COMPLETE WIRING SYSTEM FOR TEMPERATURE CONTROLS.

C. ALL WIRING SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE.

D. COORDINATE DUCT SMOKE DETECTOR/ROOFTOP UNIT FAN SHUT–DOWN WITH ELECTRICAL CONTRACTOR.

1.3 REQUIREMENTS

A. ERECT EQUIPMENT ALIGNED, LEVEL AND ADJUSTED TO SATISFACTORY OPERATION, INSTALL SO THAT CONNECTING AND DISCONNECTING OF PIPING AND ACCESSORIES CAN BE MADE READILY AND SO THAT ALL PARTS ARE EASILY ACCESSIBLE FOR INSPECTIONS, OPERATION, MAINTENANCE AND REPAIR.

B. RESPONSIBILITY FOR CARE AND PROTECTION OF ALL MATERIAL AND MECH. WORK RESTS WITH THE CONTRACTOR AT ALL TIMES UNTIL THE PROJECT HAS BEEN COMPLETED, TESTED AND THE PROJECT ACCEPTED BY THE OWNER.

C. AFTER COMPLETION OF THE INSTALLATION WORK THE CONTRACTOR AND HIS SUBCONTRACTORS SHALL FURNISH NECESSARY MECHANICS OR ENGINEERS FOR THE ADJUSTMENT AND OPERATION OF THE PLANT, AND AT THE END THAT THE PLANT MAY BE PERFECTLY ADJUSTED AND TURNED OVER TO THE OWNER IN PERFECT WORKING ORDER. THE CONTRACTOR SHALL FURTHER INSTRUCT THE OWNER'S AUTHORIZED REPRESENTATIVE IN THE CARE AND OPERATION OF THE INSTALLATION, PROVIDING ALL REQUIRED FRAMED INSTRUCTION CHARTS AND DIRECTIONS.

D. AFTER THE ENTIRE INSTALLATION IS COMPLETED, READY FOR OPERATION, THE CONTRACTOR SHALL TEST AND BALANCE THE SYSTEM. THE OWNER SHALL PROVIDE ALL WATER AND ELECTRIC CURRENT FOR THE TEST. THE CONTRACTOR SHALL PROVIDE NECESSARY LABOR, TEST PUMP, GAUGES, METERS, OTHERS INSTRUMENTS AND MATERIALS. PROVIDE FINAL REPORT

E. THE CONTRACTOR SHALL, AFTER AWARD OF CONTRACT AND BEFORE INSTALLATION, SUBMIT FOR APPROVAL SHOP DRAWINGS, BULLETINS, PRODUCT DATA AND ALL OTHER RELATED ITEMS. SUBMITTAL SHALL INCLUDE ALL PHYSICAL DATA AND PERFORMANCE DATA REQUIRED TO VERIFY COMPLIANCE WITH THE CONTRACT DOCUMENTS.

F. FOR MAINTENANCE PURPOSES, PROVIDE APPROVED SHOP DRAWINGS, PARTS LIST, SPECIFICATIONS AND MFGR MAINTENANCE BULLETINS FOR EACH PIECE OF EQUIPMENT. PROVIDE NAME, ADDRESS AND TELEPHONE NUMBER OF THE MANUFACTURER'S REPRESENTATIVE AND SERVICE COMPANY FOR EACH PIECE OF EQUIPMENT.

G. REMOVE ALL DEBRIS FROM SITE DAILY. ALL MATERIAL AND PIECES OF EQUIPMENT SHALL BE TURNED OVER TO THE OWNER FREE OF ANY DUST AND DIRT, BOTH INSIDE AND OUT.

H. COORDINATE START–UP OF VARIOUS EQUIPMENT AND SYSTEMS. NOTIFY ARCHITECT/ENGINEER SEVEN DAYS PRIOR TO START–UP OF EACH ITEM. VERIFY THAT EACH PIECE OF EQUIP. OR SYSTEM HAS BEEN CHECKED FOR PROPER ROTATION CONTROL SEQUENCE OR OTHER CONDITION WHICH MAY CAUSE DAMAGE. VERIFY THAT WIRING AND SUPPORT COMPONENTS FOR EQUIPMENT ARE COMPLETE AND TESTED. EXECUTE START–UP UNDER SUPERVISION OF RESPONSIBLE MANUFACTURER'S REPRESENTATIVE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. SUBMIT A WRITTEN REPORT THAT EQUIPMENT OR SYSTEM HAS BEEN PROPERLY INSTALLED AND IS FUNCTIONING CORRECTLY.

SECTION 15140: SUPPORTS AND ANCHORS

1.1 PIPE HANGERS AND SUPPORTS

A. MANUFACTURERS: 1. GRINNELL, 2. B–LINE.
B. CONFORM TO ASME B31.9, ASTM F708, MSS SP58, MSSSP69 AND MSS SP89.
C. HANGERS FOR PIPE SIZES 1/2" TO 1–1/2": MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.
D. HANGERS FOR HOT PIPE SIZES 2" TO 4": CARBON STEEL, ADJUSTABLE, CLEVIS.
E. HANGERS FOR HOT PIPE SIZES 6" AND OVER: ADJUSTABLE STEEL YOKE, CAST IRON ROLL, DOUBLE HANGER.
F. HANGERS RODS: MILD STEEL THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUS THREADED.

1.2 INSERTS

A. MANUFACTURER: 1. GRINNELL, 2. B–LINE.

B. INSERTS: MALLEABLE IRON CASE OF STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT. TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER RODS.

1.3 EXECUTION

A. PLACE HANGERS WITHIN 12" OF EACH HORIZONTAL ELBOW. USE HANGERS WITH 1–1/2" VERTICAL ADJUSTMENT DESIGN HANGERS FOR PIPE MOVEMENT WITHOUT DISENGAGEMENT OF SUPPORTED PIPE. DO NOT SUPPORT PIPES FROM OTHER PIPES OR EQUIPMENT. PIPE HANGERS ATTACHED TO BAR JOISTS SHALL BE ATTACHED TO TOP CHORDS. SIZE PIPE HANGERS TO ACCOMMODATE CONTINUOUS PIPING INSULATION. SUPPORT HORIZONTAL PIPING AS SCHEDULED BELOW:

PIPE SIZE	HANGER ROD MAX. HANGER SPACING	DIAMETER
1/2" TO 1–1/4"	6.5 FT	3/8"
2–1/2" TO 3"	10 FT	3/8"
4" TO 6"	10 FT	5/8"
8" TO 12"	14 FT	7/8"

SECTION 15190: MECHANICAL IDENTIFICATION

1.1 NAMEPLATES

A. MANUFACTURER: SETON NAME PLATE COMPANY.
LAMINATED 3–LAYER PLASTIC WITH ENGRAVED BLACK LETTERS ON LIGHT CONTRASTING BACKGROUND COLOR.

1.2 TAGS

A. MANUFACTURER PLASTIC TAGS: SETON NAME PLATE COMPANY.
LAMINATED 3–LAYER PLASTIC WITH ENGRAVED BLACK LETTERS ON LIGHT CONTRASTING BACKGROUND COLOR. TAG SIZE MINIMUM 1–1/2" DIAMETER.

B. MANUFACTURER METAL TAGS: SETON NAME PLATE COMPANY.
BRASS WITH STAMPED LETTERS; TAG MINIMUM 1–12/" DIAMETER WITH SMOOTH EDGES.

1.3 PIPE MARKERS

A. MANUFACTURER PLASTIC PIPE MARKER: SETON NAME PLATE COMPANY.
FACTORY FABRICATED, FLEXIBLE, SEMI–RIGID PLASTIC, PREFORMED TO FIT AROUND PIPE OR PIPE COVERING.

1.4 INSTALLATION

A. INSTALL IDENTIFYING DEVICES AFTER COMPLETION OF COVERINGS. INSTALL TAGS USING CORROSIVE RESISTANT CHAIN. NUMBER TAGS CONSECUTIVELY BY LOCATION. IDENTIFY ALL ITEMS OF MECHANICAL EQUIPMENT SUCH AS AS PUMPS, BOILERS AND WATER HEATERS WITH PLASTIC NAMEPLATES. IDENTIFY VALVES IN MAIN AND BRANCH PIPING WITH METAL TAGS. IDENTIFY PIPES WITH PLASTIC PIPE MARKERS. IDENTIFY SERVICE AND FLOW DIRECTIONAL. PROVIDE VALVE TAG CHART. LOCATE IN MECHANICAL ROOM. COORDINATE TAGGING NOMENCLATURE WITH OWNER BEFORE ORDERING.

SECTION 15260: PIPING INSULATION

1.1 PIPING INSULATION

A. MANUFACTURER: 1. JOHNS MANVILLE, 2. OWENS CORNING, 3. CERTAINTEED, 4. KNAUF, 4. ARMSTRONG.
LAMINATED 3–LAYER PLASTIC WITH ENGRAVED BLACK LETTERS ON LIGHT CONTRASTING BACKGROUND COLOR.

1.2 GLASS FIBER

A. ASTM C547, RIGID MOLDED, NONCOMBUSTIBLE, K–VALUE 0.24 AT 75°F, WHITE KRAFT VAPOR BARRIER JACKET WITH GLASS FIBER YARN, BONDED TO ALUMINIZED FILM, MAX. MOISTURE ABSORPTION 0.2% BY VOLUME. VAPOR BARRIER LAP ADHESIVE COMPATIBLE WITH INSULATION.

1.3 ELASTOMERIC FOAM

A. ASTM C534, FLEXIBLE, CELLULAR ELASTOMERIC, MOLDED OR SHEET, K–VALUE 0.27, MAX. SERVICE TEMPERATURE WITH GLASS FIBER YARN, BONDED TO ALUMINIZED FILM, MAX. MOISTURE ABSORPTION 0.2% BY VOLUME. VAPOR 220°F, WATERPROOF VAPOR BARRIER ADHESIVE, AIR DRIED COMPATIBLE WITH INSULATION.

1.4 JACKETS

A. ASTM D1784, 1 PIECE MOLDED TYPE FITTING COVERS, OFF WHITE COLOR, 15 MIL THICKNESS, MAX. 150°F SERVICE TEMPERATURE, CONNECTIONS; BRUSHED ON WELDING ADHESIVE COMPATIBLE WITH INSULATION.

1.5 EXECUTION

A. PIPING SYSTEMS REQUIRING INSULATION, TYPE OF INSULATION REQUIRED, AND INSULATION THICKNESS SHALL BE AS LISTED IN THE TABLE BELOW. INSULATE ALL FITTINGS, FLANGES, AND VALVES, EXCEPT VALVE STEMS, HAND WHEELS AND OPERATORS. USE FACTORY PRE–MOLDED, PRECUT INSULATION OF THE SAME THICKNESS AS USED ON ADJACENT PIPING.

SERVICE	INSULATION MATERIAL	VAPOR BARRIER REQUIRED	INSULATION WALL THICKNESS AT THE FOLLOWING NOMINAL PIPE DIAMETERS				
			1" AND LESS	1–1/4" – 2"	2–1/2" – 4"	5" – 6"	8" AND UP
DOMESTIC HOT WATER AND RECIRCULATING PIPING	ELASTOMERIC FOAM	NO	1"	1–1/2"	2"	2"	–
	GLASS FIBER	NO	1"	1–1/2"	2"	2"	–
DOMESTIC COLD WATER AND CONDENSATE PIPING	ELASTOMERIC FOAM	NO	1"	1"	1–1/2"	1–1/2"	1–1/2"
	GLASS FIBER	YES	1"	1"	1–1/2"	1–1/2'	1–1/2"

B. INSTALL PER NAIMA AND MANUFACTURER'S INSTRUCTIONS. PIPE EXPOSED IN MECHANICAL ROOMS FINISH WITH PVC JACKET AND FITTING COVERS.

C. INSULATED PIPES CONVEYING FLUIDS BELOW AMBIENT TEMPERATURE: INSULATE ENTIRE SYSTEM INCLUDING FITTINGS, VALVES, UNIONS, FLANGES AND STRAINERS. PROVIDE VAPOR BARRIER JACKET.

D. GLASS FIBER INSULATED PIPES CONVEYING FLUIDS ABOVE 140°F: INSULATE ENTIRE SYSTEM INCLUDING FITTINGS, VALVES, UNIONS, FLANGES, STRAINERS AND EQUIPMENT. PROVIDE STANDARD JACKET.

E. INSERTS AND SHIELDS: PROVIDE ON PIPES 2" AND LARGER. SHIELDS SHALL BE GALVANIZED. INSERTS SHALL BE MINIMUM 6" LONG, SAME THICKNESS AS INSULATION, HYDROUS CALCIUM SILICATE OR OTHER HEAVY DENSITY INSULATING MATERIAL.

SECTION 15290 – DUCTWORK INSULATION

PART 1 – PRODUCTS

1.1 MANUFACTURERS

A. JOHNS MANVILLE.
B. OWENS CORNING.
C. CERTAINTEED.
D. KNAUF.

1.2 GLASS FIBER, FLEXIBLE

A. INSULATION: 1–1/2 INCH THICK, ASTM C553; FLEXIBLE, NONCOMBUSTIBLE BLANKET.

1. 'K' ('KSI') VALUE: ASTM C518, 0.27 AT 75F (0.39 AT 24C).

2. MAXIMUM SERVICE TEMPERATURE: 250F (121C) FACED AND 350F (176C) UNFACED.

3. MAXIMUM MOISTURE ABSORPTION: 0.20 BY VOLUME.

B. VAPOR BARRIER JACKET:

1. KRAFT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM.

2. MOISTURE VAPOR TRANSMISSION: ASTME96; 0.02 PERM.

3. SECURE WITH PRESSURE SENSITIVE TAPE.

C. VAPOR BARRIER TAPE: KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.

D. TIE WIRE: ANNEALED STEEL, 16 GAGE (1.5 MM).

1.3 GENERAL

A. ALL INSULATION MATERIAL SHALL BE ASBESTOS FREE. NO FIBERS SHALL BE RELEASED FROM ANY MATERIAL WITH DIMENSIONS SIMILAR TO ASBEST OS FIBERS.

PART 2 – EXECUTION

2.1 EXAMINATION

A. SECTION 01040 – COORDINATION: VERIFICATION OF EXISTING CONDITIONS BEFORE STARTING WORK.

B. VERIFY THAT DUCTWORK HAS BEEN TESTED BEFORE APPLYING INSULATION MATERIALS.

C. VERIFY THAT SURFACES ARE CLEAN, FOREIGN MATERIAL REMOVED, AND DRY.

2.2 INSTALLATION

A. SECTION 01400 – QUALITY CONTROL: MANUFACTURER'S INSTRUCTIONS.

B. INSTALL IN ACCORDANCE WITH NAIMA NATIONAL INSULATION STANDARDS.

C. INSULATED DUCTWORK CONVEYING AIR BELOW AMBIENT TEMPERATURE:

1. PROVIDE INSULATION WITH VAPOR BARRIER JACKETS.

2. FINISH WITH TAPE AND VAPOR BARRIER JACKET.

3. CONTINUE INSULATION THROUGH WALLS, SLEEVES, HANGERS, AND OTHER DUCT PENETRATIONS.

4. INSULATE ENTIRE SYSTEM INCLUDING FITTINGS, JOINTS, FLANGES, FIRE DAMPERS, FLEXIBLE CONNECTIONS, AND EXPANSION JOINTS.

D. INSULATED DUCTWORK CONVEYING AIR ABOVE AMBIENT TEMPERATURE:

1. PROVIDE WITH OR WITHOUT STANDARD VAPOR BARRIER JACKET.

2. INSULATE FITTINGS AND JOINTS. WHERE SERVICE ACCESS IS REQUIRED, BEVEL AND SEAL ENDS OF INSULATION.

E. DUCTWORK EXPOSED BELOW 10 FEET (3 METERS) ABOVE FINISHED FLOOR IN MECHANICAL EQUIPMENT ROOMS OR BELOW 8 FEET (2.4 METERS) ABOVE FINISHED FLOOR IN FINISHED SPACES: FINISH WITH CANVAS JACKET SIZED FOR FINISH PAINTING.

F. EXTERIOR APPLICATIONS: PROVIDE INSULATION WITH VAPOR BARRIER JACKET. COVER WITH CALKED ALUMINUM JACKET WITH SEAMS LOCATED ON BOTTOM SIDE OF HORIZONTAL DUCT SECTION.

G. EXTERNAL DUCT INSULATION APPLICATION:

1. SECURE INSULATION WITH VAPOR BARRIER WITH WIRES AND SEAL JACKET JOINTS WITH VAPOR BARRIER ADHESIVE OR TAPE TO MATCH JACKET.

2. SECURE INSULATION WITHOUT VAPOR BARRIER WITH STAPLES, TAPE, OR WIRES.

3. INSTALL WITHOUT SAG ON UNDERSIDE OF DUCTWORK. USE ADHESIVE OR MECHANICAL FASTENERS WHERE NECESSARY TO PREVENT SAGGING. LIFT DUCTWORK OFF TRAPEZE HANGERS AND INSERT SPACERS.

4. SEAL VAPOR BARRIER PENETRATIONS BY MECHANICAL FASTENERS WITH VAPOR BARRIER ADHESIVE.

5. STOP AND POINT INSULATION AROUND ACCESS DOORS AND DAMPER OPERATORS TO ALLOW OPERATION WITHOUT DISTURBING WRAPPING.

H. ENSURE SURFACE IS CLEAN AND DRY PRIOR TO INSTALLATION. ENSURE INSULATION IS DRY BEFORE AND DURING APPLICATION. FINISH WITH SYSTEM AT OPERATING CONDITIONS.

I. ENSURE INSULATION IS CONTINUOUS THROUGH INSIDE WALLS. PACK AROUND DUCTS WITH FIREPROOF SELF–SUPPORTING INSULATION MATERIAL, PROPERLY SEALED.

J. FINISH INSULATION NEATLY AT HANGERS, SUPPORTS AND OTHER PROTRUSIONS.

K. LOCATE INSULATION OR COVER SEAMS IN LEAST VISIBLE LOCATIONS.

L. REPAIR SEPARATION OF JOINTS OR CRACKING OF INSULATION DUE TO THERMAL MOVEMENT OR POOR WORKMANSHIP.

M. STANDING SEAMS, SUPPORTING ANGLES AND FLANGES ON ALL INSULATED DUCTWORK SHALL BE INSULTED WITH THICKNESS EQUAL TO THE DUCT AND ALL EDGES SHALL BE FINISHED AND VAPOR SEALED.

N. MECHANICAL FASTENERS SHALL NOT BE RIVETED OR SCREWED TO THE DUCT AND SHALL NOT PENETRATE THE METALWORK.

O. FOR SUPPLY OR RETURN DUCTWORK WHICH IS REQUIRED TO BE INSULATED, INSULATION SHALL BE CONTINUOUS AND SHALL INCLUDE THE INSULATING OF REGISTER, GRILLE AND DIFFUSER CONNECTION PLENUMS/BOOTS.

SECTION 15890 – DUCTWORK

PART 1 – PRODUCTS

1.1 ACCEPTABLE MANUFACTURERS

A. FLEXIBLE DUCTS:

1. FLEXIBLE TECHNOLOGIES – THERMAFLEX PRODUCT LINE.
2. ATCO RUBBER PRODUCTS, INC.

B. PLASTIC DRAWBANDS:

1. PANDUIT.
2. THOMAS AND BETTS.
3. TYTON.

C. TAPE FOR FLEXIBLE DUCTS:

1. IDEAL TAPE CO., INC.
2. FASSON.
3. MINNESOTA MINING AND MANUFACTURING (3M).
4. NASHUA.
5. SHURTAPE.
6. VENTURE.

D. SEALANTS:

1. HARDCAST.
2. DUCTMATE.
3. ECO.
4. FOSTER.
5. UNITED MCGILL.

E. MANUFACTURED DUCTWORK – TRANSVERSE DUCT CONNECTION SYSTEM:

1. DUCTMATE.

1.2 MATERIALS

A. GALVANIZED STEEL DUCTS: ASTM A525 AND ASTM A527 GALVANIZED STEEL SHEET, LOCK–FORMING QUALITY, HAVING G60 ZINC COATING OF IN CONFORMANCE WITH ASTM A90.

B. FLEXIBLE DUCTS: TRIPLE LOCK MECHANICAL JOINT ALUMINUM FLEX DUCT, CONSTRUCTED ENTIRELY WITHOUT THE USE OF ADHESIVE.

1. UL LABELED, BLACK POLYMER FILM SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE.
2. PRESSURE RATING: 4 INCHES WG (1000 PA) POSITIVE AND 0.5 INCHES WG (175 PA) NEGATIVE.
3. MAXIMUM VELOCITY: 4000 FPM (20.3 M/SEC).
4. TEMPERATURE RANGE: –20(F TO 175(F (–28(C TO 79(C).

C. DRAWBANDS FOR FLEXIBLE DUCTS:

1. STAINLESS STEEL: 1/2–INCH (13 MM) WIDE WITH SCREW–DRIVEN WORM GEAR.
2. PLASTIC: PANDUIT PLT5H OR PLT8H; THOMAS AND BETTS DUKT–RAP, VAL–26–50, OR VAL–275X–25; OR TYTON T150L OR LX. INSTALL WITH MANUFACTURER(S LEVER–ACTION TIGHTENING TOOL.

D. TAPE FOR FLEXIBLE DUCTS: IDEAL–SEAL 587A/B, UL 181B–FX, ALUMINUM FOIL WITH PRESSURE–SENSITIVE ACRYLIC ADHESIVE, –20(F) TO 250(F)–28(C) TO 121(C) TEMPERATURE RANGE.

E. FASTENERS: RIVETS, BOLTS, OR SHEET METAL SCREWS.

F. SEALANTS: NON–HARDENING, WATER RESISTANT, NON–FLAMMABLE AN DNON–COMBUSTIBLE IN BOTH SOLID AND LIQUID STATES, COMPATIBLE WITH MATING MATERIALS; LIQUID USED ALONE OR WITH TAPE, OR HEAVY MASTIC.

G. HANGER ROD: ASTM A36; GALVANIZED STEEL; THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED.

1.3 DUCTWORK FABRICATION

A. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARD – METAL AND FLEXIBLE, AS SPECIFIED OR AS INDICATED ON THE DRAWINGS. PROVIDE DUCT MATERIAL, GAUGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED.

B. CONSTRUCT TEES, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1–1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE SINGLE WALL TURNING VANES. DO NOT USE AIR FOIL TURNING VANES.

C. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

D. FABRICATE CONTINUOUSLY WELDED ROUND AND OVAL DUCT FITTINGS TWO GAUGES HEAVIER THAN DUCT GAUGES INDICATED IN SMACNA STANDARD. JOINTS SHALL BE MINIMUM 4 INCH (100 MM) CEMENTED SLIP JOINT BRAZED OR ELECTRIC WELDED.

PRIME COAT WELDED JOINTS.

E. PROVIDE STANDARD 45 DEGREE LATERAL WYE TAKEOFFS UNLESS OTHERWISE INDICATED WHERE 90 DEGREE CONICAL TEE CONNECTIONS MAY BE USED.

F. LONGITUDINAL LOCKS OR SEAMS KNOWN AS (BUTTON–PUNCH–SNAP–LOCK(WILL NOT BE PERMITTED.

G. DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.

1.4 DUCT SEALING

A. ALL DUCTWORK SHALL BE SEALED AS OUTLINED IN THE HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (HEREAFTER REFERRED TO AS SMACNA HVACDCS).

1. ALL DUCT SEALING MATERIALS USED SHALL BE NON–FLAMMABLE AND NON–COMBUSTIBLE IN BOTH LIQUID AND SOLID STATES.
2. MATERIALS FOR SEALING:
3. HARDCAST TAPE.
4. DUCTMATE WITH GASKETS.
5. DUCTMATE PROSEAL.
6. ECO 4450.
7. ECO 4452.
8. OR APPROVED EQUAL.

PART 2 – EXECUTION

2.1 INSTALLATION

A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B. INSTALL DUCTS IN ACCORDANCE WITH SMACNA HVACDCS – METAL AND FLEXIBLE.

C. DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.

D. CONNECT DIFFUSERS OR LIGHT TROFFER BOOTS TO LOW PRESSURE SUPPLY DUCTS DIRECTLY OR WITH 5 FEET MAXIMUM LENGTH OF FLEXIBLE DUCT.

E DUCT HELD IN PLACE WITH STRAP OR CLAMP. MINIMUM BEND RADIUS SHALL BE ONE AND ONE HALF TIMES THE DUCT DIAMETER.

F. CONNECT FLEXIBLE DUCTS TO METAL DUCTS WITH 2 TURNS OF DUCT TAPE AND METAL DRAW BANDS. PLASTIC DRAWBANDS WILL NOT BE ACCEPTED. PLASTIC DRAWBANDS MAY BE USED IF THEY ARE INSTALLED USING THE BAND MANUFACTURER'S LEVER–ACTION TIGHTENING TOOL. ON INSULATED FLEXIBLE DUCTS, PROVIDE AN ADDITIONAL SEAL OF TAPE AND DRAWBAND ON THE INSULATION(S VAPOR BARRIER.

G. PROVIDE DUCT SLEEVES AT WALL PENETRATIONS.

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STATE OF MAINE
CLIFTON W. GREIM
No. 6405
LICENSED
PROFESSIONAL ENGINEER

Project Title

WESTGATE PLAZA RETAILS

PORTLAND, ME

HA Project No. **07182**

Key Plan

Mark	Date	Description
–	05–16–08	ISSUED FOR BID

Issue Dates

Drawing Status

Drawing Title

MECHANICAL SPECIFICATIONS

PA / PE: **RDM** Drawn By: **MED**

Drawing Number

M30.1