

WEST NAVARRE INTERMEDIATE SCHOOL
5 CLASSROOM ADDITION

SECTION 15086 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. THIS SECTION INCLUDES MECHANICAL INSULATION FOR BOILER BREECHING, DUCT, EQUIPMENT, AND PIPE, INCLUDING THE FOLLOWING:
 - 1. INSULATION MATERIALS.
 - 2. ADHESIVES.
 - 3. MASTICS.
 - 4. SEALANTS.
 - 5. FACTORY APPLIED JACKETS
 - 6. TAPES.
 - 7. SECUREMENTS.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

1.3 QUALITY ASSURANCE

- A. SURFACE-BURNING CHARACTERISTICS: FOR INSULATION AND RELATED MATERIALS, AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO ASTM E 84, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. FACTORY LABEL INSULATION AND JACKET MATERIALS AND ADHESIVE, MASTIC, TAPES, AND CEMENT MATERIAL CONTAINERS, WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY.
 - 1. INSULATION INSTALLED INDOORS: FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS.
 - 2. INSULATION INSTALLED OUTDOORS: FLAME-SPREAD INDEX OF 75 OR LESS, AND SMOKE-DEVELOPED INDEX OF 150 OR LESS.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. COMPLY WITH REQUIREMENTS IN "DUCT INSULATION SCHEDULE, GENERAL," "INDOOR DUCT AND PLENUM INSULATION SCHEDULE," AND "ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE" ARTICLES FOR WHERE INSULATING MATERIALS SHALL BE APPLIED.
- B. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.

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- C. PRODUCTS THAT COME IN CONTACT WITH STAINLESS STEEL SHALL HAVE A LEACHABLE CHLORIDE CONTENT OF LESS THAN 50 PPM WHEN TESTED ACCORDING TO ASTM C 871.
- D. INSULATION MATERIALS FOR USE ON AUSTENITIC STAINLESS STEEL SHALL BE QUALIFIED AS ACCEPTABLE ACCORDING TO ASTM C 795.
- E. MINERAL-FIBER BLANKET INSULATION: MINERAL OR GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE III WITH FACTORY-APPLIED FSK JACKET. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CERTAINTED CORP.; SOFTTOUCH DUCT WRAP.
 - B. JOHNS MANVILLE; MICROLITE.
 - C. KNAUF INSULATION; FRIENDLY FEEL DUCT WRAP.
 - D. MANSON INSULATION INC.; ALLEY WRAP.
 - E. OWENS CORNING; SOFTR ALL-SERVICE DUCT WRAP.
- F. MINERAL-FIBER BOARD INSULATION: MINERAL OR GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 612, TYPE IA OR TYPE IB. FOR DUCT AND PLENUM APPLICATIONS, PROVIDE INSULATION WITH FACTORY-APPLIED FSK JACKET. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CERTAINTED CORP.; COMMERCIAL BOARD.
 - B. JOHNS MANVILLE; 800 SERIES SPIN-GLAS.
 - C. KNAUF INSULATION; INSULATION BOARD.
 - D. MANSON INSULATION INC.; AK BOARD.
 - E. OWENS CORNING; FIBERGLAS 700 SERIES.

2.2 ADHESIVES

- A. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED.
- B. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-127.
 - B. EAGLE BRIDGES - MARATHON INDUSTRIES; 225.
 - C. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 85-03/11-70.
 - D. MON-ECO INDUSTRIES, INC.; 22-25.

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- C. ASJ ADHESIVE, AND FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-82.
 - B. EAGLE BRIDGES - MARATHON INDUSTRIES; 225.
 - C. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 85-50.
 - D. MON-ECO INDUSTRIES, INC.; 22-25.

2.3 MASTICS

- A. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES; COMPLY WITH MIL-PRF-19565C, TYPE II.
 - 1. FOR INDOOR APPLICATIONS, USE MASTICS THAT HAVE A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).
- B. VAPOR-BARRIER MASTIC: WATER BASED; SUITABLE FOR INDOOR USE ON BELOW AMBIENT SERVICES.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 30-03/11-90.
 - B. VIMASCO CORPORATION; 749.
 - 2. WATER-VAPOR PERMEANCE: ASTM E 96/E 96M, PROCEDURE B, 0.013 PERM AT 43-MIL DRY FILM THICKNESS.
 - 3. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F.
 - 4. SOLIDS CONTENT: ASTM D 1644, 58 PERCENT BY VOLUME AND 70 PERCENT BY WEIGHT.
 - 5. COLOR: WHITE.
- C. BREATHER MASTIC: WATER BASED; SUITABLE FOR INDOOR AND OUTDOOR USE ON ABOVE AMBIENT SERVICES.
 - 1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-10.
 - B. EAGLE BRIDGES - MARATHON INDUSTRIES; 550.
 - C. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 46-50.
 - D. MON-ECO INDUSTRIES, INC.; 55-50.
 - E. VIMASCO CORPORATION; WC-1/WC-5.

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2. WATER-VAPOR PERMEANCE: ASTM F 1249, 1.8 PERMS AT 0.0625-INCH DRY FILM THICKNESS.
3. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F.
4. SOLIDS CONTENT: 60 PERCENT BY VOLUME AND 66 PERCENT BY WEIGHT.
5. COLOR: WHITE.

2.4 SEALANTS

A. FSK AND METAL JACKET FLASHING SEALANTS:

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-76.
 - B. EAGLE BRIDGES - MARATHON INDUSTRIES; 405.
 - C. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 95-44.
 - D. MON-ECO INDUSTRIES, INC.; 44-05.
2. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
3. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
4. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
5. COLOR: ALUMINUM.

2.5 FACTORY-APPLIED JACKETS

A. INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:

1. FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II.

2.6 TAPES

A. FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C 1136.

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
 - A. ABI, IDEAL TAPE DIVISION; 491 AWF FSK.
 - B. AVERY DENNISON CORPORATION, SPECIALTY TAPES DIVISION; FASSON 0827.
 - C. COMPAC CORPORATION; 110 AND 111.
 - D. VENTURE TAPE; 1525 CW NT, 1528 CW, AND 1528 CW/SQ.
2. WIDTH: 3 INCHES.
3. THICKNESS: 6.5 MILS.
4. ADHESION: 90 OUNCES FORCE/INCH IN WIDTH.

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5. ELONGATION: 2 PERCENT.
6. TENSILE STRENGTH: 40 LBF/INCH IN WIDTH.
7. FSK TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF FSK TAPE.

2.7 SECUREMENTS

- A. ALUMINUM BANDS: ASTM B 209, ALLOY 3003, 3005, 3105, OR 5005; TEMPER H-14, 0.020 INCH THICK, 1/2 INCH WIDE WITH WING SEAL.
- B. INSULATION PINS AND HANGERS:
 1. METAL, ADHESIVELY ATTACHED, PERFORATED-BASE INSULATION HANGERS: BASEPLATE WELDED TO PROJECTING SPINDLE THAT IS CAPABLE OF HOLDING INSULATION, OF THICKNESS INDICATED, SECURELY IN POSITION INDICATED WHEN SELF-LOCKING WASHER IS IN PLACE. COMPLY WITH THE FOLLOWING REQUIREMENTS:
 - A. BASEPLATE: PERFORATED, GALVANIZED CARBON-STEEL SHEET, 0.030 INCH THICK BY 2 INCHES SQUARE.
 - B. SPINDLE: COPPER- OR ZINC-COATED, LOW-CARBON STEEL, FULLY ANNEALED, 0.106-INCH- DIAMETER SHANK, LENGTH TO SUIT DEPTH OF INSULATION INDICATED.
 - C. ADHESIVE: RECOMMENDED BY HANGER MANUFACTURER. PRODUCT WITH DEMONSTRATED CAPABILITY TO BOND INSULATION HANGER SECURELY TO SUBSTRATES INDICATED WITHOUT DAMAGING INSULATION, HANGERS, AND SUBSTRATES.
 2. NONMETAL, ADHESIVELY ATTACHED, PERFORATED-BASE INSULATION HANGERS: BASEPLATE FASTENED TO PROJECTING SPINDLE THAT IS CAPABLE OF HOLDING INSULATION, OF THICKNESS INDICATED, SECURELY IN POSITION INDICATED WHEN SELF-LOCKING WASHER IS IN PLACE. COMPLY WITH THE FOLLOWING REQUIREMENTS:
 - A. BASEPLATE: PERFORATED, NYLON SHEET, 0.030 INCH THICK BY 1-1/2 INCHES IN DIAMETER.
 - B. SPINDLE: NYLON, 0.106-INCH- DIAMETER SHANK, LENGTH TO SUIT DEPTH OF INSULATION INDICATED, UP TO 2-1/2 INCHES.
 - C. ADHESIVE: RECOMMENDED BY HANGER MANUFACTURER. PRODUCT WITH DEMONSTRATED CAPABILITY TO BOND INSULATION HANGER SECURELY TO SUBSTRATES INDICATED WITHOUT DAMAGING INSULATION, HANGERS, AND SUBSTRATES.
 3. SELF-STICKING-BASE INSULATION HANGERS: BASEPLATE WELDED TO PROJECTING SPINDLE THAT IS CAPABLE OF HOLDING INSULATION, OF THICKNESS INDICATED, SECURELY IN POSITION INDICATED WHEN SELF-LOCKING WASHER IS IN PLACE. COMPLY WITH THE FOLLOWING REQUIREMENTS:
 - A. BASEPLATE: GALVANIZED CARBON-STEEL SHEET, 0.030 INCH THICK BY 2 INCHES SQUARE.
 - B. SPINDLE: COPPER- OR ZINC-COATED, LOW-CARBON STEEL, FULLY ANNEALED, 0.106-INCH- DIAMETER SHANK, LENGTH TO SUIT DEPTH OF INSULATION INDICATED.
 - C. ADHESIVE-BACKED BASE WITH A PEEL-OFF PROTECTIVE COVER.

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- 4. INSULATION-RETAINING WASHERS: SELF-LOCKING WASHERS FORMED FROM 0.016-INCH- THICK, GALVANIZED-STEEL SHEET, WITH BEVELED EDGE SIZED AS REQUIRED TO HOLD INSULATION SECURELY IN PLACE BUT NOT LESS THAN 1-1/2 INCHES IN DIAMETER.
 - A. PROTECT ENDS WITH CAPPED SELF-LOCKING WASHERS INCORPORATING A SPRING STEEL INSERT TO ENSURE PERMANENT RETENTION OF CAP IN EXPOSED LOCATIONS.
- 5. NONMETAL INSULATION-RETAINING WASHERS: SELF-LOCKING WASHERS FORMED FROM 0.016-INCH- THICK NYLON SHEET, WITH BEVELED EDGE SIZED AS REQUIRED TO HOLD INSULATION SECURELY IN PLACE BUT NOT LESS THAN 1-1/2 INCHES IN DIAMETER.
- C. STAPLES: OUTWARD-CLINCHING INSULATION STAPLES, NOMINAL 3/4-INCH- WIDE, STAINLESS STEEL OR MONEL.
- D. WIRE: 0.062-INCH SOFT-ANNEALED, STAINLESS STEEL.

PART 3 - EXECUTION

3.1 PREPARATION

- A. SURFACE PREPARATION: CLEAN AND DRY SURFACES TO RECEIVE INSULATION. REMOVE MATERIALS THAT WILL ADVERSELY AFFECT INSULATION APPLICATION.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF DUCTS AND FITTINGS.
- B. INSTALL INSULATION MATERIALS, VAPOR BARRIERS OR RETARDERS, JACKETS, AND THICKNESSES REQUIRED FOR EACH ITEM OF DUCT SYSTEM AS SPECIFIED IN INSULATION SYSTEM SCHEDULES.
- C. INSTALL ACCESSORIES COMPATIBLE WITH INSULATION MATERIALS AND SUITABLE FOR THE SERVICE. INSTALL ACCESSORIES THAT DO NOT CORRODE, SOFTEN, OR OTHERWISE ATTACK INSULATION OR JACKET IN EITHER WET OR DRY STATE.
- D. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT TOP AND BOTTOM OF HORIZONTAL RUNS.
- E. INSTALL MULTIPLE LAYERS OF INSULATION WITH LONGITUDINAL AND END SEAMS STAGGERED.
- F. KEEP INSULATION MATERIALS DRY DURING APPLICATION AND FINISHING.
- G. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.

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- H. INSTALL INSULATION WITH LEAST NUMBER OF JOINTS PRACTICAL.
 - I. WHERE VAPOR BARRIER IS INDICATED, SEAL JOINTS, SEAMS, AND PENETRATIONS IN INSULATION AT HANGERS, SUPPORTS, ANCHORS, AND OTHER PROJECTIONS WITH VAPOR-BARRIER MASTIC.
 - 1. INSTALL INSULATION CONTINUOUSLY THROUGH HANGERS AND AROUND ANCHOR ATTACHMENTS.
 - 2. FOR INSULATION APPLICATION WHERE VAPOR BARRIERS ARE INDICATED, EXTEND INSULATION ON ANCHOR LEGS FROM POINT OF ATTACHMENT TO SUPPORTED ITEM TO POINT OF ATTACHMENT TO STRUCTURE. TAPER AND SEAL ENDS AT ATTACHMENT TO STRUCTURE WITH VAPOR-BARRIER MASTIC.
 - 3. INSTALL INSERT MATERIALS AND INSTALL INSULATION TO TIGHTLY JOIN THE INSERT. SEAL INSULATION TO INSULATION INSERTS WITH ADHESIVE OR SEALING COMPOUND RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
 - J. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE RATE AND WET AND DRY FILM THICKNESSES.
 - K. INSTALL INSULATION WITH FACTORY-APPLIED JACKETS AS FOLLOWS:
 - 1. DRAW JACKET TIGHT AND SMOOTH.
 - 2. COVER CIRCUMFERENTIAL JOINTS WITH 3-INCH- WIDE STRIPS, OF SAME MATERIAL AS INSULATION JACKET. SECURE STRIPS WITH ADHESIVE AND OUTWARD CLINCHING STAPLES ALONG BOTH EDGES OF STRIP, SPACED 4 INCHES O.C.
 - 3. OVERLAP JACKET LONGITUDINAL SEAMS AT LEAST 1-1/2 INCHES. CLEAN AND DRY SURFACE TO RECEIVE SELF-SEALING LAP. STAPLE LAPS WITH OUTWARD CLINCHING STAPLES ALONG EDGE AT 2 INCHES O.C.
 - A. FOR BELOW AMBIENT SERVICES, APPLY VAPOR-BARRIER MASTIC OVER STAPLES.
 - 4. COVER JOINTS AND SEAMS WITH TAPE, ACCORDING TO INSULATION MATERIAL MANUFACTURER'S WRITTEN INSTRUCTIONS, TO MAINTAIN VAPOR SEAL.
 - 5. WHERE VAPOR BARRIERS ARE INDICATED, APPLY VAPOR-BARRIER MASTIC ON SEAMS AND JOINTS AND AT ENDS ADJACENT TO DUCT FLANGES AND FITTINGS.
 - L. CUT INSULATION IN A MANNER TO AVOID COMPRESSING INSULATION MORE THAN 75 PERCENT OF ITS NOMINAL THICKNESS.
 - M. FINISH INSTALLATION WITH SYSTEMS AT OPERATING CONDITIONS. REPAIR JOINT SEPARATIONS AND CRACKING DUE TO THERMAL MOVEMENT.
 - N. REPAIR DAMAGED INSULATION FACINGS BY APPLYING SAME FACING MATERIAL OVER DAMAGED AREAS. EXTEND PATCHES AT LEAST 4 INCHES BEYOND DAMAGED AREAS. ADHERE, STAPLE, AND SEAL PATCHES SIMILAR TO BUTT JOINTS.
- 3.3 PENETRATIONS
- A. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.

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3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH ADHESIVE AND INSULATION PINS.
1. APPLY ADHESIVES ACCORDING TO MANUFACTURER'S RECOMMENDED COVERAGE RATES PER UNIT AREA, FOR 50 PERCENT COVERAGE OF DUCT AND PLENUM SURFACES.
 2. APPLY ADHESIVE TO ENTIRE CIRCUMFERENCE OF DUCTS AND TO ALL SURFACES OF FITTINGS AND TRANSITIONS.
 3. INSTALL EITHER CAPACITOR-DISCHARGE-WELD PINS AND SPEED WASHERS OR CUPPED-HEAD, CAPACITOR-DISCHARGE-WELD PINS ON SIDES AND BOTTOM OF HORIZONTAL DUCTS AND SIDES OF VERTICAL DUCTS AS FOLLOWS:
 - A. ON DUCT SIDES WITH DIMENSIONS 18 INCHES AND SMALLER, PLACE PINS ALONG LONGITUDINAL CENTERLINE OF DUCT. SPACE 3 INCHES MAXIMUM FROM INSULATION END JOINTS, AND 16 INCHES O.C.
 - B. ON DUCT SIDES WITH DIMENSIONS LARGER THAN 18 INCHES, PLACE PINS 16 INCHES O.C. EACH WAY, AND 3 INCHES MAXIMUM FROM INSULATION JOINTS. INSTALL ADDITIONAL PINS TO HOLD INSULATION TIGHTLY AGAINST SURFACE AT CROSS BRACING.
 - C. PINS MAY BE OMITTED FROM TOP SURFACE OF HORIZONTAL, RECTANGULAR DUCTS AND PLENUMS.
 - D. DO NOT OVERCOMPRESS INSULATION DURING INSTALLATION.
 - E. IMPALE INSULATION OVER PINS AND ATTACH SPEED WASHERS.
 - F. CUT EXCESS PORTION OF PINS EXTENDING BEYOND SPEED WASHERS OR BEND PARALLEL WITH INSULATION SURFACE. COVER EXPOSED PINS AND WASHERS WITH TAPE MATCHING INSULATION FACING.
 4. FOR DUCTS AND PLENUMS WITH SURFACE TEMPERATURES BELOW AMBIENT, INSTALL A CONTINUOUS UNBROKEN VAPOR BARRIER. CREATE A FACING LAP FOR LONGITUDINAL SEAMS AND END JOINTS WITH INSULATION BY REMOVING 2 INCHES FROM ONE EDGE AND ONE END OF INSULATION SEGMENT. SECURE LAPS TO ADJACENT INSULATION SECTION WITH 1/2-INCH OUTWARD-CLINCHING STAPLES, 1 INCH O.C. INSTALL VAPOR BARRIER CONSISTING OF FACTORY- OR FIELD-APPLIED JACKET, ADHESIVE, VAPOR-BARRIER MASTIC, AND SEALANT AT JOINTS, SEAMS, AND PROTRUSIONS.
 - A. REPAIR PUNCTURES, TEARS, AND PENETRATIONS WITH TAPE OR MASTIC TO MAINTAIN VAPOR-BARRIER SEAL.
 - B. INSTALL VAPOR STOPS FOR DUCTWORK AND PLENUMS OPERATING BELOW 50 DEG F AT 18-FOOT INTERVALS. VAPOR STOPS SHALL CONSIST OF VAPOR-BARRIER MASTIC APPLIED IN A Z-SHAPED PATTERN OVER INSULATION FACE, ALONG BUTT END OF INSULATION, AND OVER THE SURFACE. COVER INSULATION FACE AND SURFACE TO BE INSULATED A WIDTH EQUAL TO TWO TIMES THE INSULATION THICKNESS, BUT NOT LESS THAN 3 INCHES.
 5. OVERLAP UNFACED BLANKETS A MINIMUM OF 2 INCHES ON LONGITUDINAL SEAMS AND END JOINTS. AT END JOINTS, SECURE WITH STEEL BANDS SPACED A MAXIMUM OF 18 INCHES O.C.
 6. INSTALL INSULATION ON RECTANGULAR DUCT ELBOWS AND TRANSITIONS WITH A FULL INSULATION SECTION FOR EACH SURFACE. INSTALL INSULATION ON ROUND AND FLAT-OVAL DUCT ELBOWS WITH INDIVIDUALLY MITERED GORES CUT TO FIT THE ELBOW.

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7. INSULATE DUCT STIFFENERS, HANGERS, AND FLANGES THAT PROTRUDE BEYOND INSULATION SURFACE WITH 6-INCH- WIDE STRIPS OF SAME MATERIAL USED TO INSULATE DUCT. SECURE ON ALTERNATING SIDES OF STIFFENER, HANGER, AND FLANGE WITH PINS SPACED 6 INCHES O.C.

3.5 FIELD QUALITY CONTROL

- A. PERFORM TESTS AND INSPECTIONS.
- B. TESTS AND INSPECTIONS:
 1. INSPECT DUCTWORK, RANDOMLY SELECTED BY ARCHITECT, BY REMOVING FIELD-APPLIED JACKET AND INSULATION IN LAYERS IN REVERSE ORDER OF THEIR INSTALLATION. EXTENT OF INSPECTION SHALL BE LIMITED TO ONE LOCATION(S) FOR EACH DUCT SYSTEM DEFINED IN THE "DUCT INSULATION SCHEDULE, GENERAL" ARTICLE.
- C. ALL INSULATION APPLICATIONS WILL BE CONSIDERED DEFECTIVE WORK IF SAMPLE INSPECTION REVEALS NONCOMPLIANCE WITH REQUIREMENTS.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. PLENUMS AND DUCTS REQUIRING INSULATION:
 1. SUPPLY RETURN, EXHAUST AND OUTDOOR AIR.
 2. DIFFUSER BACKS.
- B. ITEMS NOT INSULATED:
 1. FACTORY-INSULATED FLEXIBLE DUCTS.
 2. FLEXIBLE CONNECTORS.
 3. VIBRATION-CONTROL DEVICES.
 4. FACTORY-INSULATED ACCESS PANELS AND DOORS.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. SUPPLY-AIR, RETURN-AIR, OUTDOOR-AIR AND EXHAUST-AIR DUCT AND DIFFUSER BACK INSULATION: MINERAL-FIBER BLANKET, 2 INCHES THICK AND 0.75-LB/CU. FT. NOMINAL DENSITY.
- B. SUPPLY-AIR, RETURN-AIR, OUTDOOR-AIR AND EXHAUST-AIR DUCT INSULATION AT SMOKE DETECTORS: MINERAL-FIBER BOARD, 2 INCHES THICK AND 3-LB/CU. FT. NOMINAL DENSITY.

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