

WEST NAVARRE INTERMEDIATE SCHOOL
5 CLASSROOM ADDITION

SECTION 15088 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES INSULATING THE FOLLOWING HVAC PIPING SYSTEMS:
 - 1. REFRIGERANT SUCTION AND HOT-GAS PIPING, INDOORS AND OUTDOORS.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. FIELD QUALITY-CONTROL REPORTS.

1.4 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 AND INSPECTING 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. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
- B. 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.
- C. FOAM INSULATION MATERIALS SHALL NOT USE CFC OR HCFC BLOWING AGENTS IN THE MANUFACTURING PROCESS.

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- D. FLEXIBLE ELASTOMERIC INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS.

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

- A. AEROFLEX USA, INC.; AEROCCEL.
- B. ARMACELL LLC; AP ARMAFLEX.
- C. K-FLEX USA; INSUL-LOCK, INSUL-TUBE, AND K-FLEX LS.

2.2 INSULATING CEMENTS

- A. MINERAL-FIBER, HYDRAULIC-SETTING INSULATING AND FINISHING CEMENT: COMPLY WITH ASTM C 449.

2.3 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. FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I.
- C. PVC JACKET ADHESIVE: COMPATIBLE WITH PVC JACKET.

2.4 SEALANTS

- A. PVC JACKET FLASHING SEALANTS:
 - 1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
 - 2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
 - 3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
 - 4. COLOR: WHITE.

2.5 FIELD-APPLIED JACKETS

- A. FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C 921, TYPE I, UNLESS OTHERWISE INDICATED.
- B. PVC JACKET: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH ASTM D 1784, CLASS 16354-C; THICKNESS AS SCHEDULED; ROLL STOCK READY FOR SHOP OR FIELD CUTTING AND FORMING. THICKNESS IS INDICATED IN FIELD-APPLIED JACKET SCHEDULES.
 - 1. ADHESIVE: AS RECOMMENDED BY JACKET MATERIAL MANUFACTURER.
 - 2. COLOR: WHITE.
 - 3. FACTORY-FABRICATED FITTING COVERS TO MATCH JACKET IF AVAILABLE; OTHERWISE, FIELD FABRICATE.

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- A. SHAPES: 45- AND 90-DEGREE, SHORT- AND LONG-RADIUS ELBOWS, TEES, VALVES, FLANGES, UNIONS, REDUCERS, END CAPS, SOIL-PIPE HUBS, TRAPS, MECHANICAL JOINTS, AND P-TRAP AND SUPPLY COVERS FOR LAVATORIES.

2.6 TAPES

- A. PVC TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FIELD-APPLIED PVC JACKET WITH ACRYLIC ADHESIVE; SUITABLE FOR INDOOR AND OUTDOOR APPLICATIONS.
 - 1. WIDTH: 2 INCHES.
 - 2. THICKNESS: 6 MILS.
 - 3. ADHESION: 64 OUNCES FORCE/INCH IN WIDTH.
 - 4. ELONGATION: 500 PERCENT.
 - 5. TENSILE STRENGTH: 18 LBF/INCH IN WIDTH.

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 OR CLOSED SEAL.
- B. STAPLES: OUTWARD-CLINCHING INSULATION STAPLES, NOMINAL 3/4-INCH- WIDE, STAINLESS STEEL OR MONEL.
- C. 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.
- B. COORDINATE INSULATION INSTALLATION WITH THE TRADE INSTALLING HEAT TRACING. COMPLY WITH REQUIREMENTS FOR HEAT TRACING THAT APPLY TO INSULATION.

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 PIPING INCLUDING FITTINGS, VALVES, AND SPECIALTIES.
- B. INSTALL INSULATION MATERIALS, FORMS, VAPOR BARRIERS OR RETARDERS, JACKETS, AND THICKNESSES REQUIRED FOR EACH ITEM OF PIPE 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.

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- 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. DO NOT WELD BRACKETS, CLIPS, OR OTHER ATTACHMENT DEVICES TO PIPING, FITTINGS, AND SPECIALTIES.
- G. KEEP INSULATION MATERIALS DRY DURING APPLICATION AND FINISHING.
- H. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
- I. INSTALL INSULATION WITH LEAST NUMBER OF JOINTS PRACTICAL.
- J. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE RATE AND WET AND DRY FILM THICKNESSES.
- K. CUT INSULATION IN A MANNER TO AVOID COMPRESSING INSULATION MORE THAN 75 PERCENT OF ITS NOMINAL THICKNESS.
- L. FINISH INSTALLATION WITH SYSTEMS AT OPERATING CONDITIONS. REPAIR JOINT SEPARATIONS AND CRACKING DUE TO THERMAL MOVEMENT.
- M. 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.
- N. FOR ABOVE-AMBIENT SERVICES, DO NOT INSTALL INSULATION TO THE FOLLOWING:
 - 1. VIBRATION-CONTROL DEVICES.
 - 2. TESTING AGENCY LABELS AND STAMPS.
 - 3. NAMEPLATES AND DATA PLATES.
 - 4. MANHOLES.
 - 5. HANDHOLES.
 - 6. CLEANOUTS.

3.3 PENETRATIONS

- A. INSULATION INSTALLATION AT ABOVEGROUND EXTERIOR WALL PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH WALL PENETRATIONS.
 - 1. SEAL PENETRATIONS WITH FLASHING SEALANT.
 - 2. FOR APPLICATIONS REQUIRING ONLY INDOOR INSULATION, TERMINATE INSULATION INSIDE WALL SURFACE AND SEAL WITH JOINT SEALANT. FOR APPLICATIONS REQUIRING INDOOR AND OUTDOOR INSULATION, INSTALL INSULATION FOR OUTDOOR APPLICATIONS TIGHTLY JOINED TO INDOOR INSULATION ENDS. SEAL JOINT WITH JOINT SEALANT.
 - 3. EXTEND JACKET OF OUTDOOR INSULATION OUTSIDE WALL FLASHING AND OVERLAP WALL FLASHING AT LEAST 2 INCHES.
 - 4. SEAL JACKET TO WALL FLASHING WITH FLASHING SEALANT.

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- B. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. REQUIREMENTS IN THIS ARTICLE GENERALLY APPLY TO ALL INSULATION MATERIALS EXCEPT WHERE MORE SPECIFIC REQUIREMENTS ARE SPECIFIED IN VARIOUS PIPE INSULATION MATERIAL INSTALLATION ARTICLES.
- B. INSULATION INSTALLATION ON FITTINGS, VALVES, STRAINERS, FLANGES, AND UNIONS:
 - 1. INSTALL INSULATION OVER FITTINGS, VALVES, STRAINERS, FLANGES, UNIONS, AND OTHER SPECIALTIES WITH CONTINUOUS THERMAL AND VAPOR-RETARDER INTEGRITY UNLESS OTHERWISE INDICATED.
 - 2. INSULATE PIPE ELBOWS USING PREFORMED FITTING INSULATION OR MITERED FITTINGS MADE FROM SAME MATERIAL AND DENSITY AS ADJACENT PIPE INSULATION. EACH PIECE SHALL BE BUTTED TIGHTLY AGAINST ADJOINING PIECE AND BONDED WITH ADHESIVE. FILL JOINTS, SEAMS, VOIDS, AND IRREGULAR SURFACES WITH INSULATING CEMENT FINISHED TO A SMOOTH, HARD, AND UNIFORM CONTOUR THAT IS UNIFORM WITH ADJOINING PIPE INSULATION.
 - 3. INSULATE TEE FITTINGS WITH PREFORMED FITTING INSULATION OR SECTIONAL PIPE INSULATION OF SAME MATERIAL AND THICKNESS AS USED FOR ADJACENT PIPE. CUT SECTIONAL PIPE INSULATION TO FIT. BUTT EACH SECTION CLOSELY TO THE NEXT AND HOLD IN PLACE WITH TIE WIRE. BOND PIECES WITH ADHESIVE.
 - 4. INSULATE VALVES USING PREFORMED FITTING INSULATION OR SECTIONAL PIPE INSULATION OF SAME MATERIAL, DENSITY, AND THICKNESS AS USED FOR ADJACENT PIPE. OVERLAP ADJOINING PIPE INSULATION BY NOT LESS THAN TWO TIMES THE THICKNESS OF PIPE INSULATION, OR ONE PIPE DIAMETER, WHICHEVER IS THICKER. FOR VALVES, INSULATE UP TO AND INCLUDING THE BONNETS, VALVE STUFFING-BOX STUDS, BOLTS, AND NUTS. FILL JOINTS, SEAMS, AND IRREGULAR SURFACES WITH INSULATING CEMENT.
 - 5. INSULATE STRAINERS USING PREFORMED FITTING INSULATION OR SECTIONAL PIPE INSULATION OF SAME MATERIAL, DENSITY, AND THICKNESS AS USED FOR ADJACENT PIPE. OVERLAP ADJOINING PIPE INSULATION BY NOT LESS THAN TWO TIMES THE THICKNESS OF PIPE INSULATION, OR ONE PIPE DIAMETER, WHICHEVER IS THICKER. FILL JOINTS, SEAMS, AND IRREGULAR SURFACES WITH INSULATING CEMENT. INSULATE STRAINERS SO STRAINER BASKET FLANGE OR PLUG CAN BE EASILY REMOVED AND REPLACED WITHOUT DAMAGING THE INSULATION AND JACKET. PROVIDE A REMOVABLE REUSABLE INSULATION COVER. FOR BELOW-AMBIENT SERVICES, PROVIDE A DESIGN THAT MAINTAINS VAPOR BARRIER.
 - 6. INSULATE FLANGES AND UNIONS USING A SECTION OF OVERSIZED PREFORMED PIPE INSULATION. OVERLAP ADJOINING PIPE INSULATION BY NOT LESS THAN TWO TIMES THE THICKNESS OF PIPE INSULATION, OR ONE PIPE DIAMETER, WHICHEVER IS THICKER.
 - 7. COVER SEGMENTED INSULATED SURFACES WITH A LAYER OF FINISHING CEMENT AND COAT WITH A MASTIC. INSTALL VAPOR-BARRIER MASTIC FOR BELOW-AMBIENT SERVICES AND A BREATHER MASTIC FOR ABOVE-AMBIENT SERVICES. REINFORCE THE MASTIC WITH FABRIC-REINFORCING MESH. TROWEL THE MASTIC TO A SMOOTH AND WELL-SHAPED CONTOUR.
 - 8. FOR SERVICES NOT SPECIFIED TO RECEIVE A FIELD-APPLIED JACKET EXCEPT FOR FLEXIBLE ELASTOMERIC AND POLYOLEFIN, INSTALL FITTED PVC COVER OVER

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ELBOWS, TEES, STRAINERS, VALVES, FLANGES, AND UNIONS. TERMINATE ENDS WITH PVC END CAPS. TAPE PVC COVERS TO ADJOINING INSULATION FACING USING PVC TAPE.

9. STENCIL OR LABEL THE OUTSIDE INSULATION JACKET OF EACH UNION WITH THE WORD "UNION." MATCH SIZE AND COLOR OF PIPE LABELS.

- C. INSULATE INSTRUMENT CONNECTIONS FOR THERMOMETERS, PRESSURE GAGES, PRESSURE TEMPERATURE TAPS, TEST CONNECTIONS, FLOW METERS, SENSORS, SWITCHES, AND TRANSMITTERS ON INSULATED PIPES. SHAPE INSULATION AT THESE CONNECTIONS BY TAPERING IT TO AND AROUND THE CONNECTION WITH INSULATING CEMENT AND FINISH WITH FINISHING CEMENT, MASTIC, AND FLASHING SEALANT.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. SEAL LONGITUDINAL SEAMS AND END JOINTS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.

- B. INSULATION INSTALLATION ON PIPE FLANGES:

1. INSTALL PIPE INSULATION TO OUTER DIAMETER OF PIPE FLANGE.
2. MAKE WIDTH OF INSULATION SECTION SAME AS OVERALL WIDTH OF FLANGE AND BOLTS, PLUS TWICE THE THICKNESS OF PIPE INSULATION.
3. FILL VOIDS BETWEEN INNER CIRCUMFERENCE OF FLANGE INSULATION AND OUTER CIRCUMFERENCE OF ADJACENT STRAIGHT PIPE SEGMENTS WITH CUT SECTIONS OF SHEET INSULATION OF SAME THICKNESS AS PIPE INSULATION.
4. SECURE INSULATION TO FLANGES AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.

- C. INSULATION INSTALLATION ON PIPE FITTINGS AND ELBOWS:

1. INSTALL MITERED SECTIONS OF PIPE INSULATION.
2. SECURE INSULATION MATERIALS AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.

- D. INSULATION INSTALLATION ON VALVES AND PIPE SPECIALTIES:

1. INSTALL PREFORMED VALVE COVERS MANUFACTURED OF SAME MATERIAL AS PIPE INSULATION WHEN AVAILABLE.
2. WHEN PREFORMED VALVE COVERS ARE NOT AVAILABLE, INSTALL CUT SECTIONS OF PIPE AND SHEET INSULATION TO VALVE BODY. ARRANGE INSULATION TO PERMIT ACCESS TO PACKING AND TO ALLOW VALVE OPERATION WITHOUT DISTURBING INSULATION.
3. INSTALL INSULATION TO FLANGES AS SPECIFIED FOR FLANGE INSULATION APPLICATION.
4. SECURE INSULATION TO VALVES AND SPECIALTIES AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.

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3.6 FIELD-APPLIED JACKET INSTALLATION

- A. WHERE PVC JACKETS ARE INDICATED, INSTALL WITH 1-INCH OVERLAP AT LONGITUDINAL SEAMS AND END JOINTS; FOR HORIZONTAL APPLICATIONS. SEAL WITH MANUFACTURER'S RECOMMENDED ADHESIVE.
 - 1. APPLY TWO CONTINUOUS BEADS OF ADHESIVE TO SEAMS AND JOINTS, ONE BEAD UNDER LAP AND THE FINISH BEAD ALONG SEAM AND JOINT EDGE.

3.7 FINISHES

- A. FLEXIBLE ELASTOMERIC THERMAL INSULATION: AFTER ADHESIVE HAS FULLY CURED, APPLY TWO COATS OF INSULATION MANUFACTURER'S RECOMMENDED PROTECTIVE COATING.
- B. COLOR: FINAL COLOR AS SELECTED BY ARCHITECT. VARY FIRST AND SECOND COATS TO ALLOW VISUAL INSPECTION OF THE COMPLETED WORK.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. ACCEPTABLE PREFORMED PIPE AND TUBULAR INSULATION MATERIALS AND THICKNESSES ARE IDENTIFIED FOR EACH PIPING SYSTEM AND PIPE SIZE RANGE. IF MORE THAN ONE MATERIAL IS LISTED FOR A PIPING SYSTEM, SELECTION FROM MATERIALS LISTED IS CONTRACTOR'S OPTION.
- B. ITEMS NOT INSULATED: UNLESS OTHERWISE INDICATED, DO NOT INSTALL INSULATION ON THE FOLLOWING:
 - 1. DRAINAGE PIPING LOCATED IN CRAWL SPACES.
 - 2. UNDERGROUND PIPING.
 - 3. CHROME-PLATED PIPES AND FITTINGS UNLESS THERE IS A POTENTIAL FOR PERSONNEL INJURY.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. REFRIGERANT SUCTION AND HOT-GAS PIPING: FLEXIBLE ELASTOMERIC, 1 INCH THICK.

3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. REFRIGERANT SUCTION AND HOT-GAS PIPING: INSULATION SHALL BE THE FOLLOWING:
 - 1. FLEXIBLE ELASTOMERIC: 2 INCHES THICK.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE FACTORY-APPLIED JACKET.

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- B. IF MORE THAN ONE MATERIAL IS LISTED, SELECTION FROM MATERIALS LISTED IS CONTRACTOR'S OPTION.
- C. PIPING, CONCEALED:
 - 1. NONE.
- D. PIPING, EXPOSED BELOW 6'-8" ABOVE FINISHED FLOOR:
 - 1. PVC: 30 MILS THICK.
- E. PIPING, EXPOSED 6'-8" OR MORE ABOVE FINISHED FLOOR:
 - 1. NONE.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. PIPING, CONCEALED:
 - 1. NONE.
- B. PIPING, EXPOSED:
 - 1. PVC: 30 MILS THICK.

END OF SECTION 15088