

## SECTION 23 07 13 - DUCT INSULATION

### PART I - GENERAL

#### 1.1 SECTION INCLUDES

- A. Ductwork Insulation
- B. Fan and Equipment Insulation
- C. Insulation Jackets
- D. Insulation Lagging

#### 1.2 RELATED SECTIONS

- A. *Section 23 31 00 – HVAC Ducts*

#### 1.3 REFERENCES

- A. *National Commercial and Industrial Insulation Standards Manual, maintained by the Midwest Insulation Contractors Association (MICA)*

*[Note to PSC: Any experienced insulation contractor should be familiar with this manual. It provides a comprehensive guide of installation practices for the mechanical insulation industry. By referencing this standard it becomes unnecessary to identify exhaustive and detailed installation procedures. These standards are to insulation what SMACNA standards are to ductwork.]*

- B. *ASHRAE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings*
- C. *Applicable SMACNA standards*
- D. *ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials*
- E. *IECC - International Energy Conservation Code*
- F. *Illinois Energy Conservation Code*
- G. *IMC – International Mechanical Code*

#### 1.4 QUALITY ASSURANCE

- A. Products and execution shall be in compliance with applicable codes and standards including those referenced above in paragraph entitled *REFERENCES*.
- B. Installation shall be in compliance with Manufacturer's recommendations and installation instructions.

### PART 2 - PRODUCTS

#### 2.1 INSULATION MATERIALS

- A. Type F: Flexible Fiberglass Wrap, 1.0 lb./cu. ft., ASTM C553 Type I & II
- B. Type R: Rigid Fiberglass Board, 3.0 lb./cu. ft., ASTM C612 Type IA
- C. Type L: Flexible Fiberglass Liner (for transfer ducts only); 1.5 lb./cu. ft.
- D. Type P: Rigid Polyisocyanurate Board, ASTM C591
- E. Type PH: Rigid Phenolic Foam Board, ASTM C1126 Type III
- F. Type E: **EPDM** Cellular Flexible Elastomeric Foam Sheet, 300 deg. F maximum service temperature, ASTM C534 Grade 1

1. **Not allowed: NBR/PVC blend**

2. Approved Products

- a. Aeroflex Aerocel
- b. Armacell
  - (a) AP Armaflex FS
  - (b) UT Solaflex

*[Note to PSC: The University has experienced widespread failure of NBR/PVC blend insulation in recent years. This problem has been addressed by specifying EPDM elastomeric material exclusively in lieu of NBR/PVC blend. NBR/PVC blend is disallowed for all applications including piping, equipment and ductwork.]*

*[Note to PSC: Aeroflex and Armacell, the primary manufacturers of elastomeric insulation, both offer complete lines of EPDM elastomeric insulation products. However, standard AP Armaflex, given that it is NBR/PVC blend, is not allowed.]*

2.2 JACKETS, FACTORY APPLIED

- A. ASJ (All Service Jacket): White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil vapor barrier backing
- B. FSK (Foil Scrim Jacket): Aluminum-foil vapor barrier, fiberglass-reinforced scrim with kraft-paper backing

2.3 TAPE, ADHESIVES, COATINGS, FASTENERS

- A. Provide in accordance with insulation manufacturer's specifications and requirements.
- B. Sheet metal screws installed outdoors shall be stainless steel with rubber washers. Use of galvanized screws outdoors not allowed.

2.4 LAGGIG, FIELD INSTALLED

- A. ALUM: Aluminum, .032" thick, stucco embossed finish
  - 1. For protecting or securing insulation only, not for vapor barrier
- B. FMAS (Flexible Metallic Adhesive System): Self-adhesive embossed aluminum foil sheet, 6.0 mil minimum total thickness. Basis of design: VentureClad 1577CWE

*[Note to PSC: FMAS appears to be a proven product in the industry. The University now approves it although the jury is still out to some degree. If it proves to be problematic in any manner its approval will be revisited.]*

2.5 MATEIAL PROPERTIES

- A. Insulation material shall satisfy material property requirements of referenced ASTM standard. For convenient summary of referenced ASTM standards see *Insulation Specification Materials Guide* as presented by *National Commercial and Industrial Insulation Association (NIA)*.
- B. All duct insulation materials including jackets, tapes, adhesives and coatings shall meet *ASTM E84 25/50 Flame Spread/Smoke Development* requirements.
- C. Duct insulation located in ventilation air plenums shall be UL listed for application.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General Requirements
  - 1. Install insulation after ductwork has been inspected and tested unless otherwise authorized by the PSC. Ductwork shall be clean and dry.

2. Completely insulate all ductwork conveying air unless specifically indicated otherwise.
3. Insulate all components of duct system including but not limited to coil housings and damper frames.
4. Do not apply insulation on cold duct systems, vulnerable to condensation
5. Provide continuity of insulation and vapor barrier through penetrations unless code prohibits. Ensure openings at penetrations adequate in size to accommodate such continuity.
6. Provide continuity of insulation and vapor barrier through hangers and at supports.
7. Provide high compressive strength inserts at supports and hangers, including trapeze hangers, to prevent compression of insulation.
8. Provide protection at each corner of insulated ductwork extending to or through floors or curbs. Construct of sheet metal angle. Extend minimum 12" above floor/curb.

B. Specific Requirements for Insulation Type

1. Type F - Flexible Fiberglass Wrap
  - a. Mechanically attach at bottom of ducts over 12" wide and on all sides of vertical ducts.
  - b. Include the use of staples in attaching adjoining insulation. Cover staples with adhesive tape.
2. Type R - Rigid Fiberglass Board
  - a. Mechanically attach with welded pins and clips.
3. Type L - Flexible Duct Liner (for transfer ducts only)
  - a. Mechanically fasten and fully adhere insulation to duct. Attachment with adhesive only is not allowed.
  - b. Butt liner tight without gaps at transverse joints and completely coat edges with adhesive. Coat frayed edges and damaged areas with approved coating.
  - c. Duct dimensions given are net inside dimensions. Ensure that duct size conforms to design dimensions.
4. Type P – Rigid Polyisocyanurate Board
  - a. Mechanically attach. Secure with adhesive as needed.
5. Type PH – Rigid Phenolic Board
  - a. Mechanically attach. Secure with adhesive as needed.
6. Type E – **EPDM** Cellular Flexible Elastomeric Foam
  - a. Generously adhere insulation to duct or fan. Fully adhere at joints.

C. Additional Requirements for Outdoor Installations

1. Ensure openings in roof and exterior walls adequate in size to accommodate continuity of duct, insulation and vapor barrier.
2. Ensure insulation jacket is sealed waterproof, vapor tight.
3. Provide tightly fitted metal lagging with overlapped sections properly oriented for prevailing winter wind directions.
4. Mechanically attach lagging sections. Seal all seams and penetrations watertight.
5. For insulated round duct, attach lagging sections with aluminum or stainless steel bands, 12" on center. Minimize use of screws. Seal all seams and penetrations watertight.

6. With approval of PSC: In lieu of metal lagging provide FMAS flexible metallic adhesive system (specification provided above) with factory fabricated aluminum fitting covers. Apply pressure to FMAS with spreading tool to ensure maximum adherence.

*[Note to PSC: Edit text above as required to ensure clarity of lagging requirements. If metal lagging is required delete references to FMAS or vice-versa. Or, allow FMAS as an approved option as stated/indicated. Discuss with Owner prior to finalizing design.]*

3.2 APPLICATION SCHEDULE (Not applicable to laboratory or specialty ductwork)

SERVICE	INSULATION TYPE	JACKET TYPE	LAGGING	MINIMUM THICKNESS*
OA Ducts and Plenums, Exposed	R	ASJ	None	2"
OA Ducts and Plenums, Concealed	R	FSK	None	2"
EA Ducts and Plenums from Damper to Outlet, Exposed	R	ASJ	None	2"
EA Ducts and Plenums from Damper to Outlet, Concealed	R	FSK	None	2"
Other Ducts and Plenums, Exposed	R	ASJ	None	1 ½"
Other Ducts and Plenums, Concealed	F	FSK	None	1 ½"
Transfer Ducts	L	NA	NA	1"
Fans and Equipment Exposed	R	ASJ	None	Same as Duct
Fans and Equipment Concealed	R	FSK	None	Same as Duct
Ducts and Fans in Wet or Humid Indoor Environments	E	None	None	1"
Exterior Ductwork, Plenums and Housings Option 1	P	Integral Moisture Barrier	ALUM or FMAS	2"
Exterior Ductwork, Plenums and Housings Option 2	E	None	ALUM or FMAS	2"
Exterior Ductwork, Plenums and Housings Option 3	R	FSK	ALUM or FMAS	2"

*[Note to PSC: Evaluate required insulation thickness requirements for project-specific temperature and humidity conditions. Increase scheduled insulation thickness as required.]*

*[Note to PSC: Application of rigid fiberglass board to Exterior Ductwork and Plenums (Option 3) is generally discouraged. This product has been included in the Application Table for infrequent applications where particularly appropriate. For a given project, non-applicable options should be deleted from table.]*

*[Note to PSC: Edit text above as required to ensure clarity of lagging requirements. If metal lagging is required delete references to FMAS or vice-versa. Or, allow FMAS as an approved option as stated/indicated.]*

*[Note to PSC: There may be applications where it is acceptable to provide uninsulated ductwork exposed within a conditioned area. In such case ductwork must be located openly within conditioned space, not within a plenum. Use caution when considering such design. Edit Application Schedule accordingly.]*

#### Notes

1. Manufacturer's thickness guide or calculation shall be used to determine required minimum insulation thickness for ambient temperature and humidity conditions. Applied insulation thickness shall meet or exceed this value. Thickness may exceed scheduled value. Discuss with PSC prior to bidding. *[Note to PSC: Perform required calculations, edit schedule accordingly and delete this note. Note is provided for projects with no PSC.]*
2. Insulation thickness and R value shall satisfy ASHRAE Standard 90.1 at a minimum.
3. For repairs, insulation thickness shall match existing.

END OF SECTION **23** 07 13

This section of the *U of I Facilities Standards* establishes minimum requirements only.  
It should not be used as a complete specification.