Engineering Standard

SAES-N-001 30 July, 2003

Basic Criteria, Industrial Insulation

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1 Scope

1.1 This standard defines the minimum mandatory requirements governing the design and installation of industrial insulation. It provides detailed guidelines on industrial insulation systems for piping and equipment.

1.2 The requirements of this standard are in addition to and supplement the requirements of the Process Industry Practices (PIP) documents referenced in Section 3 of this standard.

1.3 This standard may be attached to purchase orders.

1.4 Oil flowlines and pipelines located outside process plant battery limits are exempt from the requirements of this standard.

2 Conflicts and Deviations

2.1 Any conflicts between this standard and other applicable Saudi Aramco Engineering Standards (SAESs), Materials System Specifications (SAMSSs), Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

2.2 Direct all requests to deviate from this standard in writing to the Company or Buyer Representative, who shall follow internal company procedure SAEP-302 and forward such requests to the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

3 References

The selection and design of equipment and facilities covered by this standard shall comply with the latest edition of the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

SAEP-302	*Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement*

Saudi Aramco Engineering Standards

SAES-A-105	*Noise Control*
SAES-A-112	*Meteorological and Seismic Design Data*
SAES-B-006	*Fireproofing in Onshore Facilities*

SAES-B-009	*Fire Protection and Safety Requirements for Offshore Production Facilities*
SAES-H-001	*Selection Requirements for Industrial Coatings*
SAES-H-002	*Internal and External Coating for Steel Pipelines and Piping*
SAES-H-101	*Approved Protective Coating Systems*

3.2 Industry Codes and Standards

Process Industry Practices

PIP INEG1000	*Insulation Design and Type Codes*
PIP INGG1000	*Insulation Documents Use Guidelines*
PIP INIC1000	*Cold Insulation Installation Details*
PIP INIH1000	*Hot Insulation Installation Details*
PIP INSC1000	*Requirements for Cold Service Insulation Material*
PIP INSC2000	*Installation of Cold Service Insulation Systems*
PIP INSH1000	*Requirements for Hot Service Insulation Material*
PIP INSH2000	*Installation of Hot Service Insulation System*
PIP INSR1000	*Installation of Flexible, Removable/Reusable Insulation Covers for Hot Insulation Service*
PIP INTG1000	*Insulation Inspection Checklist*

American Society for Testing and Materials

ASTM E84	*Test Method for Surface Burning Characteristics of Building Materials*
ASTM E96	*Test Method for Water Vapor Transmission of Materials*

4 Definitions

Cellular Glass Insulation: Insulation that is produced of glass and composed of small individual cells sealed from each other.

Fibrous Type Insulation: Insulation that is composed of small diameter fibers which finely divide the air space. These fibers may be organic or inorganic.

Polyurethane or Urethane Insulation: Insulation made by the condensation of organic isocyanates with compounds or resins that contain hydroxyl groups.

Process Plant Battery Limit: Process plant or plants enclosed within one fence.

Saudi Aramco Engineer: The Supervisor of the Piping and Valves Unit, Consulting Services Department, Dhahran.

Vapor Barrier: A material that prevents the passage of moisture into the insulation.

Weatherproofing: A material that protects the insulation from the ravages of weather such as rain, wind, solar radiation, atmospheric contamination and mechanical damage.

Wicking Type Insulation: Insulation, such as calcium silicate and fibrous insulation, which has high tendency to absorb moisture.

5 Equipment Insulation Selection Criteria

5.1 Insulation shall not be installed in pumps, air-cooled equipment, compressors, steam traps, nameplates, expansion joints, rotating joints and other applications where the intended use would be compromised.

5.2 Acoustical insulation shall be used where required to comply with requirements of SAES-A-105.

6 Thermal Insulation Systems

6.1 Hot Insulation Systems

6.1.1 Wicking or fibrous type insulation shall not be used beyond flange to pipe welding joint for flanged joints on pipes and equipment handling heat transfer fluids or asphalt.

6.1.2 Wicking or fibrous type insulation shall not be used on tanks and vessels handling hydrocarbon liquids with operating temperature above 93°C where spillage or leakage onto the insulation is likely to occur.

6.1.3 Cellular glass insulation shall be used on flanged joints in piping and equipment handling heat transfer fluids. Usage of wicking or fibrous type insulation for these applications is prohibited.

6.1.4 Cellular glass insulation shall be used on tanks and vessels handling asphalt where spillage or leakage onto the insulation is probable. Usage of wicking or fibrous type insulation is prohibited.

6.2 Cold Insulation Systems

Polyurethane foam, foam-in-place or spray applications shall be subject to a supplementary specification by the contractor, submitted to the Saudi Aramco

Engineer for approval. Installers must have previous commercial experience and must supply references to Saudi Aramco prior to being granted authorization to work.

7 General Requirements for all Systems

7.1 Carbon steel in contact with insulation shall be coated according to SAES-H-001, SAES-H-002 and SAES-H-101.

7.2 Fireproofing shall be in accordance with SAES-B-006 or SAES-B-009, as appropriate.

7.3 Design ambient conditions shall be in accordance with SAES-A-112.

7.4 Insulation Details

7.4.1 Preformed insulation joints shall be in staggered arrangement. Multiple layer insulation shall be in staggered arrangement at both the longitudinal and circumferential joints. Each layer shall be secured.

7.4.2 Vessels and tanks shall be insulated with block, blanket, or foam insulation.

7.4.3 Removable or flexible type insulation shall be used in areas where access for frequent maintenance is necessary. The insulation shall be bonded to the removable cover.

7.4.4 All metallic protrusions through insulation systems shall be caulked with a sealant.

7.5 Insulation Installation

7.5.1 Insulation support rings, pins, clips, studs, and accessories shall be of materials compatible with the components to which they are attached, and if welded, shall be installed by the fabricator prior to post-weld heat treatment unless specifically permitted otherwise by the Saudi Aramco Engineer.

7.5.2 All equipment, vessels, and piping shall have been tested and inspected as required by the relevant specification prior to the installation of insulation.

7.5.3 Nameplates shall not be insulated and shall be attached with extended brackets to give adequate clearance for full insulation thickness.

7.5.4 Manufacturers' instructions and recommendations of insulation and vapor barrier manufacturers shall be followed.

7.6 Insulation Materials

7.6.1 All non-metallic materials shall have a flame-spread index of not greater than 25 when tested per ASTM E84.

7.6.2 Insulation containing sodium silicate shall not be used over alloys containing molybdenum, such as 316 stainless steel, Hastelloy-X, Inconel 625, operating at 815°C or hotter.

7.6.3 Insulation material shall be 100% asbestos-free.

7.7 Insulation Accessories

7.7.1 Vapor Barrier

7.7.1.1 Where metal jackets are not required, vapor barriers shall be capable of providing weatherproof protection.

7.7.1.2 Plastic coatings shall be used on insulating cement finishes to prevent the ingress of water on non-fireproofed systems.

7.7.1.3 A vapor barrier mastic with a water vapor transmission rating not exceeding 1 metric perm shall be used to coat insulating cement.

7.7.1.4 Vapor barrier shall have a water vapor transmission rating less than 1.6 metric perms per ASTM E96 when tested at 23°C. Fabric reinforcement of elastomeric coatings is required. A metal jacket does not qualify as a vapor barrier.

7.7.2 Weatherproofing

7.7.2.1 Jackets for insulation systems that require fireproofing shall be stainless steel, galvanized steel, or aluminized steel.

7.7.2.2 Aluminum metal jackets shall be used in non-fire hazardous areas within process plant battery limits.

7.7.2.3 Elastomeric coatings shall be used for weatherproofing on plastic foam and cellular glass when there is no requirement for metal jackets.

7.7.2.4 Corrugated jacketing shall not be used to cover cold insulation.

8 Additional Requirements

8.1 Piping Insulation

8.1.1 Flanges and valves shall be insulated only in a piping system insulated to conserve energy. Where there is a need for access for frequent maintenance, the insulation shall be of the removable type. Allowance must be made for the removal of flange bolts without disturbing the fixed insulation and permanent vapor barrier. Packing glands shall be left exposed.

8.1.2 Flanges shall not be insulated in hydrogen service, or in toxic service such as phenol or hydrogen sulfide.

8.1.3 For hydrogen service or where heat conservation insulation is not required for flanges, a sheet-metal shroud should be installed over flanges for personnel protection.

8.1.4 Spectacle blinds shall be left visible for easy accessibility and not totally enclosed by insulation boxes.

8.2 Vessel and Tank Insulation

8.2.1 Removable insulated covers shall be provided for manways and designed so that their removal shall not disturb the surrounding permanently fixed insulation.

8.2.2 Removable insulation plugs shall be provided to permit on-stream ultrasonic inspection when required by the operating proponent. Plugs shall be vapor tight, ultra violet resistant and be such that they can be opened and reclosed without disturbing the adjacent insulation.

9 Specific System Requirements

9.1 Elastomeric insulation used outdoors shall be resistant to ultra violet exposure or coated according to the insulation manufacturer's instructions.

9.2 Polyurethane Insulation

9.2.1 Elastomeric coatings shall be used on foam such as polyurethane below metal jackets.

9.2.2 Vapor barriers for foamed-in-place urethane shall be reviewed and approved by the Saudi Aramco Engineer.

9.2.3 Test procedures shall be established to verify dimensional stability. The procedures are subject to Saudi Aramco review and approval.

Revision Summary

30 July, 2003 Major revision.