



PROCESS  
INDUSTRY  
PRACTICES

TECHNICAL REVISION  
July 2019

***Insulation***

**PIP INEG1000  
Insulation Design Guide**

---

Currently in preview, click buy full version

## PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

© Process Industry Practices (PIP), Construction Industry Institute, The University of Texas at Austin, 3925 West Braker Lane (F4-00), Austin, Texas 78759. PIP member companies and subscribers may copy this Practice for their internal use. Changes or modifications of any kind are not permitted within any PIP Practice without the express written authorization of PIP. Authorized Users may attach addenda or overlays to clearly indicate modifications or exceptions to specific sections of PIP Practices. Authorized Users may provide their clients, suppliers and contractors with copies of the Practice solely for Authorized Users' purposes. These purposes include, but are not limited to the procurement process (e.g., as attachments to requests for quotation / purchase orders or requests for proposals/contracts) and preparation and issue of design engineering deliverables for use on a specific project by Authorized User's client. PIP's copyright notices must be clearly indicated and unequivocally incorporated in documents where an Authorized User desires to provide any third party with copies of the Practice.

### **PRINTING HISTORY**

December 1997	Issued	July 2007	Editorial Revision	July 2019	Technical Revision
April 1999	Complete Revision	October 2010	Reaffirmation with Editorial Revision		
October 2005	Complete Revision	December 2017	Complete Revision		

Not printed with State funds



## PIP INEG1000 Insulation Design Guide

### Table of Contents

<b>1. Scope .....</b>	<b>2</b>	<b>9. Type Codes .....</b>	<b>17</b>
<b>2. References .....</b>	<b>2</b>	9.1 General .....	17
2.1 Process Industry Practices .....	2	9.2 Hot Insulation Types .....	18
2.2 Industry Codes and Standards .....	2	9.3 Cold Insulation Types .....	19
2.3 Other References .....	3	9.4 Insulation Types for Traced and Energy Transfer Jacketed Systems. 19	
<b>3. Insulation Materials .....</b>	<b>3</b>	9.5 AC – Acoustic Control Insulation .....	20
3.1 Categories .....	3	9.6 FP – Fire-Protection Insulation .....	20
3.2 Closed-Cell Insulations .....	3		
3.3 Fibrous Insulations .....	3		
3.4 Granular Insulations .....	5		
3.5 Insulating (Insulative) Coatings .....	5		
3.6 Jacket Materials and Accessories .....	6		
3.7 Vapor Barriers .....	7		
<b>4. Insulation System Design .....</b>	<b>8</b>		
4.1 General .....	8		
4.2 Basic Design Criteria .....	8		
4.3 Other Design Criteria .....	12		
<b>5. Corrosion under Insulation .....</b>	<b>13</b>		
<b>6. Insulation Material Selection .....</b>	<b>14</b>		
6.1 General .....	14		
6.2 ASTM Considerations .....	14		
6.3 Insulation Materials Properties .....	15		
<b>7. Extent of Insulation .....</b>	<b>15</b>		
<b>8. Insulation Thickness .....</b>	<b>16</b>		
8.1 General .....	16		
8.2 3E Plus .....	17		

### Data Forms

**INEG1000-D001** – Documentation  
Requirements Sheet

*The following data forms shall be part of this Practice  
only if indicated on the purchaser's completed  
Documentation Requirements Sheet*

**INEG1000-D002** – Hot Service Insulation  
Design Parameters

**INEG1000-D003** – Cold Service Insulation  
Design Parameters

## 1. Scope

---

This Practice provides guidance for the design of insulation systems. This Practice describes the types of insulation systems that are indicated by the type code on the Piping and Instrumentation Diagrams (P&IDs), data sheets, and other design documents. This Practice provides guidance on insulation design criteria, insulation materials, extent of insulation, determination of insulation thickness, and insulation material properties.

## 2. References

---

Applicable parts of the following Practices, industry codes and standards, and references shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles will be used herein where appropriate.

### 2.1 Process Industry Practices (PIP)

- PIP CTSE1000 – *Application of External Coatings*
- PIP INSC1000 – *Cold Service Insulation Materials and Installation Specification*
- PIP INSH1000 – *Hot Service Insulation Materials and Installation Specification*
- PIP INSR1000 – *Installation of Flexible, Removable/Reusable Insulation Covers for Hot Insulation Service*

### 2.2 Industry Codes and Standards

- American Petroleum Institute (API)
  - API 521 – *Pressure-Relieving and Depressuring Systems*
  - API 2001 – *Fire Protection in Refineries*
  - API RP 2218 – *Fireproofing Practices in Petroleum and Petrochemical Processing Plants*
- American Society of Testing and Materials (ASTM)
  - ASTM C240 – *Standard Test Methods of Testing Cellular Glass Insulation Block*
  - ASTM C447 – *Standard Specification for Mineral Fiber Pipe Insulation*
  - ASTM C552 – *Standard Specification for Cellular Glass Thermal Insulation*
  - ASTM C680 – *Standard Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs*
  - ASTM C800 – *Standard Specification for Fibrous Glass Blanket Insulation (Aircraft Type)*
  - ASTM C871 – *Standard Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions*
  - ASTM C1055 – *Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries*
  - ASTM C1104 – *Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation*
  - ASTM C1696 – *Standard Guide for Industrial Thermal Insulation Systems*