



Introducing NIA's Thermal Insulation Inspector Program

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Expo 2019

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Modified Power Point Presentation

**Pasadena Convention Center,
Pasadena. TX**



- **Why** is the program needed?
- **What** is the scope of the program?
- **What** is the value to my company?
- **Where** can I find more information?

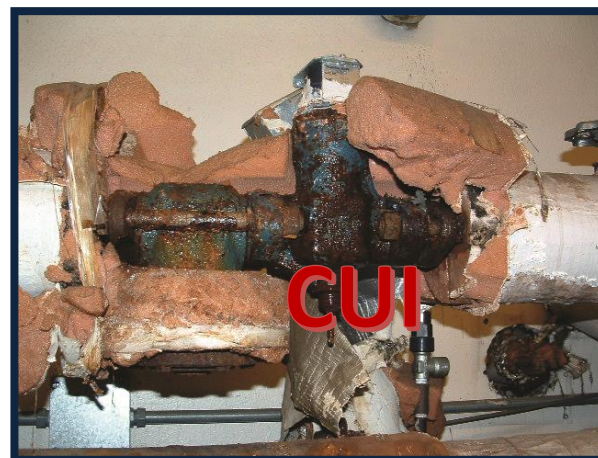


- Dwindling Knowledge Base
- Less Time Spent on Monitoring
- More Options and Alternatives Available
- Qualified Worker Shortage
- Compressed Construction Schedules
- Modularization



- Commissioning
- Fewer Companies Specializing in Mechanical Insulation
- Consequences of Improper Installation or Maintenance
- Specification Compliance
- Enhancement of Current Value of QA/QC Programs
- The Industry Is Requesting It

Why is inspection needed?





- **Part 1: Introduction to Mechanical Insulation**

- To serve as a thorough introduction to mechanical insulation and the inspection process for mechanical insulation systems in new construction, retrofit, and/or maintenance applications.

- **Part 2: Thermal Insulation Inspector Certification Course**

- To prepare those individuals who are seeking professional mechanical insulation system inspection certification.



What is the scope of the program?



Cryogenic Applications	Low - High Temperature Applications		Refractory Applications
-50°F & Below	Refrigeration, chilled water, and below-ambient applications	-49°F to + 75°F	+1,200°F & Above
	Medium- to high- temperature applications	+76°F to +1,200°F	



Prerequisite Learning Requirement: Success Completing of the E-Learning Series

- Module 1: Series Overview & Defining Mechanical Insulation
- Module 2: Benefits of Mechanical Insulation
- Module 3: Mechanical Insulation Science & Technology
- Module 4: Mechanical Insulation Design & Considerations
- Module 5: Mechanical Insulation Maintenance

Mechanical Insulation Education & Awareness E-Learning Series





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What is the scope
of the program?
-- Introduction Level --



Part 1- Introduction to Mechanical Insulation topic include:

- The need and importance of inspection
- The insulation industry market segments
- Why insulate and why is that important
- Defining mechanical insulation, protective covering and accessory materials
- Safety data sheets (SDSs)
- Codes, standards, specifications, and guidelines
- Resources available
- Review, testing, and obtaining results

Mechanical insulation is primarily used to limit heat gain or loss from surfaces operating at temperatures above or below ambient temperature. The theory of heat transfer is the core topic behind each insulation “design objective.”

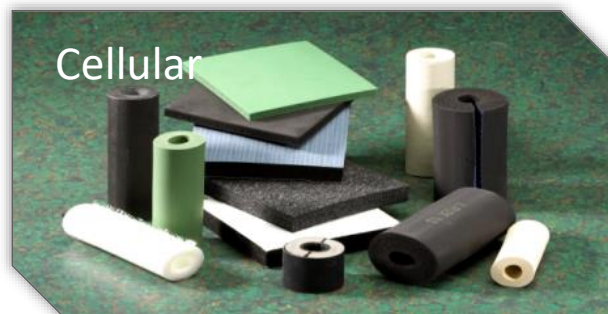
Design Objectives

- Condensation Control
- Energy Conservation
- Fire Safety
- Freeze Protection
- Personnel Protection and/or Comfort
- Process Control
- Noise Control

Design Considerations

- Abuse Resistance
- Corrosion under Insulation (CUI)
- Indoor Air Quality
- Maintainability
- Regulatory Considerations
- Service and Location
- Service Life

Defining Insulation Categories & Forms



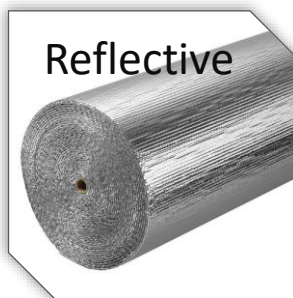
Cellular



Flake



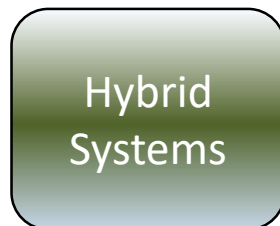
Fibrous



Reflective



Granular



Hybrid
Systems

- **Sectional Pipe Covering**

- Hinged and Half Sections
- Quads
- V-Groove Pipe Covering
- Slip On

- **Additional Pipe Covering Shapes**

- Scored Block
- V-Groove Block
- Curved Radius Block (CRB) and Beveled Lags
- Flat Block and Beveled Lags

- **Insulation Material Shape Definitions**

- Engineered Head Segment
- Pipe & Tank Wrap
- Board
- Blanket or Sheet

Class Exercise

Categories of Insulation Materials



Insulation Materials Specification Chart from the NIA National Insulation Training Program

This chart provides the reader with material properties as typically specified in ASTM material specifications and is a guide to performance characteristics, but may not be sufficient for writing specifications. This was created by NIA for use by NIA in its training programs and for its members and may not be reproduced.

Physical Properties ^{1,4,5,6,7}	Elastomeric Tube and Sheet	Elastomeric Tube and Sheet – High Temp	Elastomeric Tube and Sheet – Halogen Free	Cellular Glass Block	Cellular Glass Pipe	Polystyrene Board	Polystyrene Pipe	Polyiso-cyanurate	Phenolic Foam Unfaced	Melamine Foam	Polyolefin Sheet and Tube	Polyimide Foam	Polyimide Foam	Polyimide Rigid Cellular	Physical Properties ^{1,4,5,6,7}
Type of Material	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Type of Material
ASTM Standard	C534 Grade I	C534 Grade II	C534 Grade III	C552 Grade 6, Type I	C552 Grade 6, Type II	C578 Type I – XII	C578 Type XIII	C591	C1126 Type III	C1410	C1427	C1482 Type I	C1482 Type VI	C1594 Type II, Grade III, Class I	ASTM Standard
Temp (°F) - Max.	220	350	250	800	800	165	165	300	257	350	200	400	572	600	Temp (°F) - Max.
Temp (°F) - Min.	-297	-297	-297	-450	-450	-65	-297	-297	-290	-40	-150	-328	-328	-423	Temp (°F) - Min.
⁸ Apparent Thermal Conductivity Max. (Btu-in/h ² ft ² F) at Mean Temperatures of:	(C518 &/or C177)	(C518 &/or C177)	(C518 &/or C177)	(C518 &/or C177)	(C335)	(C518 &/or C177)	(C518 &/or C177)	(C518 &/or C177)	(C518 &/or C177)	(C518)	(C518)	(C518)	(C518)	(C518 &/or C177)	⁸ Apparent Thermal Conductivity Max. (Btu-in/h ² ft ² F) at Mean Temperatures of:
-100°F	Not Stated	Not Stated	Not Stated	0.21	0.23	N/A ³	0.181	0.17 – 0.19	0.18	N/A ³	0.29	0.21	0.21	0.066	-100°F
0°F	0.26	0.26	0.26	0.27	0.29	N/A ³	0.221	0.18 – 0.20	0.18	N/A ³	0.33	0.27	0.28	0.138	0°F
75°F	0.28	0.30	0.28	0.31	0.34	0.20 – 0.32	0.259	0.18 – 0.20	0.18	0.30	0.35	0.32	0.34	0.246	75°F
200°F	N/A ³	0.38	0.31	0.40	0.43	N/A ³	N/A ³	0.24 – 0.28	0.25	0.41	N/A ³	0.51	0.50	0.396	200°F
400 °F	N/A ³	N/A ³	N/A ³	0.58	0.63	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	0.82	0.82	0.648	400 °F
600°F	N/A ³	N/A ³	N/A ³	N/A	N/A	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	Not Stated	600°F
Compressive Resistance (psi) (C165/C1621) - Min.	N/A	N/A	N/A	60 @ failure	N/A	5 – 100 @ 10%	20 @ 10%	20 – 125 @ 10%	18 @ 10%	N/A	N/A	0.5 @ 25%	0.5 @ 25%	Not Stated	Compressive Resistance (psi) (C165/C1621) - Min.
Corrosion of Carbon Steel (ASTM C1617)	Not Stated	Not Stated	Not Stated	S.D.I. Water	S.D.I. Water	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	Corrosion of Carbon Steel (ASTM C1617)
Density (lbs/ft ³)	Not Stated	Not Stated	Not Stated	6.12 min	6.12 min	0.7 – 3.0	1.6	1.8 – 6.0	2 min	0.6 – 0.8	2.5 max	0.48 max	0.50 max	3.0 max	Density (lbs/ft ³)
Linear Change at Max Temp (C356 / D2126)	7% (C 356)	7% (C 356)	7% (C 356)	Not Stated	Not Stated	2% max (D 2126)	2% max (D 2126)	2% max (D 2126)	2% max (D 2126)	5% max (C 356)	7% max (C 356)	Not Stated	Not Stated	Not Stated	Linear Change at Max Temp (C356 / D2126)
Min. Flexural Strength (psi) Min. (C203)	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	10 – 100	45	Not Stated	Not Stated	N/A	N/A	Not Stated	Not Stated	Not Stated	Min. Flexural Strength (psi) Min. (C203)
pH	Not Stated	Not Stated	Not Stated	7 – 8	7 – 8	Not Stated	Not Stated	Not Stated	Not Stated	Not Stated	6 – 8	Not Stated	Not Stated	Not Stated	pH
Behavior in a Vertical Tube Furnace (ASTM E136)	N/A	N/A	N/A	P	P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹	25/50 ²	Not stated	Not stated	5/0	5/0	Not Stated	Not Stated	25/50 ²	25/50 ²	25/50 ²	25/50 ²	10/15 ²	10/15 ²	10/15	Surface Burning Characteristics Max (E84) ⁹
Water Vapor Permeability (Perm in) Max (E96) Procedure A or B	0.10 A	0.10 A	0.10 A	0.005 B	0.005 B	1.1 – 5.0 A	1.5 A	2.0 – 4.0 A	0.9 A	Not Stated	0.05 A	Not Stated	Not Stated	8 B	Water Vapor Permeability (Perm in) Max (E96) Procedure A or B
Physical Properties ^{1,4,5,6,7}	Elastomeric Tube and Sheet	Elastomeric Tube and Sheet – High Temp	Elastomeric Tube and Sheet – Halogen Free	Cellular Glass Block	Cellular Glass Pipe	Polystyrene Board	Polystyrene Pipe	Polyiso-cyanurate	Phenolic Foam Unfaced	Melamine Foam	Polyolefin Sheet and Tube	Polyimide Foam	Polyimide Foam	Polyimide Rigid Cellular	Physical Properties ^{1,4,5,6,7}

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THE VOICE OF THE INSULATION INDUSTRY

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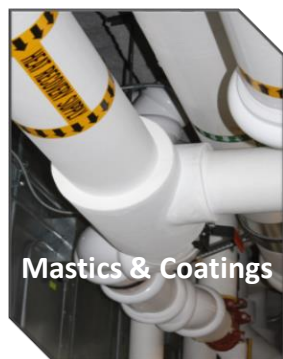


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The primary reason for protective coverings is to protect the insulation from damage.

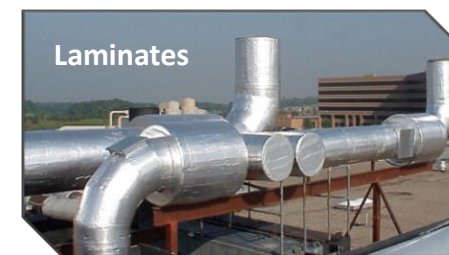
Protective coverings are typically broken down into these categories:

- Weather Barriers — protects the system from weather
- Vapor Retarders — protects from passage of water vapor
- Mechanical Abuse — protects the system from mechanical abuse
- Condensate Barriers — protects from water vapor condensation
- Appearance Coverings — provides for aesthetic or identification purposes
- Hygienic Coverings — provides hygienic protection



Covering – Barrier – Retarder – Finish Materials

- Metal Rolls or Sheets
- Polymeric (Plastic) Rolls or Sheets
- PVC Jackets
- PVDC Film
- Laminates
- Fabrics
- Mastics, Coatings, Adhesives
- Glass-Reinforced Plastic (GRP) or Fiber Glass–Reinforced Plastic (FRP)

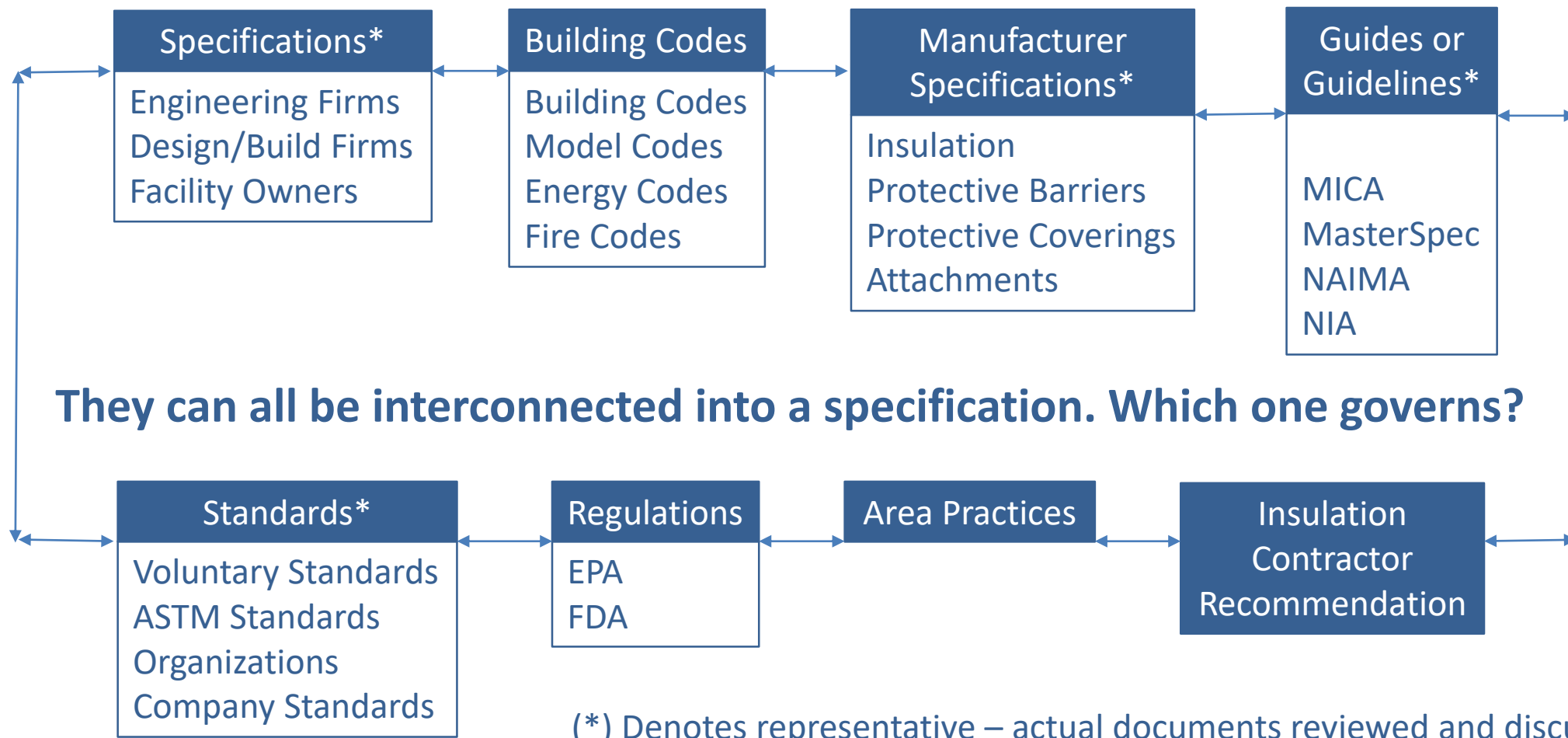


- What is a Safety Data Sheet (SDS)?
- Who is responsible for providing SDS's?
- How to read an SDS?
- What information is found in the SDS?
- Why are SDS's valuable to an inspector?

Actual SDS examples are reviewed and discussed in the class



Safety Program Protocol

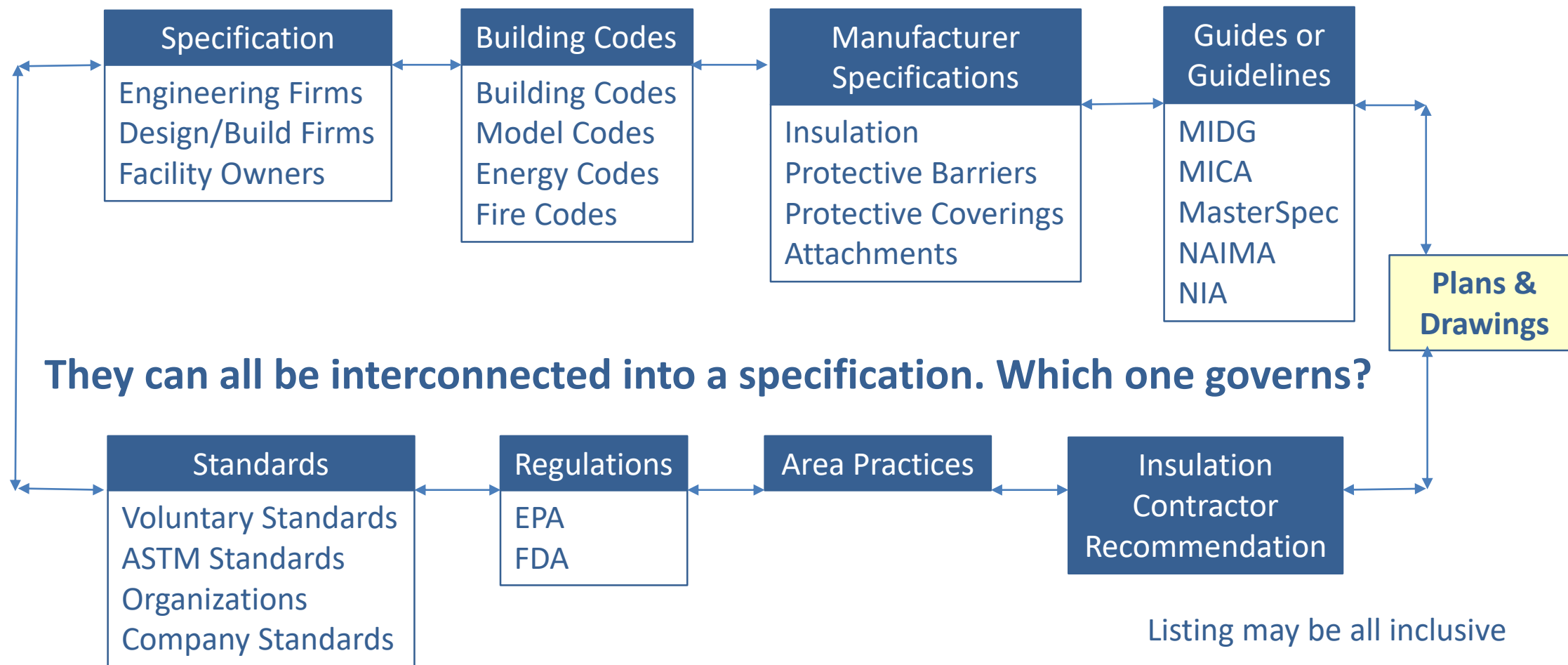




Part 2 - Topics in Thermal Insulation Inspector Certification Course include:

- Roles and responsibilities of an inspector
- Basis of inspection—what are you inspecting to?
- The inspection process (new construction and maintenance)
- Importance of pre-inspection conference
- Inspection tools and techniques
- Common occurrences—problem areas
- Inspection documentation and reporting
- Certification process, procedures, and recertification
- Review, testing, and obtaining results

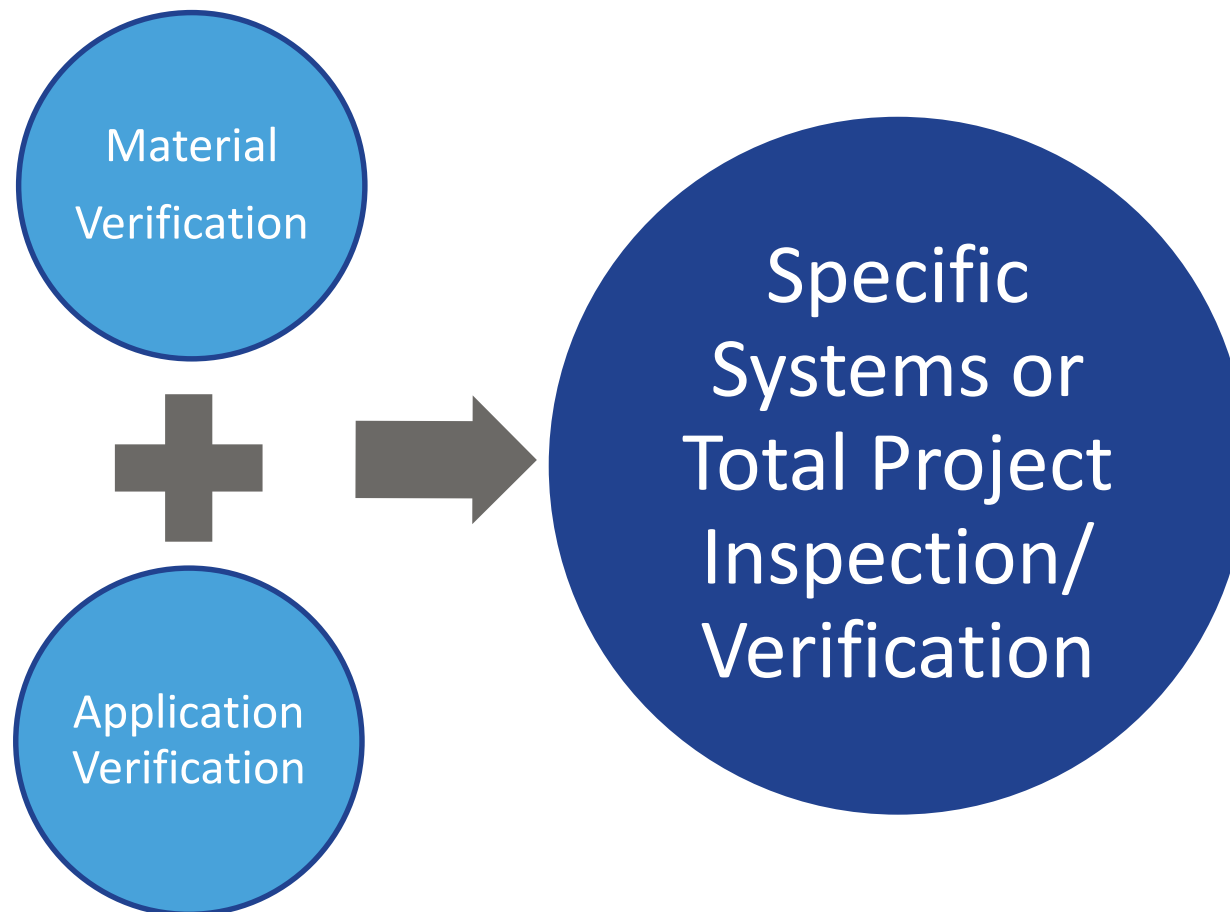
What is the controlling document – what am I inspecting to?



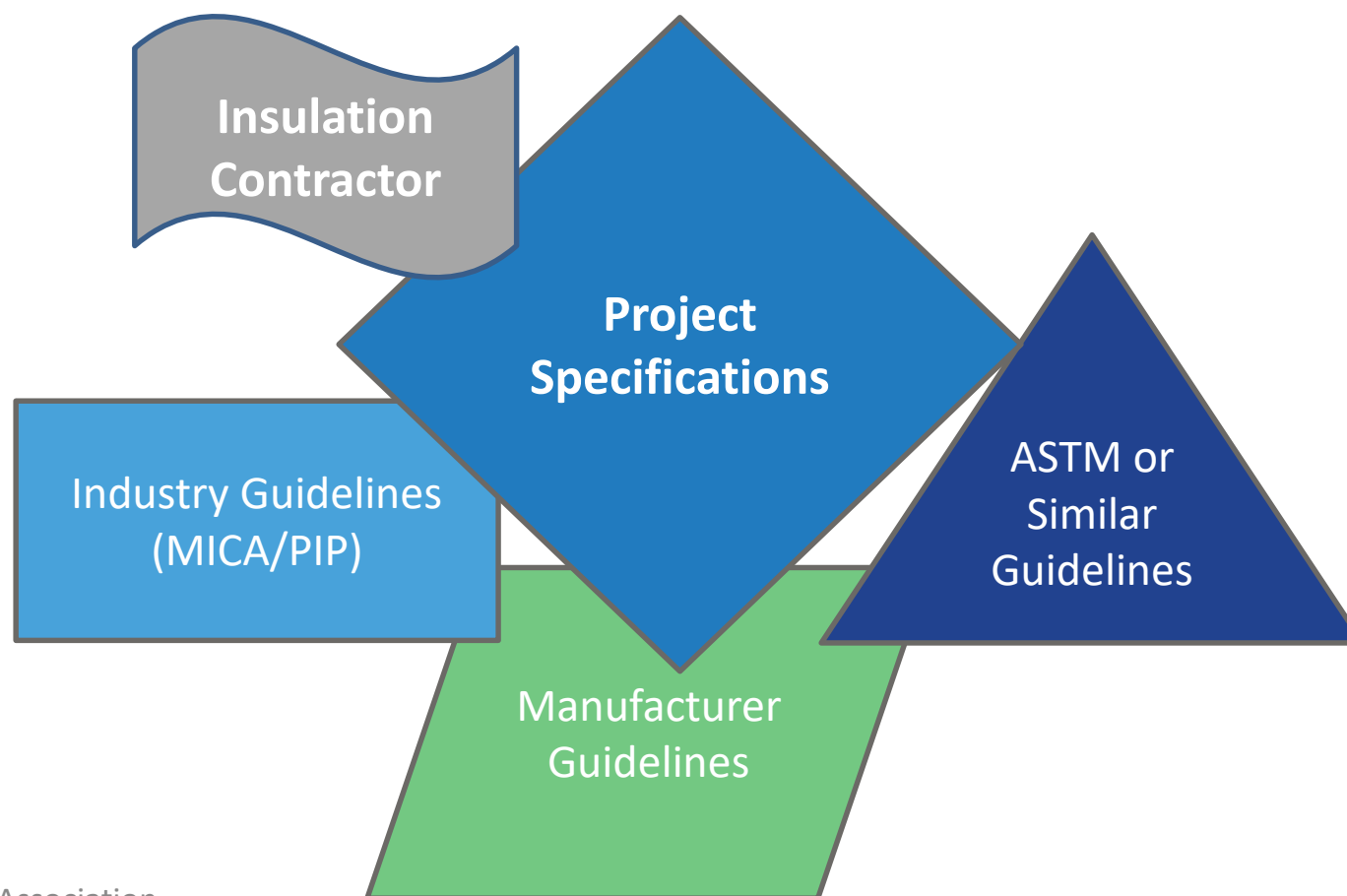


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New Construction Initial Insulation Application



Installation Procedures—How Are They determined?



Proactive

- Have an ongoing inspection and insulation maintenance program

Reactive

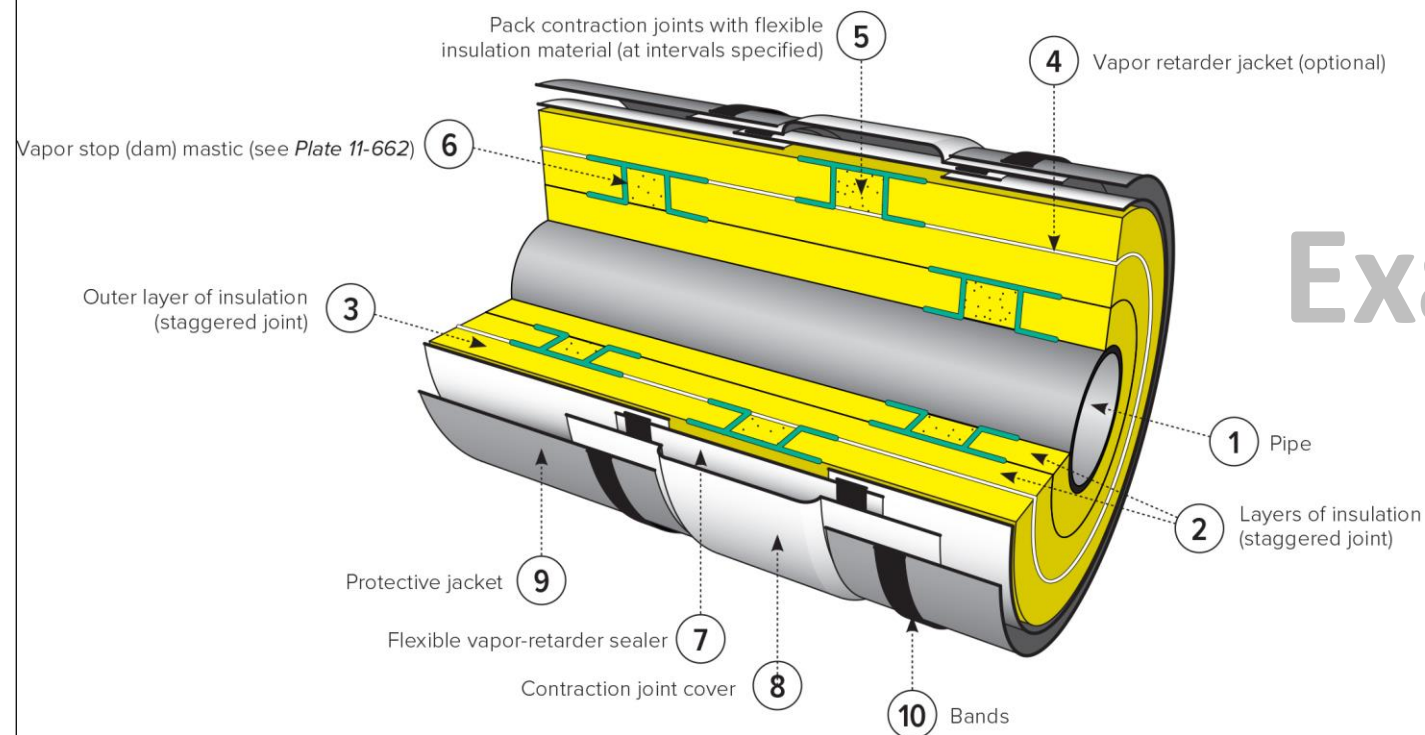
- Implement inspection and maintenance of insulation when required and/or when budget allows

CRYOGENIC PIPING

Multiple Layer Contraction Joints



Plate 11-812



Example

Reprinted, from the 8th edition of the National Commercial & Industrial Standards manual, and with permission from the Midwest Insulation Contractors Association (MICA)

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Inspection Exercises Common Occurrences - Common Sense Approach



Caulking around protrusion
missing or damaged

Ambient Temperature Range 60°F-95°F
with 70% RH and 8 mph Wind

Protective Jacket
over a Vapor
Retarder

Uncoated Substrate

Service Temperature -20°F

Example



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Inspection Exercises Common Occurrences - Common Sense Approach



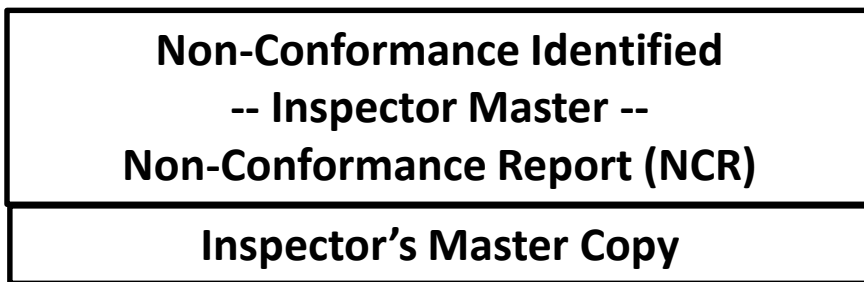
Example



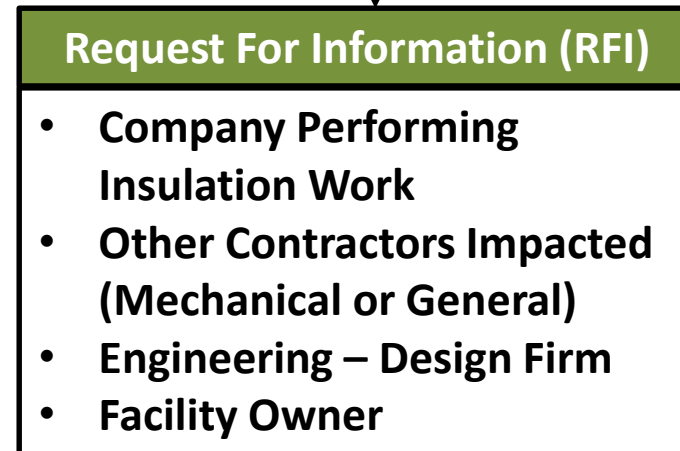
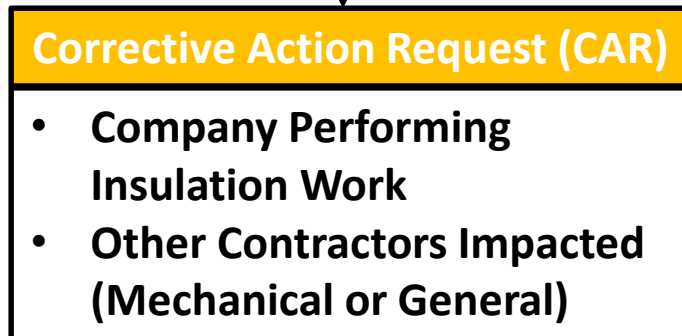
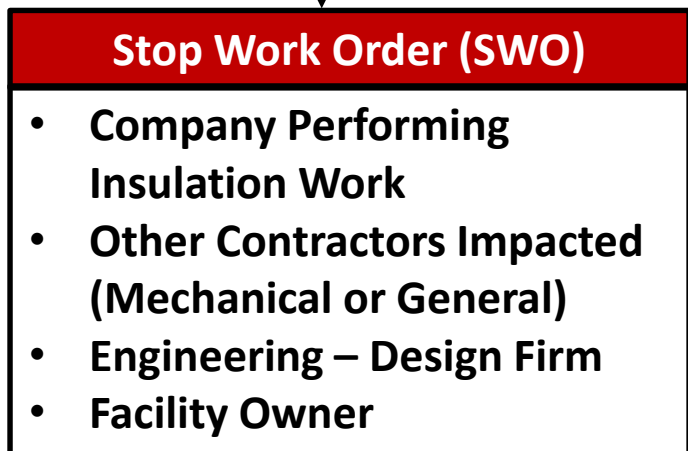
Inspection Process Documentation and Reporting



Each area has a Control Log which can be used to generate the final Inspection Report



Example



Not shown are Hold Point notifications and or their release



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The Thermal Insulation Inspector Program



2-4 Hours

• Perquisite – E Learning Modules

- Testing upon completion  or proceed to Introduction Level (Certificate of Completion)

1 ¾ Days +/-

• Introduction to Mechanical Insulation

- Testing upon completion  or proceed to Certification Course (Certificate of Completion)

1 ¾ Days +/-

• Thermal Insulation Inspector Certification Course

- Testing upon completion  **Finished the Thermal Insulation Certification Course**
Certified Thermal Insulation Inspector

Certification valid for 3 years – recertification required

The above illustration is based upon successfully passing each test level



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What is the value of the program to your company?



The answer to that question depends on your company's strategic objectives and internal processes and procedures.

- Code/regulatory officials
- Engineering firms
- Facility owners
- Inspection – QC/QA firms
- Manufacturers
- Mechanical and other contractors
- Mechanical insulation distributors/fabricators and contractors

Service *QC/QA Program*
Risk Assessment *Marketing/Sales*
Differentiation
Knowledge *Craft Training*
Liability "Support"
Commissioning *Profitability \$*
Productivity
Employee Training *Growth*
Over Time Raises the Bar
Continuing Education



Summary:

- Comprehensive – starts with the basic's though the inspection process and reporting
- Applicable to the commercial and industrial mechanical insulation industry segments (all service temperature ranges)
- Class is product and labor generic in nature
- Contains multiple class participant exercises – participation and interaction is encouraged
- Review and discussion of actual documents
- Product samples from all basic groups are present in the class room
- Allows time for networking with fellow participants
- Not a give-me – testing is extensive but fair and balanced
- Take-aways are extensive
- Developed and reviewed by experienced industry people
- It has been requested by industry and is needed in the industry

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Thank You !



Introducing NIA's Thermal Insulation Inspector Program

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Thermal Insulation Inspector Program

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www.insulation.org/training-tools/inspectorprogram/



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