



## Specification Compliance and Reference Guide

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## ASTM

### Specification Compliance for Knauf Products

#### C 547

##### Type I (850° F)

**Grade A**—1000° Pipe Insulation (faced & unfaced)

##### Type IV (1000° F)

**Grade A**—1000° Pipe Insulation (faced & unfaced)

#### C 553

**Type I**—450° F max: Building Insulation; Metal Building Insulation; Duct Wrap;\* FDM;

KN Series;\* Amber Blanket;\* Duct Liner E•M;\* Textile Liner;\* Equipment Liner M;\* Wall Ceiling Liner M;\* ET Blanket; ET Batt

**Type II**—450° F max: Metal Building Insulation; Duct Wrap;\* FDM; KN Series\*; Amber Blanket;\* Duct Liner E•M;\* Textile Liner;\* Equipment Liner M;\* Wall Ceiling Liner M;\* ET Blanket; ET Batt

**Type III**—450° F max: Duct Wrap, 1.5 pcf; KN Series, 1.5 pcf; Amber Blanket, 1.5 pcf; Duct Liner E•M, 2 pcf; Textile Liner, 2 pcf; Equipment Liner M, 2 pcf; ET Batt; IB, 1.6 pcf

**Type IV**—850° F max: ET Panel; ET Board

**Type V**—1000° F max: ET Blanket; ET Batt

**Type VI**—1000° F max: ET Batt

#### C 612

**Type IA**—450° F, no load: Insulation Board, 1.6, 2.25, 3, 4.25 & 6 pcf; ET Board; ET Panel; Hullboard; Fab Board

**Type IB**—450° F, load: Insulation Board, 3, 4.25 & 6 pcf; ET Board; ET Panel; Hullboard; Fab Board

**Type II**—850° F: ET Board; ET Panel; Hullboard; Fab Board

**Type III**—1000° F: ET Panel

#### C 665

**Type I**—Unfaced: Building Insulation; Mobile Home, Metal Building Insulation

**Type II**—Nonreflective Facing

**Class A**—FS<25

**Class B**—CRF>0.12W

**Class C**—FS not rated

**Category 1**—Vapor Retarder: Kraft Faced Building Insulation

**Type III**—Reflective Facing

**Class A**—FS<25: FSK-25 Building Insulation

**Class B**—CRF>0.12W: Foil Faced Building Insulation

**Class C**—FS not rated

**Category 1**—Vapor Retarder: Foil Faced Building Insulation

#### C 764

**Type I**—Blowing Wool: Jet Stream; Perimeter Plus; Blue Label

**Type II**—Pouring Wool

#### C 795

ET Board; ET Blanket; ET Panel; 1000° Pipe Insulation; Insulation Board; Hullboard; Fab Board; Duct Wrap; Unbonded-Unlubricated; Pipe and Tank; KwikFlex.

#### C 991

**Type I**—Unfaced: Metal Building Insulation

**Type II**—Faced

#### C 1071

**Type I**—Rolls: Duct Liner E•M; Textile Liner; Equipment Liner M

**Type II**—Board or Slab: Rigid Plenum Liner

#### C 1136

**Type I**—ASJ

**Type II**—FSK, PSK, ASJ

**Type III**—ASJ

**Type IV**—FSK, PSK, ASJ

#### C 1139

**Type I**—Unfaced Thermal Blanket

**Grade 1**—0.75 pcf: Metal Building Insulation; KN Series; Amber Blanket; Duct Wrap; FDM

**Grade 2**—1.0 pcf: KN Series; Amber Blanket; Duct Wrap; ET Blanket

**Grade 3**—1.5 pcf: KN Series; Amber Blanket; Duct Wrap; ET Batt; Insulation Board, 1.6 pcf

**Grade 4**—2.0 pcf: KN Series; Amber Blanket

**Grade 5**—2.5 pcf: KN Series; Amber Blanket; ET Panel; Insulation Board, 2.25 pcf

**Grade 6**—3.0 pcf: ET Board; Insulation Board; Hullboard; Fab Board.

**Type II**—Unfaced Sound Absorbing Blanket

**Grade 1**—0.75 pcf: Metal Building Insulation; KN Series; Amber Blanket; Duct Wrap; FDM

**Grade 2**—1.0 pcf: KN Series; Amber Blanket; Duct Wrap; ET Blanket

**Grade 3**—1.5 pcf: KN Series; Amber Blanket; Duct Wrap; ET Batt; Insulation Board, 1.6 pcf

**Grade 4**—2.0 pcf: KN Series; Amber Blanket

**Grade 5**—2.5 pcf: KN Series; Amber Blanket; ET Panel; Insulation Board, 2.25 pcf

**Grade 6**—3.0 pcf: ET Board; Insulation Board, 3 pcf; Hullboard; Fab Board

**Type III**—Faced, Thermal and Sound Absorbing Board: ET Board; Hullboard (approved base material with facing supplied by laminator)

#### C 1290

**Type I**—Unfaced: Unfaced Duct Wrap

**Type II**—Vapor Retarder <= 1.3 perms: FSK Duct Wrap; PSK Duct Wrap; Vinyl Faced Duct Wrap

**Type III**—Vapor Retarder <= 0.02 perms: FSK Duct Wrap; PSK Duct Wrap

#### C 1393

**Type I, II, IIIA, IIIB**

**Category 1**—Pipe and Tank

**Type I, II, IIIA, IIIB**

**Category 2**—KwikFlex

## Federal Specifications for Knauf Products

### HH-B-100B

(cancelled; replaced by ASTM C 1136)

**Type I**—Low WVTR, High Puncture:

ASJ Jacket

**Type II**—Low WVTR, Moderate Puncture:

FSK, PSK, FSK-25

### HH-I-521F

(cancelled; replaced by ASTM C 665)

**Type I**—Unfaced: Building Insulation; Mobile

Home

**Type II**—Nonreflective Facing

**Class A**—FS<25

**Class B**—CRF>0.12W

**Class C**—FS not rated: Kraft Faced

Building

**Type III**—Reflective Facing

**Class A**—FS<25: FSK-25 Building

Insulation

**Class B**—CRF>0.12W: Foil Faced Building

Insulation

**Class C**—FS not rated

### HH-I-545B

(cancelled; replaced by ASTM C 1071)

**Type I**—Blanket: Duct Liner E•M; Textile Liner

**Type II**—Board: Rigid Plenum Liner

### HH-I-558C

**Form A**—Blocks and Boards (cancelled; use

ASTM C 612)

**Form B**—Blankets and Felts, Flexible

**Type I**

**Class 6**—350°F (cancelled; use ASTM C 553)

**Class 7**—450°F: ET Blanket; KN Series

**Class 8**—1000°F: ET Blanket

**Class 9**—1200°F (cancelled; no replacement)

**Form D**

**Type III**

**Class 12**—450°F (cancelled; use

ASTM C 547)

### HH-I-1030B

(cancelled; replaced by ASTM C 764)

**Class A**—<1% LOI

**Class B**—<12% LOI: Jet Stream; Perimeter

Plus; Blue Label

## Military Specifications for Knauf Products

### MIL-I-742F

**Type I**—Cloth Faced Board

**Type II**—Unfaced Board: Hullboard

### MIL-I-15475C

(cancelled; replaced by ASTM C 553)

### MIL-I-22023D

**Type I**—Unfaced, Thermal

**Class 2**—0.75 pcf: Metal Building Insulation;

KN Series; Amber Blanket

**Class 3**—1.0 pcf: KN Series; Amber

Blanket; ET Blanket

**Class 4**—1.5 pcf: Amber Blanket;

KN Series; ET Batt

**Class 5**—2.0 pcf: Amber Blanket; KN Series

**Class 6**—3.0 pcf: ET Board\*; Hullboard\*;

Fab Board\*; Insulation Board, 3 pcf

**Type II**—Unfaced, Acoustical

**Class 2**—0.75 pcf: Metal Building Insulation;

KN Series; Amber Blanket

**Class 3**—1.0 pcf: KN Series; Amber

Blanket; ET Blanket

**Class 4**—1.5 pcf: Amber Blanket; KN Series

**Class 5**—2.0 pcf: Amber Blanket; KN Series

**Class 6**—3.0 pcf: ET Board\*; Hullboard\*;

Fab Board\*; Insulation Board, 3 pcf

**Type III**—ET Board; Hullboard (base products)

Pipe Insulation

### MIL-I-24244C

1000° Pipe Insulation; ET Blanket; ET Board;

ET Panel; Insulation Board; Unbonded-

Unlubricated; Duct Wrap; ET Batt; Pipe and

Tank; KwikFlex

### USCG 164.109

**164.109/4/0** Pipe Insulation (unfaced)

**164.109/15/0** ET Board

**164.109/16/0** Hullboard

**164.109/17/0** ET Panel

**164.109/18/0** ET Blanket; ET Batt; HD Blanket

**164.109/19/0** KN; Flexible Marine

**164.109/21/0** Amber Blanket; Unfaced Duct

Wrap (.75-1.0 pcf)

## Other Specifications and Standards for Knauf Products

### NFPA 90A and 90B

Ducts: Duct Board, EI 475 & EI 800 Coverings

and Linings: Duct Wrap (unfaced, FSK, PSK &

vinyl); Duct Liner E•M; Textile Liner; Insulation

Board (unfaced, FSK & ASJ); Pipe Insulation

### NRC Reg. Guide 1.36

1000° Pipe Insulation; ET Blanket; ET Board;

ET Panel; Hullboard; Insulation Board;

Unbonded-Unlubricated; Duct Wrap; KN Series;

Plain Blanket; Pipe and Tank; KwikFlex

### UL 181

Factory Made Air Ducts, Rigid and Flexible:

Duct Board, EI 475 & EI 800

### NY City MEA

**MEA 178-02-M** Textile Duct Liner

**MEA 243-84-M** Proto PVC Fittings

**MEA 323-83-M** Liner; Duct Wrap

**MEA 324-83-M** Insulation Board

**MEA 325-83-M** Pipe Insulation

**MEA 326-83-M** ET Board

**MEA 362-83-M** ET Panel

**MEA 363-83-M** Pipe & Tank

**MEA 364-83-M** ET Blanket

**MEA 497-90-M** Air Duct Board

**MEA 498-90-M** Building Insulation

### City of Los Angeles: (RR 7729)

Duct Wrap (faced & unfaced); Duct Liner E•M;

Rigid Plenum Liner; Insulation Board (faced &

unfaced); Pipe Insulation

# Specification Compliance and Reference Guide

## Canadian Specifications

### CAN/UL S102-M88

#### (Underwriters' Laboratories of Canada)

Pipe Insulation; Insulation Board; Duct Wrap; ET Board; ET Panel; ET Blanket; Duct Board (Issue 869C, Class 1); Duct Liner E•M; Rigid Plenum Liner; Metal Building Insulation; Hullboard

#### Canadian General Standards Board

**51-GP-9M** Pipe Insulation

**51-GP-10M** Insulation Board; ET Board; ET Panel; ET Blanket; Duct Board; Rigid Plenum Liner; Hullboard

**51-GP-11M** Duct Wrap; ET Blanket; Duct Liner E•M

**51-GP-52M**

**Type I**—ASJ Facing

**Type II**—FSK Facing

#### Department of National Defense

**15260-01 P-1** Pipe Insulation

**15260-02 P-2** Pipe Insulation

**15260-03 P-3** Duct Wrap

**15260-01 D-1** Duct Wrap

**15270-02 D-2** Duct Wrap

**15270-03 D-3** Insulation Board

**15270-04 D-4** Insulation Board

**15280-01 E-1** Duct Wrap; ET Blanket

**15280-02 E-2** Insulation Board; ET Board; ET Panel

**15280-03 E-3** Duct Wrap

**15280-04 E-4** Insulation Board

#### Canadian Coast Guard

**F1-304** Pipe Insulation (unfaced)

**F1-315** ET Board

**F1-316** ET Panel

**F1-314** ET Blanket

**F1-286** KN Series

**F1-287** OEM Blanket

**F1-324** Hullboard

#### Agriculture Canada

**774.1K82** Proto PVC Fitting Covers and Jacketing

## ASTM Standards (Definitions)

### ASTM Specification

A precise statement of a set of requirements to be satisfied by a material, products, systems, or service with procedures for evaluation.

### ASTM Guide

A series of options or instructions that do not recommend a specific course of action. It is like a menu of concerns related to a product or application which a specifier may wish to consider. Insulation products do not comply to ASTM Guides.

### ASTM Practice

A definitive procedure for performing one or more specific operations or functions that does not produce a test result. Examples of practices include procedures for conducting interlaboratory testing programs or statistical procedures; and for selection, preparation, application, etc. of testing equipment.

### ASTM Test Method

A definitive procedure for identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material or system that produces a test result. Test methods do not reference acceptable levels of performance; they are solely to measure levels of performance.

## Common ASTM References (Designation/Description)

### C 165

Test method for measuring compressive properties of thermal insulations.

### C 167

Test method for thickness and density of blanket or batt thermal insulations.

### C 168

Terminology relating to thermal insulating materials.

### C 177

Test method for thermal transmission properties at a range of mean temperatures.

### C 203

Test method for breaking load and flexural properties of block-type thermal insulation.

### C 208

Standard specification for cellulosic fiber insulating board.

### C 236

Test method for steady-state thermal performance of composite constructions such as metal building roofs or wall composites.

### C 240

Test method for cellular glass insulation block.

### C 302

Test method for density of preformed pipe-covering type thermal insulation. This test method can be used for fiber glass pipe as well as other materials.

### C 303

Test method for density of preformed block-type thermal insulation. Can be used for any rigid insulation.

### C 335

Test method for heat transfer properties of horizontal pipe insulation.

### C 351

Test method for mean specific heat of thermal insulation.

### C 356

Test method for linear shrinkage of preformed high temperature thermal insulation subjected to soaking heat. For products with operating limits in excess of 200° F.

### C 384

Test method for impedance and absorption of acoustical materials by the impedance tube method. Not used as often as C 423, this method has specific application for predicting performance in small enclosed spaces such as a machine.

## Common ASTM References (con't)

### C 390

Criteria for sampling and acceptance of preformed thermal insulation lots.

### C 411

Test method for hot-surface performance of high temperature thermal insulation. Test for block and pipe in a horizontal position. Commonly referenced as the evaluation technique for temperature limits on fiber glass products.

### C 419

Practice for making and curing test specimens of mastic thermal insulation coatings.

### C 421

Test method for tumbling friability of preformed block-type thermal insulation. Measures the mass loss of insulation materials as a result of the combination of abrasion and impact.

### C 423

Test method for sound absorption by the reverberation room method.

### C 446

Test method for breaking load and calculated modulus of rupture of preformed insulation for pipes. This method is not applicable to thermal insulation such as fiber glass which fail by crushing before failure in bending.

### C 447

Standard practice for estimating the maximum use temperature of thermal insulations. Intended as a guide in evaluating the behavior of insulations at elevated temperatures. References a series of test methods.

### C 449

Specification for mineral fiber hydraulic-setting thermal insulating and finishing cement. Materials provide a smooth surface as a final finish for heated surfaces between 100°F and 1200°F.

### C 450

Practice for prefabrication and field fabrication of thermal insulating fitting covers for piping, vessel lagging and dished head segments. Provides tables of dimensions that may be used in fabricating covers for use on valves, tees, ells, flanges and vessels.

### C 461

Test methods for mastics and coatings used with thermal insulation.

### C 488

Test method for conducting exterior exposure tests of finishes for thermal insulation.

### C 516

Standard specification for vermiculite loose fill thermal insulation.

### C 517 (deleted)

Specification for diatomaceous earth block and pipe thermal insulation.

### C 518

Test method for evaluating thermal performance at a specific mean temperature, usually 75°F.

### C 519

Test method for determining the density of fibrous loose fill building insulations. Used for evaluating blown density.

### C 522

Test method for airflow resistance of acoustical materials.

### C 523 (deleted)

Light reflectance of acoustical materials.

### C 533

Specification for calcium silicate block and pipe thermal insulation.

### C 534

Specification for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.

### C 547\*\*

Specification for mineral fiber preformed pipe insulation. Has four types, I-850°F molded pipe, II-1200°F molded pipe, III-1200°F precision v-grooved and IV-1000°F molded pipe.

### C 549

Specification for perlite loose fill insulation.

### C 550

Test method for measuring trueness and squareness of rigid block thermal insulation.

### C 552

Specification for cellular glass block and pipe thermal insulation.

### C 553\*\*

Specification for mineral fiber blanket thermal insulation for commercial and industrial applications. There are seven types based upon maximum use temperature and thermal conductivity.

### C 569 (deleted)

Test method for indentation hardness of preformed thermal insulations.

### C 578

Specification for preformed, cellular polystyrene thermal insulation.

### C 585

Practice for inner and outer diameters of rigid thermal insulation for nominal sizes of pipe and tubing.

### C 591

Specification for unfaced preformed rigid cellular polyurethane thermal insulation.

### C 592

Specification for mineral fiber blanket insulation and blanket-type pipe insulation (metal-mesh covered).

### C 610

Specification for expanded perlite block and pipe thermal insulation.

### C 612

Specification for mineral fiber block and board thermal insulation. For products with temperature limits up to 1800°F, with 5 classes based on service temperature.

### C 634

Terminology relating to environmental acoustics.

### C 635

Specification for manufacture, performance and testing of metal suspension systems for acoustical tile and lay-in panel ceilings

### C 636

Practice for installation of metal ceiling suspension systems for acoustical tile and lay-in panels

### C 640 (deleted)

Specification for corkboard and cork pipe thermal insulation.

### C 647

Guide to properties and tests of mastics and coatings for thermal insulation.

### C 653

Guide for determination of the thermal resistance of low-density blanket-type mineral fiber insulation. Guide is for curve-fitting data and calculation techniques.

### C 656

Specification for structural insulating board made of calcium silicate.

### C 665\*\*

Specification for mineral-fiber blanket thermal insulation for light frame construction and manufactured housing. This specification is sometimes referenced for the odor and corrosiveness test methods contained within it.

# Specification Compliance and Reference Guide

## Common ASTM References (con't)

### C 667

Specification for prefabricated reflective insulation systems for equipment and pipe operating at temperatures above ambient air.

### C 680

Practice for determination of heat gain or loss and surface temperatures by the use of a computer program.

### C 686

Test method for parting strength of mineral fiber batt and blanket-type insulation.

### C 687

Practice for determination of the thermal resistance of low-density fibrous loose fill type building insulation. Test method used to help determine blowing wool bag labels.

### C 691 (deleted)

Test method for thermal transmission properties of nonhomogeneous pipe insulation installed horizontally.

### C 692

Test method for evaluating the influence of thermal insulations on the stress corrosion cracking tendency of austenitic stainless steel.

### C 720

Specification for spray-applied fibrous thermal insulation for elevated temperature.

### C 726

Specification for mineral fiber roof insulation board.

### C 727

Practice for use and installation of reflective insulation in building constructions.

### C 728

Specification for perlite thermal insulation board.

### C 739

Specification for cellulosic fiber loose fill thermal insulation.

### C 740

Practice for evacuated reflective insulations in cryogenic service. Vacuum "super insulation" systems for use on extremely cold systems. Thermal conductivity less than 0.006.

### C 745

Test method for heat flux through evacuated insulations using a guarded flat plate boiloff calorimeter.

### C 755

Standard practice for selection of vapor retarders for thermal insulation.

### C 762

Practice for application of spray-applied fibrous thermal insulation.

### C 764\*\*

Specification for mineral fiber loose fill thermal insulation. There are two types: Blowing Wool and Pouring Wool.

### C 795\*\*

Specification for thermal insulation for use in contact with austenitic stainless steel.

### C 800

Specification for glass fiber blanket aircraft insulation.

### C 835

Test method for measuring total hemispherical emittance of surfaces from 68°F to 2552°F.

### C 846

Practice for application of cellulosic fiber insulating board for wall sheathing.

### C 854

Test method for resistance to external loads on metal reflective pipe insulation.

### C 870

Practice for conditioning of thermal insulating materials.

### C 871

Test methods for chemical analysis of thermal insulation materials for leachable chloride, fluoride, silicate, and sodium ions. Used in conjunction with stress corrosion testing. This test method is referenced by ASTM Specification C795.

### C 892

Specification for high-temperature fiber blanket. Up to 2300°F.

### C 916

Specification for adhesives for duct thermal insulation.

### C 921

Practice for determining the properties of jacketing materials for thermal insulation. Part of the general requirements call for 25/50. Type I is vapor retarder jacketing, and would include all Knaflex FSK, ASJ and vinyl facings. Type II is water vapor permeable. This is not a specification.

### C 929

Practice for handling, transporting, shipping, etc. for insulation materials to be used over austenitic stainless steel.

### C 930

Classification of potential health and safety concerns with thermal insulation.

### C 945

Practice for design considerations and spray application of a rigid polyurethane insulation system on outdoor service vessels.

### C 950

Practice for repair of rigid cellular polyurethane insulation system on outdoor service vessels.

### C 971

Guide for selection and application of insulation systems for heating, ventilating, and air conditioning duct work

### C 976

Test method for thermal performance of building assemblies by means of calibrated hot box.

### C 984

Specification for perlite board and rigid cellular polyurethane composite roof insulation.

### C 991\*\*

Specification for flexible glass fiber insulation for pre-engineered metal buildings. Type I is unfaced; Type II is faced.

### C 1003

Test method for dynamic thermal performance of cooling air duct sections.

### C 1013

Specification for membrane-faced rigid cellular polyisocyanurate roof insulation.

### C 1014

Specification for spray-applied mineral fiber thermal or acoustical insulation.

### C 1015

Practice for installation of cellulosic and mineral fiber loose fill thermal insulation.

### C 1029

Specification for spray-applied rigid cellular polyurethane thermal insulation.

### C 1033

Test method for steady-state heat transfer properties of pipe insulation installed vertically.

## Common ASTM References (con't)

### C 1041

Practice for in-situ measurements of heat flux in industrial thermal insulation using heat flux transducers.

### C 1043

Practice for determination of hot-plate temperature when using a line source heater in the guarded-hot-plate apparatus for measurement of steady-state thermal transmission properties.

### C 1044

Practice for using the guarded-hot-plate apparatus in the one-sided mode to measure steady-state heat flux and thermal transmission properties.

### C 1045

Practice for calculating thermal transmission properties from steady-state heat flux measurements.

### C 1046

Practice for in-situ measurement of heat flux and temperature on building envelope components.

### C 1055

Guide for heated system surface conditions that produce contact burn injuries. Establishes a process for the determination of acceptable surface operating conditions for heated systems.

### C 1056 (deleted)

Practice for preparation of loose-fill mineral fiber thermal insulation samples for testing.

### C 1057

Practice for determination of skin contact temperature from heated surfaces using a mathematical model and thermesthesiometer. Establishes a procedure for evaluating the skin contact temperature for heated surfaces.

### C 1058

Practice for selecting temperatures for reporting and evaluating thermal properties of insulation. It recommends standard temperature conditions for use in testing and evaluating thermal properties.

### C 1060

Practice for the proper use of infrared imaging systems for conducting qualitative thermal inspections of wood frame building walls.

### C 1061 (discontinued)

Test method for thermal transmission properties of nonhomogeneous insulation panels installed vertically.

### C 1071\*\*

Standard specification for flexible and rigid plenum liner.

### C 1086

Specification for glass fiber felt thermal insulation. Products which comply are needled, binder-free felts. They are intended as thermal insulation of machinery and equipment operating up to 1200°F.

### C 1094

Guide for removable insulation covers. It recommends the criteria to be considered in specifying removable insulation covers for surfaces operating in air at temperatures above ambient.

### C 1101

Test method for measuring flexibility and rigidity of thermal insulation materials.

### C 1104

Test method for measuring water vapor sorption of fibrous thermal insulation materials.

### C 1114

Test method for steady-state thermal transmission properties by means of the thin-heater apparatus.

### C 1126

Specification for faced or unfaced rigid cellular phenolic thermal insulation used as roof insulation, non-load bearing building applications and pipe insulation for use between -40°F and 257°F.

### C 1129

Practice for estimation of heat savings by adding thermal insulation to bare valves and flanges

### C 1130

Practice for calibrating thin heat flux transducers.

### C 1132

Practice for calibration of the heat flow meter apparatus.

### C 1134

Test method for water retention of rigid thermal insulations following partial immersion.

### C 1136\*\*

Specification for flexible, low permeance vapor retarders for thermal insulation, having permeance less than 0.10 perms and intended for use at ambient temperatures of -20°F to 150°F. Types classified by permeance and strength.

Type I—ASJ

Type II—FSK, PSK

### C 1139\*\*

Specification for fibrous glass thermal insulation and sound absorbing blanket and board for military applications. Replacement for MIL-I-22023D.

### C 1146

Guide for prefabricated panel insulation systems for ducts and equipment operating at temperatures above ambient air, such as power plant ducts, precipitators, bag houses, fans, etc.

### C 1149

Specification for self-supported spray applied cellulosic thermal/acoustical insulation intended for pneumatic applications.

### C 1153

Practice for the location of wet insulation in roofing systems using infrared imaging.

### C 1155

Practice determining thermal resistance of building envelope components for in-situ data.

### C 1158

Practice for use and installation of radiant barrier systems in building construction.

### C 1199

Test method for measuring the steady state thermal transmittance of fenestration systems using hot box methods.

### C 1224

Specification for reflective insulation for building applications.

### C 1258

Test method for elevated temperature and humidity resistance of vapor retarders for insulation.

### C 1263

Test method for thermal integrity of flexible water vapor retarders.

### C 1289

Specification for faced rigid cellular polyisocyanurate thermal insulation board.

### C 1290

Specification for flexible fibrous glass blanket insulation used to externally insulate HVAC ducts.

### C 1303

Test method for estimating the long-term change in the thermal resistance of unfaced rigid closed cell plastic foams by slicing and scaling under controlled laboratory conditions.

### C 1304

Test method for assessing the odor emission of thermal insulation materials.

### C 1313

Specification for sheet radiant barriers for building construction applications.

# Specification Compliance and Reference Guide

## Common ASTM References (con't)

### C 1320

Practice for installation of mineral fiber batt and blanket thermal insulation for light frame construction.

### C 1321

Practice for installation and use of interior radiation control coating systems in building construction.

### C 1338

Test method for fungi resistance on insulations and facings. Formerly contained in C 665.

### C 1393\*\*

Specification for perpendicularly oriented mineral fiber roll and sheet thermal insulation for pipe and tanks.

### E 84

Test method for measuring the surface burning characteristics of materials using the Steiner Tunnel. This is the commonly referenced method for determining flame spread and smoke developed.

### E 90

Test method for laboratory measurement of airborne sound transmission loss of isolated building partition elements in a controlled environment.

### E 96

Test method for the determination of water vapor transmission of materials such as paper, plastic films, composite facings, etc.

### E 119

Test methods for fire testing of building constructions and materials. Methods prescribe a standard fire exposure for comparing the performance of building construction assemblies. The fire exposure used under this method reaches 1300°F at 10 min., 1700°F at 1 hour. Hourly ratings are determined using this method.

### E 136

Test method for determining the behavior of materials in a vertical tube furnace. Meant to identify those materials which do not aid combustion or add appreciable heat to an ambient fire. This method is very similar, but not identical, to USCG 164.009.

### E 176

Terminology related to fire standards.

### E 336

Test method for evaluating the sound-insulating properties of building elements. It is designed to measure the sound isolation between two rooms or the performance of a partition element installed as an interior part of a building.

### E 413

Classification for rating sound insulation. It provides methods of calculating single-number acoustical ratings for laboratory and field measurements of sound transmission. Can be applied to STC, NIC and other measured classifications.

### E 447

Test method for measuring acoustical and airflow performance of duct liner materials and prefabricated silencers. Measures acoustical insertion loss, airflow generated noise, and pressure drop as a function of airflow.

### E 477

Test method for measuring acoustical and airflow performance of duct liner materials and prefabricated silencers.

### E 492

Test method for laboratory measurement of impact sound transmission of floor-ceiling assemblies.

### E 648

Test method for critical radiant flux.

### E 795

Practices for mounting test specimens during sound absorption tests.

### E 814

Test method for fire tests of through-penetration fire stops.

### E 989

Classification for determination of impact insulation class.

### E 1014

Guide for measurement of outdoor A-weighted sound levels.

### E 1042

Classification for acoustically absorptive materials applied by trowel or spray.

### E 1123

Practices for mounting test specimens for sound transmission loss testing of naval and marine ship bulkhead treatment materials.

### E 1222

Test method for laboratory measurement of the insertion loss of pipe lagging systems.

### E 1264

Classification for acoustical ceiling products.

### F 683\*\*

Practice for selection and application of thermal insulation for pipe and machinery.

### G 21

Practice for determining resistance of synthetic polymeric materials to fungi.

### G 22

Practice for determining resistance of plastics to bacteria.



## Military Specifications

### DOD-I-24688

#### Polyamide Foam

### MIL-I-742F\*\*

#### Fibrous Glass Thermal Insulation Board

Fire-resistive fibrous glass thermal insulation board.

**Type I**—Fibrous glass cloth-faced board

**Type II**—Unfaced board

### MIL-STD-76A (SH)\*\*

Thermal insulation requirements for machinery and piping.

### MIL-STD-892

### MIL-STD-1623

#### Interior Finish Materials and Furnishings

Fire performance requirements and approved specifications for interior finish materials and furnishings.

### MIL-I-2781 E

#### Pipe Thermal Insulation

Preformed thermal insulation for use on pipes at surface temperatures up to 1200°F. Specification is for calcium silicate pipe products.

### MIL-I-2818

#### Insulation Blanket, Thermal, Fibrous Material

Specification covers wire reinforced mineral wool insulation blanket.

### MIL-I-2819F

#### Thermal Block Insulation

Insulation block for use on machinery and equipment at surface temperatures up to 1500°F. Specification is for calcium silicate block products.

**Class 2**—Temperatures up to 1200°F

**Class 3**—Temperatures up to 1500°F

### MIL-A-3316C

#### Fire Resistant Adhesives

Adhesives, mastics, and coatings for thermal insulations.

#### Class 1

**Grade A**—Pigmented white

**Grade B**—Pigmented #31158 red

#### Class 2

**Grade A**—Pigmented white

#### Class 3

**Grade A**—Pigmented white

### MIL-B-5924B (cancelled; replaced by ASTM C 800)

**Glass Fiber Batting**—Aircraft insulation

### MIL-I-7171C

#### Thermal-Acoustical Insulation Blanket

Composite blankets suitable for acoustical and thermal insulation of the walls of aircraft up to 175°F.

**Type I**—Quilted blanket

**Type II**—Cemented blanket

**Class 1**—Semi-stitched blankets

**Class 2**—Fully-stitched blankets

**Style A**—Non-porous trim cloth

**Style B**—Porous trim cloth

### MIL-I-13042A

#### Flexible Tubular Insulation Sleeving

Flexible braided or woven tubular thermal insulation sleeving intended primarily for covering heater ducts, exhaust pipes, and other tubes in vehicles.

**Composition I**—Asbestos mixture

**Composition II**—Glass fiber

**Range 1**—up to 1000°F

**Range 2**—up to 750°F

**Range 3**—up to 350°F

### MIL-P-15280H

#### Unicellular Sheets and Tubes

Chemically expanded unicellular elastomeric plastic foam.

**Form T**—Tubular

**Form S**—Sheet

### MIL-I-15475C\*\*

(cancelled; replaced by ASTM C 553)

#### Semirigid Fibrous Glass Insulation

### MIL-I-16411E

#### Fiber Glass Insulation Felt

Felt for thermal insulation of machinery and equipment.

**Type I**—Felted rovings

**Type II**—Laminated and felted

### MIL-I-16562A

#### Chemically Expanded Cellular Sheet Form

Insulation—Synthetic rubber-like.

### MIL-C-17435

#### Cushioning Material, Fibrous Glass

Specification covers cushioning material composed of bonded fibrous glass.

**Type I**—Uncoated

**Type II**—Coated

### MIL-C-19565C

**Fire and Water Resistant Coating Compounds for Thermal Insulation**

### MIL-I-22023D\*\*

#### Thermal and Sound Absorbing Insulation

Lightweight faced and unfaced flexible fibrous glass felt for thermal and sound absorbing up to 400°F.

**Type 1**—Unfaced, Thermal

**Class 2**—0.75 pcf

**Class 3**—1.0 pcf

**Class 4**—1.5 pcf

**Class 5**—2.0 pcf

**Class 6**—3.0 pcf

**Type II**—Unfaced; Sound Absorbing

**Class 2**—0.75 pcf

**Class 3**—1.0 pcf

**Class 4**—1.5 pcf

**Class 5**—2.0 pcf

**Class 6**—3.0 pcf

**Type III**—Faced; Thermal and Sound Absorbing 2.8 pcf

### MIL-I-22344D\*\*

#### Fiber Glass Pipe Insulation

For use up to 370°F.

### MIL-A-23054A

**Acoustically Absorptive Fiber Glass Board with Perforated Fiber Glass Cloth Facing**

### MIL-I-23128B

#### Flexible Refractory Fiber Insulation Blanket

Asbestos free flexible refractory blanket for temperatures up to 2000°F.

**Grade A**—Temperatures up to 1200°F

**Grade B**—Temperatures up to 2000°F

**Class 1**—Nominal density, 6 pcf

**Class 2**—Nominal density, 8 pcf

### MIL-A-24179A

#### Adhesive for Flexible Plastic Insulation

Insulation adhesive.

### MIL-I-24244C\*\*

#### Insulation Material with Special Corrosion,

#### Chloride and Fluoride Requirements

Asbestos-free insulation, cement and adhesives, and asbestos-containing insulation tape—all with special corrosion, chloride and fluoride requirements.

**Types 1—XVIII**

# Specification Compliance and Reference Guide

## Federal Specifications

### (Specification Number, Title, Classification and Scope)

#### HH-B-100B\*\*

##### Vapor Retarder Material

Vapor retarders applied over thermal insulation for pipes, duct, and equipment. Both types require 0.02 perm water vapor transmission rate. ASJ facings meet Type I. FSK and PSK facings meet Type II requirements.

**Type I**—Low vapor transmission, high puncture resistance.

**Type II**—Medium vapor transmission, moderate puncture resistance.

#### HH-I-515D

##### Cellulosic or Wood Fiber Loose Fill Thermal Insulation

Chemically treated cellulosic or wood fiber loose fill for use in attic or enclosed spaces in housing and other framed buildings at ambient temperatures.

**Type I**—Pneumatic application

**Type II**—Poured application

#### HH-I-521F\*\* (cancelled; replaced by ASTM C 665)

##### Mineral Fiber Thermal Insulation Blankets for Ambient Temperatures

**Type I**—Blankets with no membrane coverings (unfaced)

**Type II**—Blankets with a nonreflective vapor retarder membrane (faced, e.g., vinyl, VRF, ASJ)

**Class A**—facing with flame spread of 25 max.

**Class B**—facing with flame spread >25 but critical radiant flux >0.12 W/cm<sup>2</sup>.

**Class C**—facing (e.g., kraft) not rated for flame resistance, intended for non-exposed applications.

**Type III**—Blankets with a reflective vapor retarder membrane (faced, e.g., FSK, foil)

**Class A**—facing with flame spread of 25 max.

**Class B**—facing with flame spread >25 but critical radiant flux >0.12 W/cm<sup>2</sup>

**Class C**—facing (e.g., kraft) not rated for flame resistance, intended for non-exposed applications.

#### HH-I-523C (cancelled; replaced by ASTM C 533)

##### Calcium Silicate Block and Pipe Covering for Temperatures up to 1200°F

#### HH-I-524C (cancelled; replaced by ASTM C 578)

##### Polystyrene Thermal Insulation Board

#### HH-I-525A

##### Cork Thermal Insulation Board

#### HH-I-526C (cancelled; replaced by ASTM C 726)

##### Mineral Thermal Insulation Board

#### HH-I-529B (cancelled; replaced by ASTM C 728)

##### Mineral Aggregate Thermal Insulation Board

#### HH-I-530B (cancelled; replaced by ASTM C 591)

##### Unfaced Polyurethane or Polyisocyanurate Thermal Insulation Board

#### HH-I-545B\*\* (cancelled; replaced by ASTM C 1071)

##### Mineral Fiber Duct Lining Material

#### HH-I-551E (cancelled; replaced by ASTM C 552)

##### Cellular Glass Block and Board Insulation

#### HH-I-558C\*\*

##### Industrial Type Mineral Fiber Blankets

##### Form A—Blocks and Boards

**Class 1-5** (cancelled; replaced by ASTM C 612)

##### Form B—Flexible Blankets

**Class 6** (cancelled; replaced ASTM C 553)  
For temperatures up to 350°F

**Class 7**—For temperatures up to 450°F

**Class 8**—For temperatures between 451°F-1000°F

**Class 9** (cancelled; no replacement)  
For temperatures up to 1200°F

##### Form C—Metal Mesh Covered Blankets

**Class 10, 11** (cancelled; replaced by ASTM C 592)

##### Form D—Pipe and Tube Covering

**Class 12** (cancelled; replaced by ASTM C 547)  
Preformed, for temperatures up to 450°F

**Class 13** (cancelled; replaced by ASTM C 547)  
Preformed, for temperatures between 451°F-1200°F

**Class 14** (cancelled; replaced by ASTM C 542)  
Metal mesh blanket for temperatures up to 1000°F

**Class 15** (cancelled; replaced by ASTM C 542)  
Metal mesh blanket for temperatures between 1000°-1200°F

##### Form E—Molded Pipe Fitting Covering

**Class 16, 17** (cancelled; replaced by ASTM C 547)

#### HH-I-573B (cancelled; replaced by ASTM C 534)

##### Flexible Unicellular Sheet and Pipe Covering

#### HH-I-574B (cancelled; replaced by ASTM C 549)

##### Perlite Loose Fill Insulation

#### HH-I-585C (cancelled; replaced by ASTM C 516)

##### Vermiculite Loose Fill Insulation

#### HH-I-1030B\*\* (cancelled; replaced by ASTM C 764)

##### Mineral Fiber Loose Fill Insulation

**Type I**—Blowing Wool

**Type II**—Pouring Wool

**Category 1**—<1% LOI

**Category 2**—<12% LOI

#### HH-I-1252B

##### Reflective Thermal Insulation—Aluminum foil insulation

**Form 1**—Provide a minimum 19 mm reflective air space having an emittance of 0.05 max.

**Class I**—One reflective air space

**Class II**—Two reflective air spaces

**Class III**—Three reflective air spaces

**Class IV**—Four reflective air spaces

**Form 2**—Provide a minimum 10 mm reflective air having an emittance of 0.05 max.

**Class V**—One or more reflective air spaces in masonry wall structure.

#### HH-I-1972/GEN

##### Polyurethane or Polyisocyanurate Faced Insulation Board

**1972/1** Faced with aluminum on both sides.

**1972/2** Faced with asphalt and felt on both sides.

**1972/3** Faced with perlite on one side and asphalt/felt on the other side.

**1972/4** Faced with gypsum on one side and aluminum on the other side.

**1972/5** Faced with perlite on both sides.

**1972/6** Faced with mineral fiber board on one side and glass mat on the other side.

#### SS-C-160A

##### Thermal Insulating Cements—Heat resistive cements

**Type III**—Mineral Wool

**Grade F**—100°F-1200°F

**Grade U**—100°F-1800°F

**Type IV**—Vermiculite 100°F-1800°F

**Type V**—Diatomaceous Silica 100°F-1900°F

## Federal Specifications (continued)

### SS-S-111B

#### Trowel and Spray Applied Sound Controlling Materials

##### Type I—Cementitious Materials

Density A—18-20 pcf

Density B—over 20 pcf

##### Type II—Fibrous Materials

Density C—11-14 pcf

Density D—over 14 pcf

##### Type III—Synthetic polymeric materials

Density E—2-12 pcf

Density F—over 12 pcf

Grades 1-7 by level of noise reduction

Grades 101-107 by level sound absorption

Class A—Noncombustible

Class B—Fire-resistant

Class C—Slow burning

**LLL-I-535B** (cancelled; replaced by ASTM C 208)

#### Cellulosic Fiber Insulation Board

## Miscellaneous Standards, Specifications & Test Methods

### ASHRAE 55

Thermal environmental conditions for human occupancy standard.

### ASHRAE 62

Ventilation standard for commercial buildings.

### ASHRAE 90.1

Energy conservation standard for commercial buildings.

### ASHRAE 119

Standard for air leakage performance of detached single-family residential buildings.

### NFPA 255

Test method for Surface Burning Characteristics of building materials. Equivalent to ASTM E 84.

### NAIMA AHC 101

Standard for duct liner. Contained in the old SMACNA Duct Liner Application Standard.

Includes material specifications and applicable reference standards.

### NAIMA AHS 100

Test methods for determining the flexural rigidity of duct board.

### NAIMA AHS 152

Test method for determining friction resistance to flowing air inside a duct.

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