



## Standard Practice for Installation and Use of Reflective Insulation in Building Constructions<sup>1</sup>

This standard is issued under the fixed designation C 727; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice has been prepared for use by the designer, specifier, and installer of reflective insulation for use in building construction. The scope is limited to recommendations relative to the use and installation of thermal insulation consisting of one or more surfaces, having an emittance of 0.1 or less such as metallic foil or metallic deposits unmounted or mounted on substrates and facing enclosed air spaces. The reflective insulation covered by this practice must meet the requirements of Specification C 1224.

1.2 This practice covers the installation process from pre-installation inspection through post-installation procedure. It does not cover the production of the insulation materials.

1.3 This practice is not intended to replace the manufacturer's installation instructions, but shall be used in conjunction with such instructions. This practice is not intended to supersede local, state, or federal codes.

1.4 This practice assumes that the installer possesses a good working knowledge of the applicable codes and regulations, safety practices, tools, equipment, and methods necessary for the installation of thermal insulation materials. It also assumes that the installer understands the fundamentals of construction that affect the installation of insulation.

1.5 The values given in inch-pound units are to be regarded as standard. The SI units in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 168 Terminology Relating to Thermal Insulating Materials<sup>2</sup>

C 1224 Specification for Reflective Insulation for Building Applications

#### 2.2 NFPA Standards:

NFPA 31 Standard for the Installation of Oil Burning Equipment<sup>3</sup>

NFPA 54 National Fuel Gas Code<sup>3</sup>

NFPA 211 Standard for Chimneys, Fireplaces, and Vents<sup>3</sup>

#### 2.3 Code of Federal Regulations:

16 CFR 460 Federal Trade Commission Trade Regulation Rule: Labeling and Advertising of Home Insulation<sup>4</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice refer to Terminology C 168

#### 3.2 Descriptions of Terms Specific to This Standard:

3.2.1 *applicator*—the person or persons who apply thermal insulation materials in buildings whether or not such person or persons have contracted with the owner to perform the work.

3.2.2 *conditioned space*—any space in a building that is served by a heating or cooling system.

3.2.3 *owner*—the person, partnership, corporation, agency, or other entity owning the building to be insulated whether such ownership is by virtue of deed, contract, or any other instrument for acquiring legal title under the laws of the state in which the building is located.

3.2.4 *reflective insulation system*—thermal insulation consisting of one or more low emittance surfaces, bounding one or more enclosed air spaces.

3.2.5 *vapor retarder*—any material (membrane or paint) that has a water vapor permeance (perm) rating of 57 ng/(Pa·s·m<sup>2</sup>) (1 perm) or less, in accordance with 9.2 of C 1224.

### 4. Significance and Use

4.1 This practice recognizes that effectiveness, safety, and durability of reflective insulation depends not only on the quality of the insulating materials, but also on their proper installation.

4.2 Improper installation of insulation can reduce its thermal effectiveness, cause fire risks and other unsafe conditions,

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.06.

<sup>3</sup> Available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

<sup>4</sup> Federal Register, Vol 45, No. 160, Aug. 15, 1980. Available from Department of Housing and Urban Development, 451 7th St. N.W., Washington, D.C. 20410.

and promote deterioration of the structure in which it is installed. Specific hazards that can result from improper installation include fires caused by (1) heat build-up in recessed lighting fixtures, (2) deterioration or failure of electrical wiring components, and heat build-up resulting from overcurrent protection devices incorrectly matched to wiring; or (3) deterioration in wood structures and paint failure due to moisture accumulation.

4.3 This practice provides recommendations for the installation of reflective insulation in a safe and effective manner. Actual conditions in existing buildings may vary greatly and in some cases additional care should be taken to ensure safe and effective installation.

4.4 This practice presents requirements that are general in nature and considered practical. They are not intended as specific recommendations. The user should consult manufacturer for recommended applications.

## 5. Safety Precautions

5.1 The applicator shall wear proper clothing and equipment as recommended by the insulation manufacturer. Protective clothing, gloves, and eye protection should be worn if there is any doubt about the effects of the insulation.

## 6. Pre-Installation Inspection and Preparation

6.1 In areas where insulation is to be installed, components of the electrical system shall be in good condition. If the electrical system is found to be faulty, proper inspection and repair shall be accomplished. (See Note 1.)

6.2 Inspect the roof, walls, ceilings, and floors to identify areas where a previous or existing moisture problem has caused paint peeling, warpage, stain, visible fungus growth, rotting, or other structural damage.

6.2.1 Do not install insulation in such areas until the owner has been informed, and these conditions have been corrected and their source(s) eliminated.

6.3 Provide proper attic ventilation and the use of vapor retarders if required prior to installation in accordance with building requirements or practices. Install insulation in such a way as to ensure free movement of air through all vents.

NOTE 1—The CPSC Product Safety Fact Sheet No. 18<sup>5</sup> has identified the following signs of potential electrical deficiencies: lights dimming, fuses blowing, circuit breakers tripping frequently, electrical sparks and glowing from receptacles, lights flickering, and coverplates on switches and outlets that are warm or hot to the touch.

6.4 In the areas where insulation is to be installed, the applicator shall locate and plan for subsequent blocking around recessed lighting fixtures, motors, fans, blowers, heaters, flues, chimneys, and other heat-producing electrical or mechanical devices.

6.4.1 Securely fasten blocking, such as wood, metal, or unfaced mineral wool batts, around all heat-producing devices to permanently maintain the clearances specified in 6.4.2, 6.4.3, or the exception in 6.4.4. Install all required blocking at

least as high as the height of the finished insulation and in a manner that ensures all devices that require maintenance or servicing remain accessible after the insulation is installed.

6.4.2 Install blocking to provide a minimum three inch (76 mm) clearance around all sides of recessed lighting fixtures, unless such fixtures are approved for installation in direct contact with insulation, including fixture wiring compartments and ballasts and other heat-producing devices not covered with thermal insulation.

6.4.3 The open area above heat producing devices must not be covered, unless they are specifically approved devices for operation when covered with thermal insulation.

6.4.4 Install blocking around gas-fired appliances to provide the minimum clearances specified in NFPA-54. Install blocking around oil-fired appliances to provide the minimum clearances specified in NFPA-31. Install blocking around masonry chimneys or masonry enclosing a flue to provide a minimum 2-in. (50-mm) clearance from the outside face of the masonry. Install blocking around vents, chimney, and vent connectors and chimneys other than masonry chimneys to provide the minimum clearances specified in NFPA-211.

## 7. Installation Guidelines

7.1 The insulation material shall be handled in accordance with manufacturer's instructions and should be kept free of extraneous materials. The materials should be kept dry and should not be in contact with the ground or other sources of water.

7.2 Manufacturer's installation instructions and local building codes shall be followed to ensure proper installation. The thermal performance of reflective insulation is based on the maintenance of a totally enclosed air space adjacent to the low emittance surface(s).

7.3 The thermal performance of a reflective insulation depends upon adherence to manufacturer's spacing recommendations. When instructions for insulating undersize and oversize cavities is not provided the manufacturer shall be consulted.

7.4 Damaged areas will result in loss of performance and shall be repaired with low emittance material(s). Minor damage such as rips, tears, or punctures shall be repaired with low emittance materials while larger damaged areas shall be replaced with new reflective insulation. (See Note 2.)

7.5 The thermal performance of a reflective insulation may be reduced by a corrosive environment. Reflective insulations should not be installed in environments that are corrosive to the low emittance surface.

7.6 The thermal performance of a reflective insulation may be adversely affected by materials such as dust, oil, or paint on the surfaces. These materials shall be removed during installation taking care not to damage the insulation.

7.7 Moisture will affect the thermal performance of the reflective insulation as long as it remains on the surface. Insulation shall be free of moisture at time of installation.

7.8 It is important that reflective insulation be fitted closely around all non-heat producing components and taped to eliminate gaps or voids through which air, dust, or water vapor might pass.

7.9 *Post-Installation*—The installer must provide a signed

<sup>5</sup> CPSC Product Safety Fact Sheet No. 18, "The Home Electrical System", available from the Consumer Product Safety Commission, 1111 Eighteenth St. N.W., Washington, D.C. 20207.

and dated statement describing the reflective insulation installed, the area insulated, and the R-value of the installed system. (See Trade Regulation Rule 16 CFR 460.)

NOTE 2—Large damaged areas are defined as those areas greater than 1 ft<sup>2</sup>.

## **8. Keywords**

8.1 building constructions; enclosed air space; insulation system; low emittance; metallic foil; reflective insulation; thermal insulating materials

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