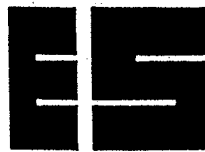


BOCA EVALUATION SERVICES, INC.

BOCA RESEARCH REPORT NO.



96-71

A Participating Member of the NES, Inc.



DIVISION 07 - THERMAL AND MOISTURE PROTECTION SECTION 07200 - INSULATION

TEMPSHIELD™ REFLECTIVE FOIL INSULATIONS

SEALED AIR CORPORATION
301 MAYHILL STREET
SADDLE BROOK, NJ 07663-5303

1.0 DESCRIPTION OF EVALUATION

This report evaluates the use of Sealed Air Corporation's Tempshield™ Single-Bubble and Double-Bubble reflective foil insulations as thermal-insulating materials through a review of physical testing and manufacturer's product data.

2.0 DESCRIPTION AND USE OF PRODUCT

2.1 GENERAL DESCRIPTION

Tempshield™ reflective insulations consist of one or two layers of polyethylene, "bubble-pack" core material laminated between two layers of reflective aluminum foil. The insulation is manufactured in two thicknesses: 3/16-inch and 3/8-inch (4.8 and 9.5 mm), referred to as Tempshield™ "Single-Bubble" and "Double-Bubble" reflective foil insulations, respectively. Tempshield™ reflective foil insulations are available in a standard 48-inch (1,219 mm) width on rolls 75-feet and 125-feet (22.86 and 38.1 m) in length. Customized widths are available, and evaluated on a case-by-case basis. Tempshield™ is utilized in several types of construction, as described in Section 2.2 of this report.

2.2 USE AND APPLICATION

2.2.1 Crawl space: For crawl space applications, Tempshield™ is applied to the underside of wood joists over crawl spaces. 5/16-inch (7.9 mm) construction-grade staples shall be used every 3 to 4 inches (76 to 102 mm) to secure the product parallel or perpendicular to the joists spaced either 16 inches or 24 inches (406 or 610 mm) on center (o.c.). Where a section of floor cannot be completed with a single strip of product, a second strip of product shall be cut to length to complete the floor section. The transverse edges of both strips shall overlap 4 inches (102 mm) at the joint, and be sealed with one-inch (25 mm) wide

reflective foil tape. At the ends of the joists, Tempshield™ shall be stapled up to the subfloor or rim joist. See Figure 1 for a typical crawl space installation of Tempshield™.

2.2.2 Concrete or concrete block wall: For concrete or concrete block wall applications, Tempshield™ is applied to the interior face of concrete or concrete block walls. The assembly shall consist of nominal 1x2-inch (25x51mm) furring strips attached to the wall at 16 inches or 24 inches (406 or 610 mm) o.c. 5/16-inch (7.9 mm) construction-grade staples shall be used every 3 to 4 inches (76 to 102 mm) to secure Tempshield™ to the furring strips, creating a 3/4-inch (19.1 mm) nominal air space between the interior face of the wall and the reflective foil insulation. The product shall be stapled to the furring strips such that each edge of the reflective foil insulation coincides with the middle of a furring strip. Joints shall be sealed with one-inch wide reflective foil tape.

Two methods exist for installations where an interior wall sheathing is to be installed over Tempshield™:

2.2.2.1 Direct application method: The wall sheathing shall be installed directly over the Tempshield™ product (See Figure 2), or:

2.2.2.2 Dual furring method: A second series of nominal 1x2-inch (25x51 mm) furring strips shall be installed over the first set of furring strips, thereby "sandwiching" the reflective foil insulation in the interstitial cavity. The interior wall sheathing shall be applied to the exposed furring strips to complete the installation by creating a second 3/4-inch (19.1 mm) nominal air space (See Figure 3).

2.2.3 Wood framed wall: For wood framed walls, Tempshield™ shall be installed in a nominal 2x4-inch (51x102 mm) or nominal 2x6-inch (51x152 mm) stud wall cavity. Strips of Tempshield™ 16 or 24 inches (406 or 610 mm) wide are cut in lengths equal to the inside height of the stud cavity to be insulated. 5/16-inch (7.9 mm) construction-grade staples shall be used every 3 to 4 inches (76 to 102 mm) to secure Tempshield™ to the inside faces of the framing members comprising the stud cavity such that two air spaces, approximately equal in width [\approx 1 1/2 inches (38 mm) for 2x4-inch (51x102 mm) framing and \approx 2 1/2 inches (64 mm) for 2x6-inch (51x152 mm) framing], are formed. This is accomplished by bending the edges of reflective

Please contact BOCA Evaluation Services, Inc., with any questions you may have regarding this report. Additionally, please contact us if you have any information on the performance of the product described herein which is contrary to this report. This report is subject to the limitations listed herein and to the specific product, data and test reports submitted by the applicant requesting this report. Independent tests were not performed by BOCA Evaluation Services, Inc., and BOCA Evaluation Services, Inc., specifically does not make any warranty, either expressed or implied, as to any findings or other matter in this report or as to any product covered by this report. Evaluation reports are not to be construed as representing aesthetics or any other attributes not specifically addressed nor as an endorsement or recommendation for the use of the subject of the report. This disclaimer includes, but is not limited to, merchantability.

4051 WEST FLOSSMOOR ROAD • COUNTRY CLUB HILLS, IL 60478-5795 • TELEPHONE (708) 799-2305

foil insulation such that 3/4-inch (19.1 mm) of reflective foil insulation is revealed to apply the staples. Joints between the stud face and the reflective foil insulation shall be sealed with one-inch (25 mm) wide reflective foil tape. A layer of plywood, gypsum board, or other interior covering shall be applied to the exposed framing thereby creating the second 1 1/2 or 2 1/2-inch (38 or 64 mm) nominal air space, completing the installation. See Figure 4 for a typical wood framed wall cavity installation of Tempshield™.

2.2.4 Finished basement floor/ceiling or wall: Tempshield™ is also designed to be installed to insulate the floor/ceiling or walls of a finished space. The walls shall be insulated using either of the two furring techniques as specified for concrete and concrete block walls in Section 2.2.2 of this report, or the "wall cavity" technique as specified for wood framed walls in Section 2.2.3 of this report.

2.2.4.1 Tempshield™ concealed: For applications requiring a finished floor/ceiling, Tempshield™ shall be applied to the underside of wood joists comprising the floor/ceiling over the space(s) intended to be finished. 5/16-inch (7.9 mm) construction-grade staples shall be used every 3 to 4 inches (76 to 102 mm) to secure the product parallel or perpendicular to the joists spaced either 16 or 24 inches (406 or 610 mm) o.c. Where a section of floor cannot be completed with a single strip of product, a second strip of product shall be cut to length to complete the floor section. The transverse edges of both strips shall overlap 4 inches (102 mm) at the joint, and be sealed with one-inch (25 mm) wide reflective foil tape. At the ends of the joists, Tempshield™ shall be stapled up to the subfloor or rim joist. See Figure 5 for a typical concrete or block wall installation of Tempshield™.

2.2.4.2 Tempshield™ exposed: For applications where Tempshield™ is to be left exposed, the product shall be installed as indicated in Section 2.2.4.1 of this report, with the exception that the product be installed parallel to the joists such that the insulation will not droop or sag, thereby exposing any cavity space above. See Figure 5 for a typical concrete or block wall installation of Tempshield™.

3.0 CODE ANALYSIS OF SUBMITTED INFORMATION

The following data were submitted by the proponent for demonstration of compliance with the respective code sections listed above each item of information. The basis is the *BOCA National Building Code/1996*.

3.1 FLAME SPREAD AND SMOKE-DEVELOPED RATINGS

Code Section 723.2 Exposed installations: This code section requires that all insulating material be tested in accordance with ASTM E84-95b to determine flame spread and smoke-developed ratings. The flame spread rating shall not be greater than 25 and the smoke-developed rating shall not be greater than 450.

Code Section 723.3 Concealed installations: This code section requires that all insulating material be tested in accordance with ASTM E84-95b to determine flame spread and smoke-developed ratings. The flame spread rating shall not be greater than 75 and the smoke-developed rating shall not be greater than 450.

INFORMATION SUBMITTED:

3.1.1 Omega Point Laboratories, Inc., Report No. 15498-100557, dated October 7, 1996, was submitted and contains test results of the flame spread and smoke-developed ratings of Tempshield™ Single-Bubble reflective foil insulation, in accordance with ASTM E84. The data indicates that the product yielded a flame spread rating of 15 and a smoke-developed rating of 10.

3.1.2 Omega Point Laboratories, Inc., Report No. 15498-100558, dated October 7, 1996, was submitted and contains test results of the flame spread and smoke-developed ratings of Tempshield™ Double-Bubble reflective foil insulation, in accordance with ASTM E84. The data indicates that the product yielded a flame spread rating of 15 and a smoke-developed rating of 15.

3.2 THERMAL PERFORMANCE

Code Section 1301.1 of the BOCA National Building Code/1996 - Scope: This code section states that buildings shall be designed and constructed in compliance with the energy code.

Code Section 104.2 of the 1995 CABO Model Energy Code - Details: This code section states that all plans and specifications shall show in sufficient detail pertinent data and features that include the R-values of insulating materials.

INFORMATION SUBMITTED:

3.2.1 Center for Applied Engineering, Inc., Report Nos. 257756-2, 257756-3, and 257756-4, dated November 27, 1996, were submitted and contain test results, substantiating the thermal resistance of Tempshield™ Single-Bubble reflective foil insulation. Center for Applied Engineering, Inc., Report Nos. 257756-6, 257756-7, and 257756-8, dated November 27, 1996, were also submitted and contain test results substantiating the thermal resistance of Tempshield™ Double-Bubble reflective foil insulation. As part of the testing protocol for each of the test reports, a calibration procedure was performed in accordance with ASTM C518-91, *Standard Test Method for Steady-State Heat Flux Measurements by Means of the Heat Flow Meter Apparatus*, to calculate the framing member, heat flow correction used in determining the thermal performance of the reflective foil insulation assemblies. A series of tests were then performed in accordance with ASTM C236-89, *Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box*, to model the products under three heat flow orientations: horizontally, upward and downward. Information from both tests were used to calculate the thermal resistance of the framing material and determine the steady-state heat flow through the reflective foil cavity. The resultant data indicates that Tempshield™ reflective foil insulations have the following thermal resistance values:

Tempshield™ Double-Bubble Reflective Foil Insulation	
Direction of Heat Flow	R-value (h-ft. ² °F./Btu)
Horizontal	10.1
Upwards	8.6
Downwards	16.8

Tempshield™ Single-Bubble Reflective Foil Insulation	
Direction of Heat Flow	R-value (h-ft. ² °F./Btu)
Horizontal	9.5
Upwards	8.1
Downwards	14.9

3.2.2 Calculations performed by David W. Yarbrough, Ph.D., P.E., dated December 23, 1996, establish the thermal performance of Tempshield™ Single-Bubble reflective foil insulation in the typical assemblies described in Section 2.2 of this report.

4.0 INSTRUCTIONS TO THE CODE OFFICIAL

Sealed Air Corporation's Tempshield™ Single-Bubble and Double-Bubble reflective foil insulations have been evaluated for compliance with the 1996 edition of the *BOCA National Codes*. This report is limited to the applications and products as stated herein. This evaluation is based solely upon information provided to BOCA Evaluation Services, Inc. by Sealed Air Corporation and has not been independently verified. BOCA-ES intends that the report be used by the code official to determine that Tempshield™ Single-Bubble and Double-Bubble reflective foil insulations comply with those code requirements specifically addressed in Section 3.0 of this report, provided that this product is installed in accordance with the following limitations:

Limitations

4.1 This report is subject to annual certification. Reports that are not certified shall not be used or referred to. In order to determine the status of certification of this report, contact BOCA Evaluation Services, Inc., or consult the latest edition of the National Product Evaluation Listing published periodically in the BOCA magazine.

4.2 Installation:

4.2.1 Sealed Air Corporation's Tempshield™ Single-Bubble and Double-Bubble reflective foil insulations shall be installed in accordance with the manufacturer's current installation manual, titled *Instructions for Easy Installation of Tempshield™ Reflective Insulation*, dated July 25, 1997, and subject to the limitations in this report.

4.2.2 Fireblocking shall be provided in accordance with Code Section 721.0 of the *BOCA National Building Code/1996*.

4.2.3 The product is not intended to be utilized as a substitute for an approved exterior weather-resistant covering in accordance with Chapter 14 of the *BOCA National Building Code/1996*.

4.2.4 Tempshield™ reflective foil insulation shall be limited to the interior applications described in Sections 2.2.1, 2.2.2, 2.2.3, and 2.2.4 of this report. The product is not intended to be utilized as a substitute for foundation or slab-edge insulation, or for use in direct contact with soil or concrete surfaces.

4.2.5 Tempshield™ reflective foil insulation shall not be installed in contact with electrical wiring.

5.0 INFORMATION REQUIRED ON CONSTRUCTION DOCUMENTS

To aid in the use of this report, the following represents the minimum level of information to be reflected on construction documents in order to determine compliance with this research report.

5.1 The language "See BOCA Evaluation Services, Inc., Research Report No. 96-71."

5.2 Direction of heat flow (*i.e.*, horizontal, upward, etc.), R-value, and thickness (*i.e.*, Single Bubble vs. Double Bubble) of the reflective insulation for the intended application of the product.

5.3 Fastening method and materials for affixing the product to the structure.

6.0 IDENTIFICATION

All Tempshield™ Single-Bubble and Double-Bubble reflective foil insulations manufactured in accordance with this research report shall be marked at the plant with the identifying language "See BOCA Evaluation Services, Inc., Research Report No. 96-71."

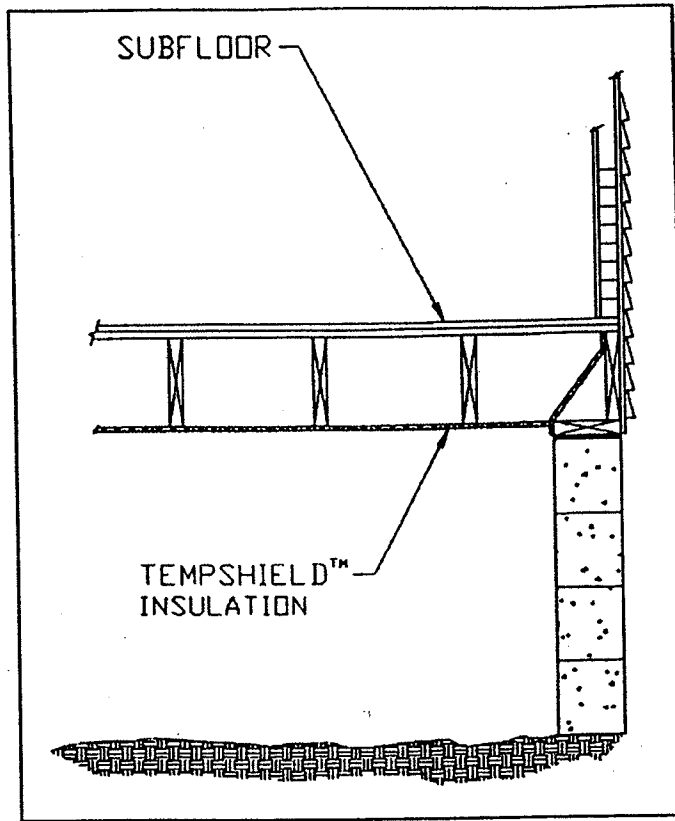


Figure 1*— CRAWL SPACE APPLICATION

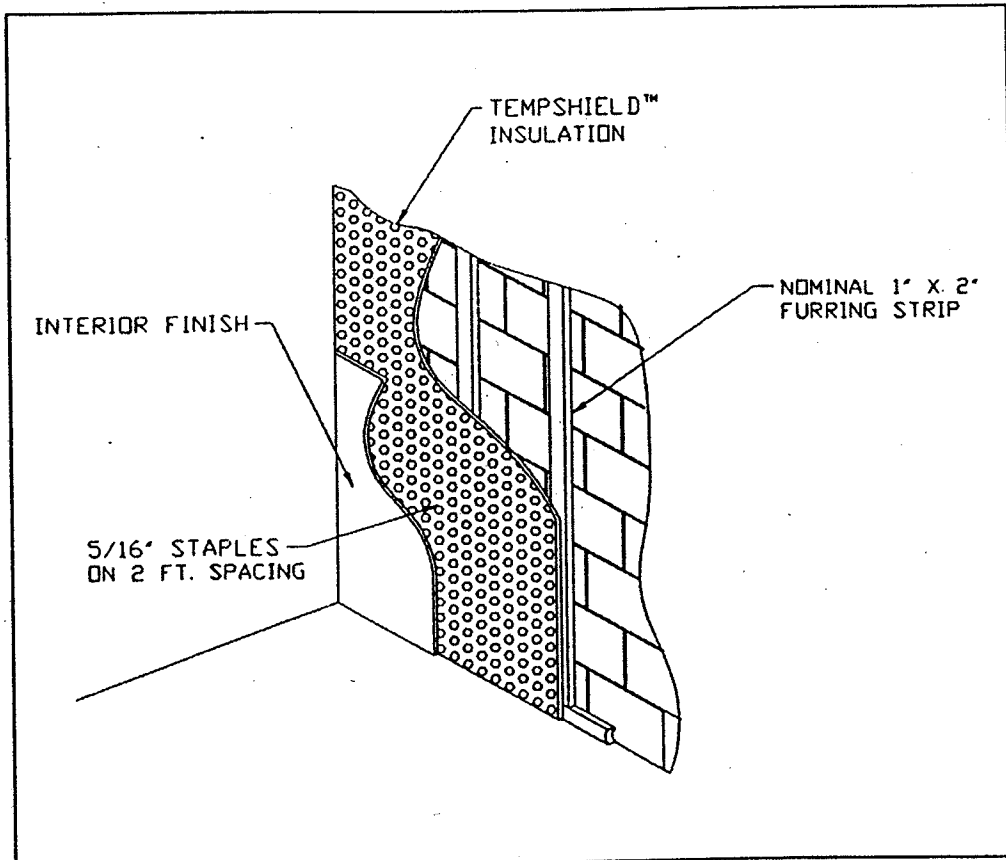


Figure 2* — BLOCK WALL APPLICATION USING SINGLE FURRING STRIP

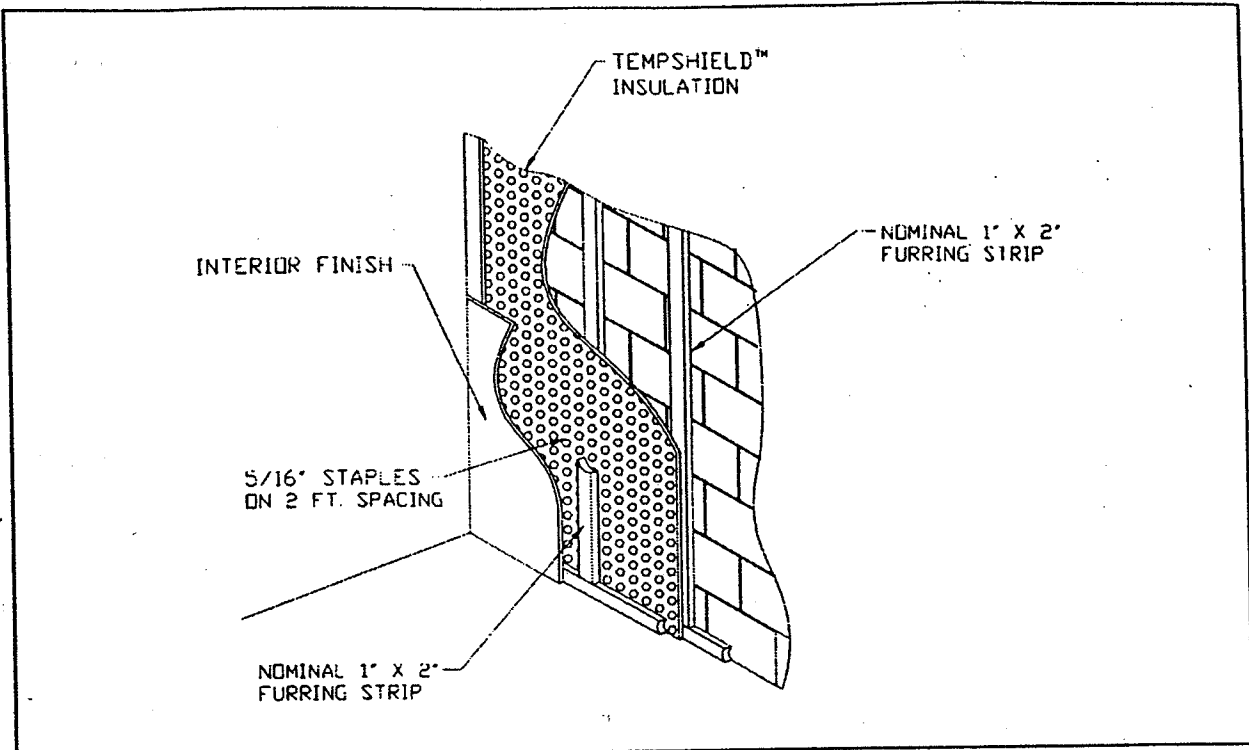


Figure 3* — BLOCK WALL APPLICATION FORMING TWO REFLECTIVE AIRSPACES
(TWO SETS OF FURRING STRIPS)

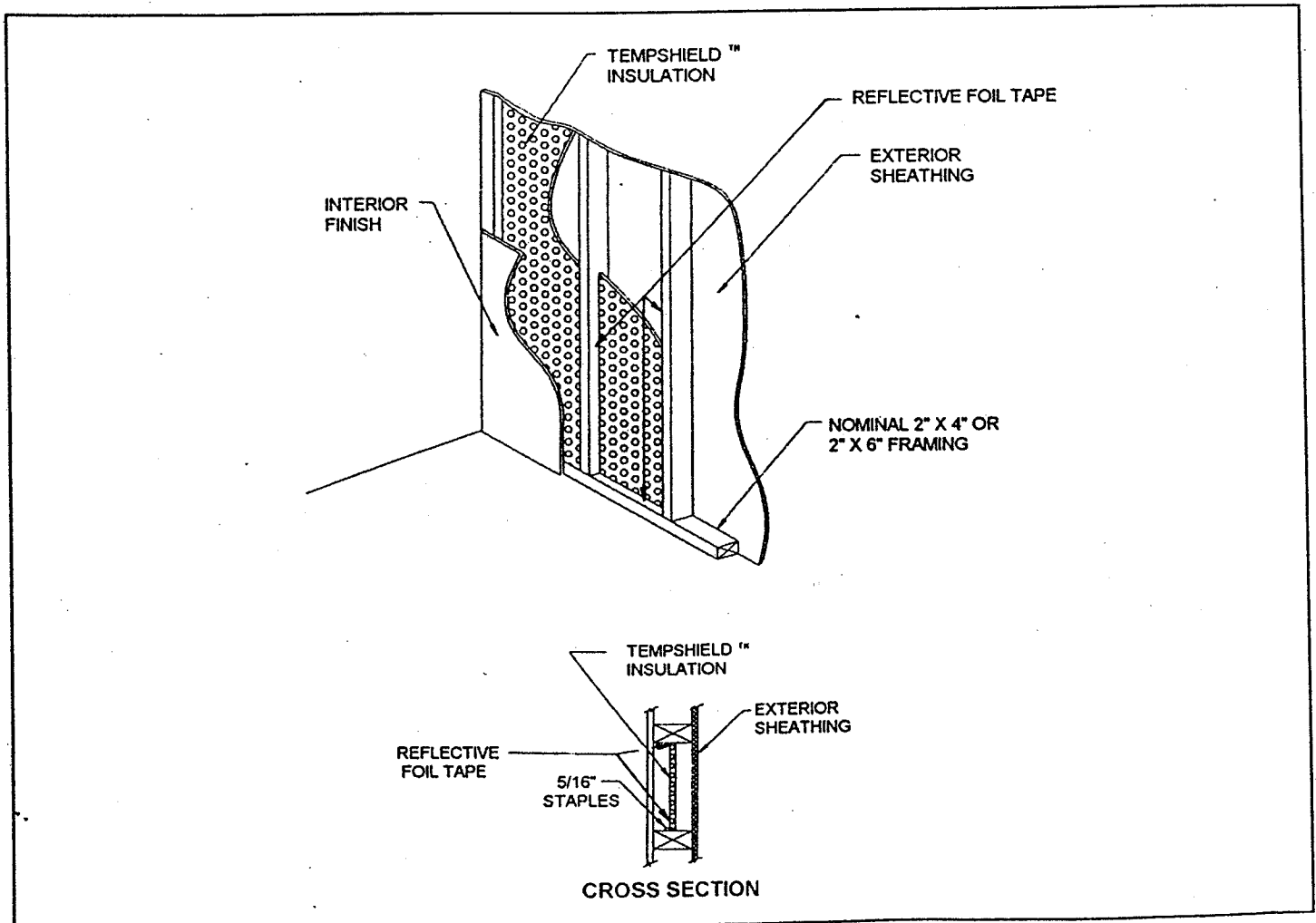


Figure 4* — WALL CAVITY APPLICATION

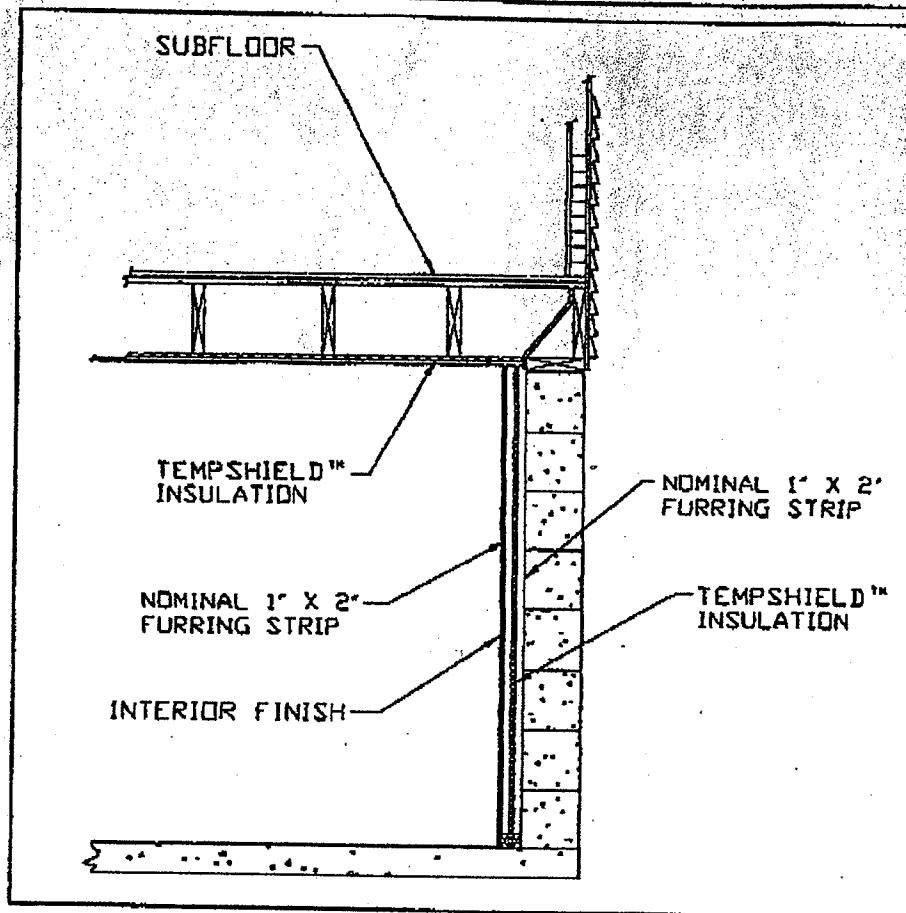


Figure 5* — FINISHED BASEMENT APPLICATION

*THESE DRAWINGS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY ARE NOT INTENDED FOR USE AS CONSTRUCTION DOCUMENTS FOR THE PURPOSE OF DESIGN, FABRICATION OR ERECTION.