

# ICC-ES Evaluation Report

## ESR-1615

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This report is subject to re-examination in one year.

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**DIVISION: 07—THERMAL AND MOISTURE PROTECTION**  
**Section: 07210—Building Insulation**  
**Section: 07280—Water-resistive Barriers**

### REPORT HOLDER:

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### EVALUATION SUBJECT:

**INSULSTAR® AND INSULBLOC® SPRAY-APPLIED  
 POLYURETHANE INSULATIONS**

### 1.0 EVALUATION SCOPE

#### Compliance with the following codes:

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2009 *International Energy Conservation Code*® (2009 IECC)
- Other Codes (see Section 8)

#### Properties evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Water vapor transmission
- Water-resistive barrier
- Fire-resistance-rated construction
- Exterior walls in Type I through IV construction

### 2.0 USES

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations are used as thermal insulating material in Type I, II, III, IV and V construction under the IBC and dwellings under the IRC. The insulations are for use in wall cavities, floor/ceiling assemblies and, when installed in accordance with Section 4.3, in attic and crawl spaces. InsulStar® and InsulBloc® insulations may be used as a vapor retarder, air barrier and/or as an air-impermeable insulation when applied in accordance with this report.

When installed in accordance with Section 4.4, the insulations may be used as alternatives to water-resistive barriers required in IBC Section 1404.2 and IRC Section R703.2. The insulations may be used in fire-resistance-rated walls when construction is in accordance with Section 4.6.

### 3.0 DESCRIPTION

#### 3.1 General:

InsulStar® and InsulBloc® are two-component, closed-cell, one-to-one-by-volume spray polyurethane foam systems with a nominal density of 2 pcf (32 kg/m<sup>3</sup>). InsulStar® and InsulBloc® insulation's liquid components are supplied in nominally 55-gallon (208 L) drums, labeled as "A" component or "R" component. The insulation components have a shelf life of six months when stored at temperatures between 70°F (21°C) and 90°F (32°C).

#### 3.2 Surface-burning Characteristics:

The insulation, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2 pcf (32 kg/m<sup>3</sup>), has a flame-spread index of less than 25 and a smoke-developed index of less than 450 when tested in accordance with ASTM E 84. Thicknesses of up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum 1/2-inch-thick (13 mm) gypsum board or an equivalent thermal barrier complying with, and installed in accordance with, the applicable code.

#### 3.3 Thermal Transmission R-values:

The InsulStar® and InsulBloc® insulations have thermal resistance R-values, at a mean temperature of 75°F (24°C), as shown in Table 1.

#### 3.4 Air Permeability:

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations, at a minimum thickness of 1 inch (25.4 mm), are considered air-impermeable insulations in accordance with Section R806.4 of the IRC, based on testing in accordance with ASTM E 283.

#### 3.5 Vapor Retarder:

The foam plastic has a vapor permeance of less than 1 perm [5.7 x 10<sup>-11</sup> kg/(m<sup>2</sup>sPa)], when applied at a minimum thickness of 1<sup>5</sup>/<sub>16</sub> inches (33.3 mm) and qualifies as a Class II vapor retarder as defined in IRC Section R202.

#### 3.6 Aldocoat® 757 Intumescent Coating:

Aldocoat® 757 intumescent coating is manufactured by Aldo Products Company and is a water-based latex

coating with specific gravity of 1.4. Aldocoat® 757 is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of six months when stored in a factory-sealed container at temperatures between 40°F (4.5°C) and 90°F (32°C).

## 4.0 INSTALLATION

### 4.1 General:

InsulStar® and InsulBloc® insulations must be installed in accordance with the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

InsulStar® and InsulBloc® insulations must be spray-applied on the jobsite using a volumetric positive displacement pump as identified in the NCFI application manual. The insulation components must be stored at temperatures between 70°F (21°C) and 90°F (32°C) for several days before application. The insulation must not be used in areas that have a maximum in-service temperature greater than 180°F (82°C). The foam plastic must not be used in electrical outlet or junction boxes or in direct continuous contact with water.

### 4.2 Thermal Barrier:

The InsulStar® and InsulBloc® insulations, with a maximum nominal thickness of 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities, must be separated from the interior of the building by an approved thermal barrier of minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with and installed in accordance with the applicable code. Within an attic or crawl space, installation must be in accordance with Section 4.3.

### 4.3 Attics and Crawl Spaces:

**4.3.1 Application with a Prescriptive Ignition Barrier:** When InsulStar® and InsulBloc® insulations are installed within attics or crawl spaces where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code, and must be installed in a manner so that the foam plastic insulation is not exposed. InsulStar® and InsulBloc® insulations as described in this section may be installed in unvented attics in accordance with IRC Section R806.4.

**4.3.2 Application without a Prescriptive Ignition Barrier:** Where InsulStar® and InsulBloc® insulations are installed in accordance with Sections 4.3.2.1 and 4.3.2.2, the following conditions apply:

- Entry to the attic or crawl space is to service utilities, and no storage is permitted.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with Section R806.4 of IRC. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

- Combustion air is provided in accordance with IMC (International Mechanical Code®) Sections 701 and 703.

**4.3.2.1 Application with Intumescent Coating:** In attics, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces; and in crawl spaces, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 16 inches (406 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 10 inches (254 mm). The foam plastic must be covered with a minimum nominally 10-mil (0.25 mm) wet film thickness of the Aldocoat® 757 intumescent coating described in Section 3.6. The Aldocoat® 757 intumescent coating must be applied over the InsulStar® insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and any other substances that could interfere with adhesion of the coating. The Aldocoat® 757 coating is applied with a medium-size nap roller, soft brush or conventional airless spray equipment at a rate of 1 gallon (3.38 L) per 100 square feet (9.3 m<sup>2</sup>) to obtain a recommended minimum dry film thickness of 7.5 mils (0.19 mm) [10 wet mils (0.25 wet mm)]. The coating must be applied when ambient and substrate temperatures are within a range of 50°F (10°C) to 90°F (32°C), and requires a 24-hour curing time. The insulations may be installed in unvented attics as described in this section in accordance with IRC Section R806.4.

**4.3.2.2 Application without Intumescent Coating:** InsulStar® and InsulBloc® insulations may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces; and in crawl spaces, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 16 inches (406 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 11.5 inches (292 mm). The insulations may be installed in unvented attics as described in this section in accordance with IRC Section R806.4.

**4.3.3 Use on Attic Floors:** InsulStar® and InsulBloc® insulations may be installed exposed at a maximum thickness of 11.5 inches (292 mm) between joists in attic floors. The InsulStar® insulation must be separated from the interior of the building by an approved thermal barrier. The ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3 may be omitted.

### 4.4 Water-resistive Barrier:

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations may be used as the water-resistive barrier prescribed in IBC Section 1404.2 and IRC Section R703.2, when installed on exterior walls as described in this section. InsulStar® and InsulBloc® foam plastic must be spray-applied to the exterior side of sheathing, masonry or other suitable exterior wall substrates to form a continuous layer of 1 inch (25.4 mm) minimum thickness. All construction joints and penetrations are to be completely sealed with InsulStar® or InsulBloc®.

### 4.5 Exterior Walls of Type I, II, III, and IV Construction:

When used on walls of Type I, II, III and IV exterior wall construction, the InsulStar® and InsulBloc® spray-applied

foam insulations must comply with Section 2603.5 of the IBC at a maximum thickness of 5 inches (127 mm), when installed per the manufacturer's published installation instructions and this report. The potential heat of the foam plastic in any portion of the wall or panels must not exceed the potential heat, expressed in Btu/ft<sup>2</sup> (MJ/m<sup>2</sup>), of the foam insulation contained in the wall assembly tested in accordance with NFPA 285. The potential heat of InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> spray-applied foam plastic insulations is 1989 Btu/ft<sup>2</sup> (22.6 MJ/m<sup>2</sup>) per inch of thickness.

#### 4.6 One-hour Fire-resistance-rated Wall Assemblies (Load-bearing):

InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> spray-applied polyurethane foam insulations may be installed on load-bearing one-hour fire-resistance-rated walls (see Figures 1 and 2), provided the system is installed in accordance with the following:

**4.6.1 Wood Framing:** Nominally 2-by-4 wood studs (kiln dried No. 2 spruce-pine-fir) spaced a maximum of 16 inches (406 mm) on center.

**4.6.2 Wall Finish (both faces):** Two layers of 5/8-inch-thick (16 mm) Type X gypsum sheathing complying with ASTM C 36 or ASTM C 1396, 4-foot-wide (1219 mm), installed vertically as follows: Base layer fastened to studs (with joints centered over studs) and plates with 6d coated nails, 1 7/8-inch-long (48 mm) spaced 7 inches (178 mm) on center or 1 7/8 inches (48 mm) long Type S or W steel screws spaced 6 inches (152 mm) on center. Face layer fastened to base layer at the edges with 1 5/8-inch-long (41 mm) Type G screws at 8 inches (203 mm) on center and to studs with 2 1/2-inch-long (64 mm) Type S steel screws at 12 inches (305 mm) on center in the field, or face layer fastened to studs with 2 1/2 inch-long (64 mm) Type S steel screws at 8 inches (203 mm) on center on the edges and 12 inches (305 mm) on center in the field. Face layer joints must be offset a minimum of 24 inches (610 mm) from base layer joints. All joints, screw or nail heads must be covered with joint tape and two coats of joint compound in accordance with GA-216 or ASTM C 840. As shown in Figure 1, the exterior face of the wall can be finished with one layer of 7/16-inch (11 mm) oriented strand board (OSB) in lieu of two layers of Type X gypsum wallboard as shown in Figure 2. The OSB must be fastened to studs with 1 7/8-inch-long (48 mm), 6d coated nails spaced 7 inches (178 mm) on center.

**4.6.3 Insulation:** InsulStar<sup>®</sup> or InsulBloc<sup>®</sup> foam is applied in the stud cavity at a maximum thickness of 3.5 inches (89 mm).

#### 5.0 CONDITIONS OF USE

The InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations and Aldocoat<sup>®</sup> 757 intumescent coating must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. The instructions within this report govern if there are any conflicts between the manufacturer's published installation instructions and this report.

**5.2** InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations must be separated from the interior of the building by an approved 15-minute thermal barrier, as described in

Section 4.2, except when installation is in attics and crawl spaces as described in Section 4.3.

- 5.3** The spray-applied insulations must be protected from the weather during application.
- 5.4** The spray-applied insulations must be applied by installers certified by NCFI Polyurethanes.
- 5.5** Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IBC Section 2603.8 or IRC Section R318.4, as applicable.
- 5.6** Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1 and IECC Sections, 303.1.1. and 303.1.2, as applicable.
- 5.7** InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations at a 1 5/16-inch (33.3 mm) thickness or greater is a Class II vapor retarder as defined in IRC Section R202 and IECC Section 202.
- 5.8** When InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations are used as water-resistive barriers, they must be protected from ultraviolet (UV) light exposure in accordance with NCFI's written instructions.
- 5.9** When use is on buildings of Type I, II, III or IV construction, documentation must be submitted to the code official verifying that the insulation has been qualified as a component of an assembly tested in accordance with IBC Sections 2603.5.1 (unless constructed in accordance with Section 4.6), 2603.5.5 and 2603.5.7. The maximum potential heat of the foam plastic used in the assembly must be no greater than that noted in Section 4.5.
- 5.10** InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations are produced in Mount Airy, North Carolina, and Clearfield, Utah, under a quality control program with inspections by PRI Construction Materials Technologies, LLC (AA-709).

#### 6.0 EVIDENCE SUBMITTED

- 6.1** Data in accordance with ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2009, including reports of tests in accordance with Appendix X of AC377.
- 6.2** Reports on room corner fire tests in accordance with NFPA 286.
- 6.3** Reports on air leakage tests in accordance with ASTM E 283.
- 6.4** Reports on water vapor transmission tests in accordance with ASTM E 96.
- 6.5** Reports on fire tests of building construction and materials in accordance with ASTM E 119.
- 6.6** Reports of potential heat of the foam plastics tests in accordance with NFPA 259.
- 6.7** Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels Used as Water-resistive Barriers (AC71), dated February 2003 (editorially revised June 2008).
- 6.8** Reports of fire propagation characteristics tests in accordance with NFPA 285.

#### 7.0 IDENTIFICATION

Components of the InsulStar<sup>®</sup> and InsulBloc<sup>®</sup> insulations are identified with the manufacturer's name (NCFI Polyurethanes), address and telephone number; the

product trade name (InsulStar® or InsulBloc®), use and application instructions; the density; the flame-spread and smoke-development indices; the evaluation report number (ESR-1615); and the name of the inspection agency (PRI Construction Materials Technologies LLC).

Aldocoat® 757 intumescent coating is identified with the manufacturer’s name (Aldo Products Company, Inc.) and address; the product trade name (Aldocoat 757); use instructions; and the name of the inspection agency (PRI Construction Materials Technologies LLC).

**8.0 OTHER CODES**

**8.1 Evaluation Scope:**

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)

- 2006 *International Energy Conservation Code*® (2006 IECC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2003 *International Energy Conservation Code*® (2003 IECC)

**8.2 Uses:**

The products comply with the above-mentioned codes as described in Sections 2.0 through 7.0 of this report except as noted below:

- **Application with a Prescriptive Ignition Barrier:** See Section 4.3.1, except attics and crawl spaces must be vented in accordance with the applicable code.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.3.2, except attics and crawl spaces must be vented in accordance with the applicable code.

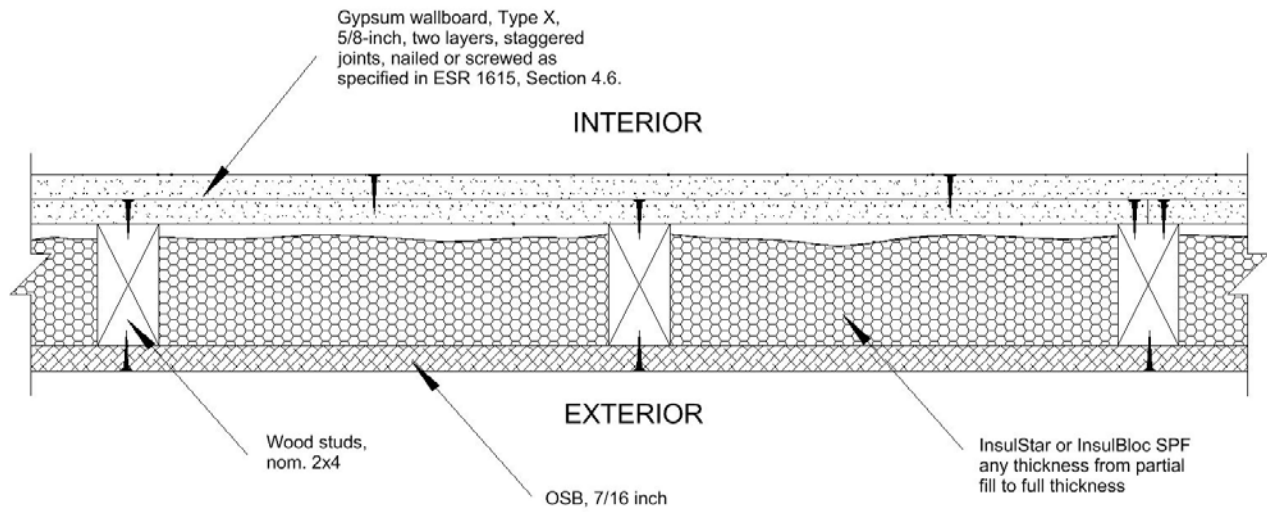
**TABLE 1— THERMAL RESISTANCE (R-VALUES)**

THICKNESS (inches)	R-VALUES (°F.ft <sup>2</sup> .h/Btu)
<b>ASTM C 518 TESTED VALUES</b>	
1	6.8
4	25
<b>CALCULATED R-VALUES<sup>1</sup></b>	
2	13
3	19
3.5	22
4.75	30
5	32
6	38
7	45
7.5	48
8	51
9	57
10	64
11	70
11.5	73
12	76
16	102

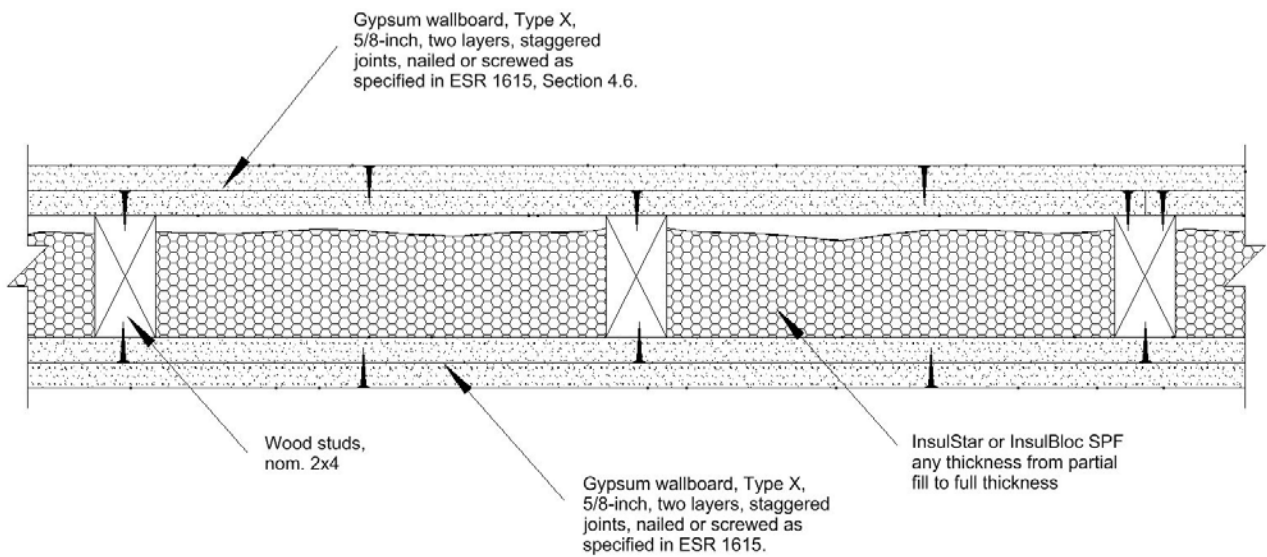
For **SI**: 1 inch = 25.5 mm; 1 °F.ft<sup>2</sup>.h/Btu = 0.176 110 °K.m<sup>2</sup>/W.

<sup>1</sup>Calculated R-values are based on tested K-values at 4-inch thickness.

**FIGURE 1**  
**NON-SYMMETRICAL ONE-HOUR FIRE RESISTANCE-RATED WALL ASSEMBLY**



**FIGURE 2**  
**SYMMETRICAL ONE-HOUR FIRE RESISTANCE-RATED WALL ASSEMBLY**



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[jason.hoerter@ncfi.com](mailto:jason.hoerter@ncfi.com)**EVALUATION SUBJECT:****INSULSTAR® AND INSULBLOC® SPRAY-APPLIED POLYURETHANE INSULATIONS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2007 *Florida Building Code—Residential*
- 2007 *Florida Building Code—Building*

**Properties Evaluated:**

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Water vapor transmission
- Water-resistive barrier
- Fire resistance-rated construction
- Exterior walls in Type I through IV construction

**2.0 PURPOSE OF THIS SUPPLEMENT**

This supplement is issued to indicate that the InsulStar® and InsulBloc® spray-applied polyurethane foam insulations described in Sections 2.0 through 7.0 of the master report comply with the 2007 *Florida Building Code—Building* (FBCB) and the 2007 *Florida Building Code—Residential*, when designed and installed in accordance with the master evaluation report.

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations may be used in the High-Velocity Hurricane Zone, except that within attic or crawl space where entry is made for service of utilities, exposed foam plastics must be protected against ignition as required in Section 2612.3.2.6 of the FBCB.

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations used in exterior walls of multistory buildings located in the High-Velocity Hurricane Zones must comply with Section 2612.3.2.4 of the FBCB.

For products falling under Florida Rule 9B-72, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report issued March 1, 2010.