FM Approvals

FM Global is a group of property/casualty insurers who have joined together to form one of the world's leading industrial insurers. The members of FM Global actively practice and promote the concept of loss prevention.

FM Global is a loss control service organization with headquarters in Norwood, Massachusetts and with district offices strategically located throughout the United States and Canada. The FM Global Research Campus is located in West Glocester, Rhode Island.

The main objective of FM Global is to help policy holders protect their properties from damage by fire, wind, explosion, boiler pressure vessel, machinery accidents and many other insured perils.

One of the ways that FM Global accomplishes its objective is by approval testing and listing of building components. FM Approvals is the business unit of FM Global that evaluates building components for use on facilities insured by the FM Global organization. FM Approvals maintains a Web-based reference tool called RoofNav, which lists all approved roof systems including roof coverings, roof insulations, and roof decks.

FM Approved, roof assemblies must conform to one or more Approval Standards, which include Approval Standards 4450 for *Class 1 Insulated Steel Deck Roofs,* Approval Standard 4470 for *Class 1 Roof Covers*, Approval Standard 4471 for *Class 1 Panel Roof* or Approval Classification Standard No. 4435 for *Roof Flashing,* 4451 for *Steel Roof Decking* or 4454 for *Lightweight Insulating Concrete Roof Deck.*

All roof assemblies listed as FM Approved have been evaluated for performance criteria that includes interior fire exposure, exterior fire exposure, wind uplift resistance, corrosion resistance for roof fasteners, accelerated weathering, hail damage resistance, leakage resistance and foot traffic resistance. All of these performance criteria must be met to be considered for approval as a roof assembly.

In addition to meeting the performance criteria stated in the above Approval Standards, an examination of the manufacturing facilities and an audit of quality control procedures is made to evaluate the manufacturer's ability to produce the product that is examined and tested, and the marking procedures used to identify the product. These examinations are repeated as part of the FM Approved product follow-up Quality Audit Program.

Conventional roof decks such as concrete, cement fiber, steel, and wood possess distinct limitations which must be understood and adequately controlled. When these limitations are not exceeded, the roof deck will be fire safe and rigid while maintaining a strong bond to the insulation or roof covering. FM approved roof decks are placed in one of two categories: Non-combustible or Class I Fire Rated. Additionally, they must meet 1-60 Windstorm requirements as a minimum.

Non-combustible Rating: This rating indicates that the roof deck will not burn or contribute fuel to a fire while preventing the passage of heat through the deck for an extended period of time. Typical decks such as concrete (including lightweight insulating concrete), gypsum, and asbestos cement, having a minimum thickness of 2 inches, are considered non-combustible. These decks can be used with any combination of insulation, vapor retarder, hot asphalt adhesive, and roof covering without the need for fire protection to the deck.

Class I Rating: Applies to those assemblies that burn slowly when subjected to an interior building fire and when their fuel contribution is reduced to acceptable limits by selecting a proper combination of deck materials. Class I decks may be steel, fire retardant treated wood, structural cement fiber, gypsum, or lightweight concrete.

These assemblies with roof coverings conform to Windstorm Resistance Classifications. Siplast Lightweight Insulating Concrete is listed in RoofNav and can be found by searching by the specific product name, assembly description, or by RoofNav assembly number.

FM Global Loss Prevention Data Sheets 1-28 "Design Wind Loads" and 1-29 “Roof Deck Securment and Above Deck Roof Components” discuss wind loading on buildings and roof systems. Wind maps and wind loading charts for use in determination of wind design requirements are part of the information in these data sheets. RoofNav also contains a Web-based calculator that will determine design pressures based on various building parameters.

Recover Roof Construction

Recover roof construction over existing FM Global Approved Roof: Proper precautions must be taken to prepare the surface by removing gravel and repairing blisters or other openings prior to application of new insulation and cover. When the additional insulation or the new roof cover is secured to the existing roof construction with adhesive, the wind uplift rating (Class 1-60, 1-75, 1-90, 1-105, etc.) is determined by the least wind resistant construction (usually the old roof). When the additional insulation or the new roof cover is mechanically attached through the existing roof construction and into the structural deck, the wind uplift rating (Class 1-60, 1-75, 1-90, 1-105, etc.) is determined by the recover application. The addition of a new roof cover with or without additional insulation will not upgrade an existing Class 2 roof assembly to Class 1. The building owner or his agent must confirm that the installer has indeed supplied the thickness of liquid cover required in the listing. The fire rating of the existing steel deck roof is assumed to be Class 2 requiring automatic sprinkler protection under the roof if the original roof assembly is not fire tested and listed by FM Approvals.

Lightweight Insulating Concrete Roof Decks, Noncombustible and Class 1 Fire Rated

(Class 1-60 Minimum Windstorm Rated)

Lightweight insulating concrete decks are poured in place as a slurry over corrugated steel-form or structural concrete deck. The corrugated steel-form deck is fastened as indicated in the Approval listing.

Approved lightweight concrete is a mixture of Portland cement and water with various aggregate and/or preformed foam and an air-entraining agent. The lightweight concrete shall be installed by a licensed applicator. Reinforcing mesh or galvanized steel-welded wire mesh is recommended in seismic areas.

Noncombustible Constructions: Require 1.) a minimum 2-inch (51 mm) thickness of lightweight concrete directly above the top of the corrugations of the steel-forming, unless otherwise noted, or 2.) a minimum 1/8-inch (3 mm) thickness of lightweight concrete above a structural concrete deck or a structural concrete deck with existing BUR cover in place, unless otherwise noted.

Insulation boards may be placed in the wet concrete, followed by additional concrete which must be placed before the bottom layer sets up. Unless otherwise noted, a minimum 2-inch (51 mm) thickness of lightweight concrete is required above any rigid insulation board.

Class 1 Fire Rated Constructions: Requires a minimum 1/8-inch (3 mm) thickness of lightweight concrete applied above the top of the corrugations of the steel form deck, unless otherwise noted. Insulation boards may then be placed in the wet concrete, followed by additional concrete which must be placed before the bottom layer sets up. A minimum 2-inch (51 mm) thickness of lightweight concrete is required above any rigid insulation boards, unless otherwise noted.

The Siplast Lightweight Insulating Concrete portion of the January 2005 FM Approval Guide is listed below. The roofing section of the FM Approval Guide is no longer published in summary format. RoofNav is the only method by which updated FM assemblies may be obtained, however the 2005 Approval Guide (the most recent FM publication on Approved Roof Constructions) can be used as a reference. When submitting roof constructions for FM Global insured projects the assemblies must have a valid RoofNav assembly number.

Siplast, Inc., 1111 Highway 67 S, Arkadelphia, AR 71923

Trade Name:	Zonocel Lightweight Insulating Concrete
Composition:	Mixture of Portland cement, Insulcel-PB foam, vermiculite concrete aggregate and water
Dry Density:	35 to 41 lb/ft^3 (561 to 657 kg/m^3) air dry density
Insulation:	Max 12-inch (305 mm) Insulperm polystyrene insulation board, with a nominal density of 0.6 to 1.5 lb/ft^3 (9.6 to 24 kg/m^3)

Trade Name:	NVS Insulating Concrete
Composition:	Mixture of Portland cement and water with an NVS vermiculite concrete aggregate in a 1:3.5 mix (cement: Type 38-NVS vermiculite by volume).
Dry Density:	35 to 41 lb/ft^3 (561 to 657 kg/m^3) air dry density
Insulation:	Max 12-inch (305 mm) Insulperm polystyrene insulation board, with a nominal density of 0.6 to 1.5 lb/ft^3 (9.6 to 24 kg/m^3)

Trade Name:	Zonolite Insulating Concrete
Composition:	Mixture of Portland cement and water with vermiculite concrete aggregate in a 1:6 to 1:4 mix (cement: vermiculite by volume)
Dry Density:	1:6 mix is 22 to 28 lb/ft^3 (352 to 449 kg/m^3) 1:4 mix is 31 to 37 lb/ft^3 (497 to 593 kg/m^3)
Insulation:	Max 12-inch (305 mm) Insulperm polystyrene insulation board, with a nominal density of 0.6 to 1.5 lb/ft^3 (9.6 to 24 kg/m^3)

Trade Name:	Insulcel Lightweight Insulating Concrete
Composition:	Mixture of Portland cement, Insulcel-PB foam and water
Dry Density:	29 pcf to 36 pcf (465 kg/m^3 to 577 kg/m^3) air dry density
Insulation:	Max 12-inch (305 mm) Insulperm polystyrene insulation board, with a nominal density of 0.6 to 1.5 pcf (9.6 to 24 kg/m^3)

Trade Name:	Insulperm, Insulperm-3, Insulperm-5
Thickness:	1 to 12 inch (25 to 305 mm)
Board Size:	2x4-foot (1.2 x 2.4 m)
Core:	Polystyrene 0.6 to 1.5 lb/ft^3 (9.6 to 24 kg/m^3)
Facers:	None
Decks:	Siplast Lightweight Insulating Concrete

Stress Plates

Trade Name:	Base Sheet Disc
Material:	Steel, Galvalume AZ 55
Size:	2 ¾- inch (70 mm) round x 0.0135 inch (0.34 mm)
Fasteners:	Zono-tite and NVS

Fasteners

Trade Name:	Zono-tite Base Sheet Fastener
Material:	Steel, CR-10 or Answer Coating (black)
Size:	1 ¾-inch (44 mm) long rectangular shank
Drive Head:	1 x 1 1/8-inch (25 x 29 mm) rectangular
Plates:	Base Sheet Disc
Decks:	Lightweight Concrete

Trade Name:	NVS Base Sheet Fastener
Material:	Steel, CR-10 or Answer Coating (black)
Size:	1.2-inch (35 mm) long rectangular shank
Drive Head:	1 x 1 1/8-inch (25 x 29 mm) rectangular
Plates:	Base Sheet Disc
Decks:	Lightweight Concrete

Construction #11: Lightweight Insulating Concrete over concrete or recover concrete. NVS Concrete placed over structural concrete deck or properly prepared existing BUR or Paradiene 20, Irex base sheets torch applied, fully adhered with hot asphalt or PA 311 over structural concrete deck to min 1 .8 in. (3 mm) thick immediately followed by min. 1 in. (25 mm) thick Insulperm-1 or 5 insulation and followed immediately by min 1 in. (25 mm) thick NVS concrete. Roof system as described below:

Construction #11a: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck with NVS Base Sheet Fasteners with Discs spaced 7 in. (178 mm) o.c. in the 3 in. (76 mm) wide base sheet lap and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Fastener heads primed with PA-1125 Primer and then any Paradiene 20 series base membrane fully adhered with hot asphalt followed by any Paradiene 30 TG series roof cover hot torch adhered. Meets Class 1-150 over concrete. Meets the rating of the existing BUR up to Class 1-150.

Construction #11b: Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the concrete with FM-45 base ply fasteners and FM-30 discs, 1.2 in. (35 mm) long C-R Base Felt Fastener and Disc, or NVS Base Sheet Fastener with Disc spaced 7 1 .2 in. (190 mm) o.c. in the 3 in. (76 mm) wide side laps and 10 in. (254 mm) o.c. in two equally spaced and staggered rows in the field of the sheets. Optional one or two plies of Approved Type IV or Type VI glass felts fully adhered with hot asphalt. Two-ply roof cover system applied as above. Meets Class 1-90 over concrete. Meets the rating of the existing BUR up to Class 1-90.

Construction #11c: Three days after the top coat is placed, Parabase base sheet is mechanically fastened to the deck with NVS Base Sheet Fasteners with Discs spaced 7 in. (178 mm) o.c. in the 3 in. (76 mm) wide base sheet lap and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Fastener heads primed with PA-1125 Primer and then any Paradiene 20 series base membrane fully adhered with PA-311 Cold Adhesive, applied at 1.5 gal/sq (0.6 L/m 2) followed by any Paradiene 30 series roof cover fully adhered with PA-311 Cold Adhesive, applied at 1.5 gal/sq (0.6 L/m 2). Meets Class 1-90 over concrete.

Construction #12: Lightweight Insulating Concrete over concrete or recover concrete. NVS Concrete placed over structural concrete deck or properly prepared existing BUR over structural concrete deck to min 1 in. (25 mm) thick. Roof system as in Construction #9a or #9b.

Construction #13: Lightweight Insulating Concrete (NVS) over steel form deck new construction or recover. Consolidated Systems, Inc. min. 22 ga., 1.5 in. (38 mm) deep. Type B-Vented galvanized steel form deck conforming to ASTM A 653 Grade 40 secured to structural steel joists spaced 6 ft. (1.8 m) o.c. with 3 .8 in (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.]. 5 .8 in. (16 mm) Dens Deck is mechanically fastened with 2 in. (51 mm) Siplast Parafast XHD or Tru-Fast HD 2 in, (51 mm) fasteners and Siplast Parafast Metal Plates or Tru-Fast MP-3 plates applied at 1.6 ft 2 (0.5 m 2). Two plies of Approved Type IV glass felt 18 in. (457 mm) o.c. coverage are fully adhered with hot asphalt. Alternatively, one layer of Paradiene 20 or Irex series base sheet may be installed in hot asphalt or torch adhered. A 1 .8 in. (3 mm) to 1 .4 in. (6 mm) slurry coat of NVS Concrete, min. west cast density of 75 lbs./ft 3 , is placed over the glass felts immediately followed by min. 1 inch (25 mm) thick Insulperm-5 Insulation. The following day a min. of 1 in. (25 mm) thick top coat of NVS Concrete with a wet density of 60 lbs./ft 3 is applied over the Insulperm-5. Roof Systems as described below:

Construction #13a: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck with NVS Fasteners spaced 7 in. (254 mm) o.c. in the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. A Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-150.

Construction #13b: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck with Simplex Base-Lok Fasteners spaced 10 in. (254 mm) o.c. in the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. A Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-90.

Construction #13c: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck with Simplex Base-Lok Fasteners spaced 12 in. (305 mm) o.c. in the 3 in. (76 mm) wide base sheet laps and 12 in. (305 mm) o.c. in three equally spaced rows in the field of the sheet. A Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-60.

Construction #14: Lightweight Insulating Concrete (1:4 ZIC and Insulcel) over steel form deck, new construction. Consolidated Systems, Inc. min 22 ga., 1.5 in. (38 mm) deep, Type B-Vented galvanized steel conforming to ASTM A 653 Grade 40 form deck secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3 .8 in. (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.] or Wheeling Corrugating Company min 24 ga., Tensilvent 125 deck secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3 .8 in. (9.5 mm) diameter weld washers, at each bottom rib [3-3 .4 in. (95 mm) o.c.]. A slurry coat of Insulcel Lightweight Insulating Concrete, min wet cast density of 44 lb/ft 3 (700 kg/m 3), is placed on the deck filling the corrugations plus min 1 .8 in. (3 mm) thick above the top flange immediately followed by min. 1 in. (25 mm) thick Insulperm-5 Insulation. The following day, min 2 in. (51 mm) thick Insulcel Lightweight Insulating Concrete, min wet cast density of 44 lb/ft 3 (700 kg/m 3), or min 2 in. (51 mm) thick ZIC (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed. Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck with Zono-tite fasteners or FM-60 base ply fasteners and FM-30 disks, FM-90 base ply fasteners. spaced 7 in. (178 mm) o.c. in the 3 in. (76 mm) wide base sheet lap and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Fastener heads primed with PA-1125 Primer and then any Paradiene 20 series or Irex base membrane fully adhered with hot asphalt or torch adhered if torch grade membrane is used followed by any Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-150 when Type B-Vented deck is used. Meets Class 1-135 when Tensilvent 125 deck is used.

Construction #14a: A slurry coat of **ZIC** (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed on the deck filling the corrugations plus min 1 .8 in. (3 mm) thick above the top flange immediately followed by min. 1 in. (25 mm) thick Insulperm-5 Insulation. The following day, min 2 in. (51 mm) thick **ZIC** (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed. Meets class 1-120.

Construction #15: Tensilvent 75 or Tensilvent 125, 26 ga. steel form deck on max 5 ft (1.5 m) spans is secured to the structural substrate with welds utilizing 3 .8 in. (10 m) dia. weld washers located at every other corrugation (approximately 7 1 .2 in. [190 mm] o.c.) or at every corrugation (approximately 3-3 .4 in. [95 mm] o.c.). Insulcel, Zonocel, ZIC 1:6, or ZIC 1:4 concrete is placed over the form deck to a min 1 .8 in. (3 mm) thickness above the top flange of the form deck. Min 2 in. (51 mm) thick Insulperm polystyrene insulation is immediately placed in the concrete. A min 2 in. (51 mm) thickness of .). Insulcel, Zonocel, ZIC 1:6, or ZIC 1:4 concrete is then immediately placed above the insulation and the surface is screeded. A roof covering is then applied as described immediately below.

Construction #15a: Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Simplex Base-Lok fasteners into the deck with an electric screw gun. Fasteners spaced 10 in. (254 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt, PA -311 Adhesive followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-90.

Construction #15b: Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Zono-tite or Simplex Base-Lok fasteners spaced 14 in. (355 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 14 in. (355 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used (hot torch not allowed when using Base-Lok Fastener) followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-75.

Construction #16: Lightweight Insulating Concrete (Insulcel) over steel form deck new construction or recover. Consolidated Systems, Inc. min. 22 ga., 1.5 in. (38 mm) deep. Type B-Vented galvanized steel form deck conforming to ASTM A 653 Grade 40 (ASTM standard applies to 1-150 rating only) secured to structural steel joists spaced 6 ft. (1.8 m) o.c. with 3 .8 in (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.]. 5 .8 in. (16 mm) Dens Deck is mechanically fastened with 2 in. (51 mm) Siplast Parafast XHD or Tru-Fast HD 2 in, (51 2). Two plies of Approved Type IV glass felt 18 in. (457 mm) o.c. coverage are fully adhered with hot asphalt. Alternatively, one layer of Paradiene 20 or Irex series base sheet may be installed in hot asphalt or torch adhered. A 1 .8 in. (3 mm) to 1 .4 in. (6 mm) slurry coat of Insulcel Lightweight Insulating Concrete is placed over the glass felts immediately followed by min. 1 inch (25 mm) thick Insulperm-5 Insulation. The following day a min. of 2 in. (25 mm) thick top coat of Insulcel Lightweight Insulating Concrete is applied over the Insulperm-5. Roof Systems as described below:

Construction #16a: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Zono-tite fasteners spaced 7 in. (178 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Zono-tite fastener heads are primed with PA-1125 Primer and then Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-150 (new) or windstorm classification of the existing roof assembly with a maximum of Class 1-150.

Construction #16b: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Simplex Base-Lok fasteners into the deck with an electric screw gun. Fasteners spaced 10 in. (254 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt, PA -311 Adhesive followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-90.

Construction #16c: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Zono-tite or Simplex Base-Lok fasteners spaced 14 in. (355 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 14 in. (355 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used (hot torch not allowed when using Base-Lok Fastener) followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-75.

Construction #17: Lightweight Insulating Concrete (Insulcel) over Concrete or Recover Concrete. Insulperm is optional in this construction. When Insulperm is used, a slurry coat of Insulcel Lightweight Insulating Concrete is placed over the structural concrete deck or properly prepared existing built up roof over structural concrete to a minimum 1 .8 in. (3 mm) thick immediately followed by 1 in. (25 mm) thick Insulperm-1 or 5 Insulation. The following day, minimum 2 in. (51 mm) thick Insulcel Lightweight Insulating Concrete is placed. Roof Systems as described below:

Construction #17a: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Zono-tite fasteners spaced 7 in. (178 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Zono-tite fastener heads are primed with PA-1125 Primer and then Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-150 (new) or windstorm classification of the existing roof assembly with a maximum of Class 1-150.

Construction #17b: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Simplex Base-Lok fasteners spaced 10 in. (178 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 10 in. (254 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-90 (new) or windstorm classification of the existing roof assembly with a maximum of Class 1-90.

Construction #17c: Three days after the top coat is placed, Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the deck by driving Zono-tite, Simplex Base-Lok, FM-60 base ply fasteners and FM -30 discs, FM-90 base ply fasteners, or 1.75 in (44 mm) long C-R Base Felt fasteners spaced 14 in. (178 mm) o.c. through the 3 in. (76 mm) wide base sheet laps and 14 in. (254 mm) o.c. in two equally spaced rows in the field of the sheet. Paradiene 20 series or Irex series base membrane is fully adhered with hot asphalt or hot torch adhered if torch grade membrane is used (hot torch not allowed when using Base-Lok Fastener) followed by a Paradiene 30 series, Paradiene 40 FR, Veral or Parafor 50 LT roof cover with hot asphalt or hot torch adhered if torch grade. Meets Class 1-75 (new) or windstorm classification of the existing roof assembly with a maximum of Class 1-75.

Construction #18: Lightweight Insulating Concrete. Zonocel Lightweight Insulating Concrete or Zonolite Insulating Concrete (see lightweight insulating concrete deck construction below). Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the concrete with FM-60 base ply fasteners and FM-30 discs, FM-90 base ply fasteners, 1 3 .4 in. (44 mm) long C-R Base Felt Fastener and Disc, or Zono-tite Base Sheet Fastener with Disc spaced 7 1 .2 in. (190 mm) o.c. in the 3 in. (76 mm) wide side laps and 10 in. (254 mm) o.c. in two equally spaced and staggered rows in the field of the sheets. Optional one or two plies of Approved Type IV or Type VI glass felts fully adhered with hot asphalt. Two-ply roof cover system applied as above. Meets Class 1-90.

Construction #19: Lightweight Insulating Concrete. Insulcel Lightweight Insulating Concrete (see lightweight insulating concrete deck construction below). Parabase, Parabase FS or Parabase Plus base sheet is mechanically fastened to the concrete with 1 3 .4 in. (44 mm) long C-R Base Felt Fastener and Disc, or Zono-tite Base Sheet Fastener with Disc spaced 7 1 .2 in. (190 mm) o.c. in the 3 in. (76 mm) wide side laps and 10 in. (254 mm) o.c. in two equally spaced and staggered rows in the field of the sheets. Optional one or two plies of Approved Type IV or Type VI glass felts fully adhered with hot asphalt. Two-ply roof cover system applied as above. Roof cover system is sealed airtight to the deck at the perimeter and all penetrations. Meets Class 1-60.

Construction #20: Lightweight Insulating Concrete over steel form deck, new construction. Consolidated Systems, Inc. min 22 ga., 1.5 in. (38 mm) deep, Type B-Vented galvanized steel conforming to ASTM A 653 Grade D form deck secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3 .8 in. (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.] or Wheeling Corrugating Company min 24 ga., Tensilvent 125 deck secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3 .8 in. (9.5 mm) diameter weld washers, at each bottom rib [3 3 .4 in. (95 mm) o.c.]. A slurry coat of Insulcel Lightweight Insulating Concrete, min wet cast density of 44 lb/ft 3 (700 kg/m

3), is placed on the deck filling the corrugations plus min 1 .8 in. (3 mm) thick above the top flange immediately followed by min. 1 in. (25 mm) thick Insulperm-5 Insulation. The following day, min 2 in. (51 mm) thick Insulcel Lightweight Insulating Concrete, min wet cast density of 44 lb/ft 3 (700 kg/m 3), or min 2 in. (51 mm) thick Zonolite Insulating Concrete (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed. Three days after the top coat is placed, Parabase base sheet is mechanically fastened to the deck with Zono-tite fasteners spaced 7 in. (178 mm) o.c. in the 3 in. (76 mm) wide base sheet lap and 10 in. (254 mm) o.c. in three equally spaced rows in the field of the sheet. Fastener heads primed with PA-1125 Primer and then any Paradiene 20 series base membrane fully adhered with hot asphalt followed by any Paradiene 30 TG series roof cover hot torch adhered. Meets Class 1-150 when Type B-Vented deck is used. Meets Class 1-135 when Tensilvent 125 deck is used.

Construction #21: Lightweight Insulating Concrete over steel form deck, new construction. Steel form deck as in Construction #20. A slurry coat of Zonolite Insulating Concrete (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed on the deck filling the corrugations plus min 1 .8 in. (3 mm) thick above the top flange immediately followed by min. 1 in. (25 mm) thick Insulperm-5 Insulation. The following day, min 2 in. (51 mm) thick Zonolite Insulating Concrete (1:4 mix), min wet cast density of 61 lb/ft 3 (980 kg/m 3), is placed. Roof System as in Construction #20 meets class 1-120.

Construction #23: Steel Deck. Any of the unfaced or glass-faced or bitumen surfaced insulations identified below are mechanically fastened over the roof deck with Approved fasteners (see below). Either of the torch applied base sheets are adhered to the bitumen surfaced insulation followed by a torched or hot asphalt applied cap sheet. An alternate construction is an asphalt applied base sheet and asphalt applied cap sheet over non-bitumen surfaced insulations. Rockacier 381, Rockterras 340, Roofslab 341, TopRock Baseboard P, Rockwool 360, Rockwool SA 360, TopRock P (unfaced), Rockterras Soudable 348, Rockacier Soudable 398, Modul R TS (bitumen faced), Roofslab 345, Hardrock 391, Hardrock Soudable 393 (fiberglass faced), TopRock Baseboard M, (fiberglass faced one side), Taurox C, Taurox D (unfaced or bitumen faced), Taurox DUO NP bitumen faced, Taurox DUO XP bitumen faced or Taurox ECO bitumen faced, Hardrock, Rockwool 360, HD Hardrock (unfaced or fiberglass faced or bitumen faced), DuoRock FM (Fiberglass Tissue faced), DuoRock FM (Bitumen Faced Torch-On), Rockwool SA 369 (bitumen faced top fiberglass facer bottom), TopRock M (fiberglass faced top side). *Note: Unfaced insulations require double mopping for asphalt for base sheet or concrete deck asphalt adhered application.* Insulation is mechanically fastened with Olympic Ribbed Plate and Standard fastener or SFS IF-3-S plate and #12 Insul-Fixx fastener or Simplex 3 In. (76 mm) dia. metal plate with either the Olympic Standard fastener or the SFS #12 Insul-Fixx fastener at a rate of 1 per 2.4 ft 2 (1 per 0.22 m 2) per for 1-60 wind classification or at rate of 1 per 2 ft (1 per 0.19 m 2) for 1-90 wind classification.

Construction #23a: Concrete Deck. Any of the unfaced or glass-faced or bitumen surfaced insulations identified above are hot asphalt adhered over the roof deck. Either of the torch applied base sheets are adhered to the bitumen surfaced insulation followed by a torched or hot asphalt applied cap sheet. An alternate construction is an asphalt applied base sheet and asphalt applied cap sheet over non-bitumen surfaced insulations. Meets Class 1-90.
Roof Covers: Asphaltic BUR, Modified Bitumen
Deck: Zonocel Lightweight Insulating Concrete, NVS Insulating Concrete, Zonolite Insulating Concrete, Insulcel Lightweight Insulating Concrete
Base Sheet: See below.

Construction #24: Lightweight Insulating Concrete over steel form deck new construction or recover. Consolidated Systems, Inc. minimum 22 ga., 1.5 in. (40 mm) deep. Type B-Vented galvanized steel form deck conforming to ASTM A 653 Grade 40 secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3⁄8 in (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.]. A slurry coat of Insulcel Lightweight Insulating Concrete, minimum wet cast density of 44 lb/ft^3 (700 kg/m^3), is poured directly onto the steel deck with a 1⁄8 in. (3 mm) to 1⁄4 in. (6 mm) coverage over the top of the flutes and immediately followed by minimum 1 in. (25 mm) thick Insulperm-5 Insulation. The following day a minimum 2 in. (50 mm) thick top coat of Insulcel Lightweight Insulating Concrete with a wet density of 44 lb/ft^3 (700 kg/m^3) is applied over the Insulperm-5 Insulation. RT Pellets are spread over the surface of the wet concrete with an RT Applicator at a rate of 4 lbs/sq (0.098 kg/m^2). Three days after the top coat is cast and the RT pellets are placed, a propane torch is used to heat activate the RT Pellets and then a Paradiene 20 TS base membrane is hot torch adhered to the deck. A Paradiene 30 TG surface membrane is hot torch adhered to the base membrane. Meets Class 1-195.

Construction #25: Lightweight Insulating Concrete over new structural concrete. A slurry coat of Insulcel Lightweight Insulating Concrete, minimum wet cast density of 44 lb/ft^3 (700 kg/m^3), is poured directly onto the structural concrete deck with a coverage of 1⁄8 in. (3 mm) to 1⁄4 in. (6 mm) and immediately followed by minimum 1 in. (25 mm) thick Insulperm-5 Insulation. The following day a minimum 2 in. (50 mm) thick top coat of Insulcel Lightweight Insulating Concrete with a wet density of 44 lb/ft^3 (700 kg/m^3) is applied over the Insulperm-5 Insulation. RT Pellets are spread over the surface of the wet concrete with an RT Applicator at a rate of 4 lbs/sq (0.098 kg/m^2). Three days after the top coat is cast and the RT pellets are placed, a propane torch is used to heat activate the RT Pellets and then a Paradiene 20 TS base membrane is hot torch adhered to the deck. A Paradiene 30 TG surface membrane is hot torch adhered to the base membrane. Meets Class 1-195.

Construction #25a: Lightweight Insulating Concrete over steel form deck new construction or recover. Consolidated Systems, Inc. minimum 22 ga., 1.5 in. (40 mm) deep. Type B-Vented galvanized steel form deck conforming to ASTM A 653 Grade 40 secured to structural steel joists spaced 5 ft (1.5 m) o.c. with 3⁄8 in (9.5 mm) diameter weld washers, at each bottom rib [6 in. (152 mm) o.c.]. A slurry coat of Insulcel Lightweight Insulating Concrete, minimum wet cast density of 44 lb/ft^3 (700 kg/m^3), is poured directly onto the steel deck with a 1⁄8 in. (3

mm) to 1⁄4 in. (6 mm) coverage over the top of the flutes and immediately followed by minimum 1 in. (25 mm) thick Insulperm-5 Insulation. The following day a minimum 2 in. (50 mm) thick top coat of Insulcel Lightweight Insulating Concrete with a wet density of 44 lb/ft^3 (700 kg/m^3) is applied over the Insulperm-5 Insulation. RT Pellets are spread over the surface of the wet concrete with an RT Applicator at a rate of 4 lbs/sq (0.098 kg/m^2). Three days after the top coat is cast and the RT pellets are placed, a propane torch is used to heat activate the RT Pellets and then a Paradiene 20 TS base membrane is hot torch adhered to the deck. A Paradiene 30 TG surface membrane is hot torch adhered to the base membrane. Meets Class 1-195.

Construction #26: Lightweight Insulating Concrete over new structural concrete. A slurry coat of Insulcel Lightweight Insulating Concrete, minimum wet cast density of 44 lb/ft^3(700 kg/m^3), is poured directly onto the structural concrete deck with a coverage of 1⁄8 in. (3 mm) to 1⁄4 in. (6 mm) and immediately followed by minimum 1 in. (25 mm) thick Insulperm-5 Insulation. The following day a minimum 2 in. (50 mm) thick top coat of Insulcel Lightweight Insulating Concrete with a wet density of 44 lb/ft^3 (700 kg/m^3) is applied over the Insulperm-5 Insulation. RT Pellets are spread over the surface of the wet concrete with an RT Applicator at a rate of 4 lbs/sq (0.098 kg/m^2). Three days after the top coat is cast and the RT pellets are placed, a propane torch is used to heat activate the RT Pellets and then a Paradiene 20 TS base membrane is hot torch adhered to the deck. A Paradiene 30 TG surface membrane is hot torch adhered to the base membrane. Meets Class 1-195.

Construction #1: Tensilvent 75 or Tensilvent 125, 26 ga. steel form deck on max 5 ft (1.5 m) spans is secured to the structural substrate with welds utilizing 3 .8 in. (10 m) dia. weld washers located at every other corrugation (approximately 7 1 .2 in. [190 mm] o.c.) or at every corrugation (approximately 3 3 .4 in. [95 mm] o.c.). Zonocel or Zonolite concrete is placed over the form deck to a min 1 .8 in. (3 mm) thickness above the top flange of the form deck. Min 2 in. (51 mm) thick Insulperm polystyrene insulation is immediately placed in the concrete. A min 2 in. (51 mm) the surface is screeded. When Insulperm is used, the top coat of concrete must be placed before the bottom layer sets up. A roof covering is then applied as described immediately below.

Construction #1a: A base sheet is mechanically fastened to the concrete with fasteners spaced 7 1 .2 in. (190 mm) o.c. in the 4 in. (102 mm) wide side laps and 10 in. (254 mm) o.c. in two equally spaced and staggered rows in the field of the sheets. Optional one or two plies of Approved Type IV or Type VI glass felts fully adhered with hot asphalt. A min 3-ply asphaltic BUR or min 3-ply asphalt adhered modified bitumen roof covering Approved for use over the base sheet is applied. Meets Class 1-90 when the form deck is secured at every flute or 1-60 when the form deck is secured at every other flute.

Approved mechanically fastened base sheets and base sheet fasteners are 1) Parabase, Parabase Plus, Ventsulation, GlasBase, Stratavent Eliminator Venting Base Sheet (Nailable), GAFGLAS #75, Dynabase, Tarmac SBS Base, or Perma Ply-R with FM-90 base ply fasteners FM-60 base ply fasteners and FM-30 discs or 2) Parabase,

Parabase Plus, Ventsulation, Dynabase, or BURmastic Composite Ply with 1 3 .4 in. (44 mm) long C-R Base Felt Fastener with Disc or Zono-tite Base Sheet Fastener with Disc.

Construction #2: NVS or Zonocel Concrete poured over structural concrete deck or a properly prepared existing BUR over structural concrete deck to min 1 .8 in. (3 mm) thickness. Min 1.0 in. (25 mm) thick Insulperm insulation is immediately applied over the slurry and followed by min 1 in. (25 mm) thick NVS or min 2 in. (50 mm) Zonocel concrete. A roof covering is then applied as described below.

Construction #2a: Base sheet, optional ply sheets and Approved 3-ply BUR (organic or glass felt) applied as in Construction #1a above. Roof cover system is sealed to deck in an airtight manner at the perimeter and all penetrations. Meets Class 1-120.

Construction ***2b:*** Base sheet, optional ply sheets and Approved 3-ply BUR (organic or glass felt or modified bitumen) applied as in Construction #1a above. Meets Class 1-90.

Construction #3: NVS or Zonocel concrete poured over structural concrete deck or a properly prepared existing BUR over structural concrete deck to min 1 in. (25 mm) thick. A roof covering is then applied as in Construction #2 above.

Construction #4: Insulcel concrete placed over structural concrete deck or a properly prepared existing BUR over structural concrete deck to min 1 .8 in. (3 mm) thickness. Min 1.0 in. (25 mm) thick Insulperm-1 or 5 insulation is immediately applied over the slurry and followed by min 1 in. (25 mm) thick NVS or min 2 in. (50 mm) Zonocel concrete. A roof covering is then applied as in Construction #1a above. Roof cover system is sealed airtight to the deck at the perimeter and all penetrations. Meets Class 1-90.

Construction #5: Insulcel concrete poured over structural concrete deck or a properly prepared existing BUR over structural concrete deck to min 1 in. (25 mm) thick. A roof covering is then applied as in Construction #1a above. Roof cover system is sealed airtight to the deck at the perimeter and all penetrations. Meets Class 1-90.