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RESEARCH REPORT: RR 23784  
CSI #05310)

Expires: October 1, 2009

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**GENERAL APPROVAL** - Renewal/Clerical Modification - Two-Hour Noncombustible Floor or Roof Construction using BHP Steel Building Products Exposed Steel Decks with Concrete Fill.

**DETAILS**

- A. Two-hour roof construction consisting of high-strength corrugated steel deck units exposed on the underside and covered with vermiculite concrete on top is approved with the following conditions:
- 1) The minimum thickness of the vermiculite concrete above the deck ridges shall be 2¼ inches.
  - 2) The vermiculite concrete mix by volume shall be one part portland cement to six parts vermiculite concrete aggregate. Water and an air-entraining agent shall not exceed 21 gallons and .56 pound per bag of cement, respectively. The concrete shall have a minimum compressive strength of 140 psi when tested in accordance with ASTM C495. Test data by a Los Angeles City approved testing agency shall be submitted for each job to verify the concrete strength.
  - 3) The slab shall be reinforced with wire mesh, 2" hexagons weighing 1.2 pounds per square yard with straight No. 16 gage galvanized steel wire woven into the mesh at 3" centers. The mesh shall be pulled up over the supports to approximately ½" below the top surface after final screeding. The mesh shall be pulled up with a hook on the end of a long pole so that there will be no foot traffic on the deck after mesh is lifted.
  - 4) Continuous inspection by a registered deputy building inspector shall be provided during the mixing and placing of the concrete.

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- 5) The steel deck units shall be of 26 MSG, or thicker, galvanized steel conforming to ASTM A446-60, Grade E, with a minimum yield strength of 80,000 psi. The corrugated sections shall have a depth of 1¼" to 1-5/16" and a pitch of 4" to 4-9/16". The deck units shall be welded to supports at 14" o.c. through standard weld washers with ¾" round hole. Side joints of adjacent units shall be welded or button-punched at 36" o.c.
  - 6) Clear span for decks with restrained ends shall not exceed 8' for the 24 MSG units (7'7" if ends are unrestrained) and 6' for the 26 MSG units. Maximum span may be limited further by structural requirements.
  - 7) The slab shall be covered with at least three plies of an approved fire retardant roof covering.
- B. Two-hour roof construction consisting of high-strength steel deck units exposed on the underside, covered with Redco Permalite (perlite) concrete on top, and restrained at ends (unrestrained rating one-hour), is approved with the following conditions:
- 1) The minimum thickness of the perlite concrete above the deck ridges shall be 2½ inches.
  - 2) The perlite concrete mix by volume shall be one part portland cement to six parts of perlite concrete aggregate with 12 gallons of water and 1.5 pt. of 12.5 percent solution of neutralized vinsol resin as an air entrainment agent. Minimum average air-dry density shall be 27 pcf.
  - 3) The slab shall be reinforced with 19 gauge galvanized wire mesh (2" hexagons) with 16 gauge. stiffener wires spaced 3" o.c. and running parallel to the metal deck corrugations. The mesh shall be pulled up over the supports to approximately ½" below the top surface directly after final screeding. The mesh shall be pulled up with a hook on the end of a long pole so that there is no foot traffic on the deck after mesh is lifted.
  - 4) Continuous inspection by a registered deputy building inspector shall be provided during the mixing and placing of the perlite concrete.
  - 5) The steel deck units shall be of 26 MSG, or thicker, galvanized steel conforming to ASTM A446-60, Grade E, with a minimum yield strength of 80,000 psi. The corrugated sections shall have a depth of 1¼" to 1-5/16" and a pitch of 4" to 4-9/16". The deck units shall be welded to supports at 12" o.c. through standard weld washers with ¾" round holes. Side joints of adjacent units shall be welded or button-punched at 36" o.c.

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- 6) Clear span for decks with restrained ends shall not exceed 8' for the 24 MSG units (7'-6" if ends are unrestrained) and 6' for the 26 MSG units. Maximum span may be limited further by structural requirements.
  - 7) The slab shall be covered with at least three plies of an approved fire retardant roof covering.
- C. For fire-rated floors or roofs using BHP Steel Building Products HIFORM type decks, exposed on the underside and covered with expanded shale or regular weight topping, see attached Table I.

## **DISCUSSION**

The clerical modification is to change the phone number and contact person.

The fire ratings are based on tests per ASTM E119.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

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**TABLE I**  
**BHP STEEL BUILDING PRODUCTS FIRE RATED FLOOR OR ROOF SYSTEM USING STEEL DECK UNITS WITH CONCRETE FILL**  
(General Notes 1 through 8)

UL No.	Applicable Deck Sections	Min. Sheet Thick. (MSG)	Concrete		Max. Span	Fire Rating	Special Notes
			Thick	Type			
D826	B & BF Hiform 24 & 30 & 36	20	3¼"	Lt. wt.	8' 10"	2 hr.	a, b
	N & NF Hiform, 2W & 3W Hiform	20	3¼"	Lt. wt.	12' 0"	2 hr.	a, b
D840	B Hiform 24 & 30 & 36	22	3¼"	Lt. wt.	7' 8"	2 hr.	b, c
	B & BF Hiform 24 & 30 & 36	20	3¼"	Lt. wt.	8' 8"	2 hr.	b, c
	B & BF Hiform 24 & 30 & 36	16	3¼"	Lt. wt.	9' 11"	2 hr.	b, c
	N & NF Hiform, 2W & 3W Hiform	18	3¼"	Lt. wt.	13' 2"	2 hr.	b, c
D902	B Hiform 24 & 30 & 36	22	3½"	Std. wt.	7' 8"	1 hr.	d, e
	B & BF Hiform 24 & 30 & 36	20	3½"	Std. wt.	8' 11"	1 hr.	d, e
	B & BF Hiform 24 & 30 & 36	16	3½"	Std. wt.	9' 11"	1 hr.	d, e
	N & NF Hiform, 2W, 2WF, 3W & 3WF Hiform	18	3½"	Std. wt.	13' 2"	1 hr.	d, e
	B Hiform 24 & 30 & 36	22	4½"	Std. wt.	7' 8"	2 hr.	d, e
	B & BF Hiform 24 & 30 & 36	20	4½"	Std. wt.	8' 11"	2 hr.	d, e
	B & BF Hiform 24 & 30 & 36	16	4½"	Std. wt.	9' 11"	2 hr.	d, e
	N & NF Hiform, 2W, 2WF, 3W & 3WF Hiform	18	4½"	Std. wt.	13' 2"	2 hr.	d, e
D907	B & F & 36	22	3¼"	Lt. wt.	9' 6"	2 hr.	f, g
	N & NF 24	22	3¼"	Lt. wt.	9' 6"	2 hr.	f, g
	2W & 2WF & 3W & 3WF, 24 & 36	22	3¼"	Lt. wt.	9' 6"	2 hr.	f, g

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#### GENERAL NOTES

1. The fire ratings are for decks which are restrained (against thermal expansion) at supports. For unrestrained condition see applicable notes for special requirements.
2. Unless otherwise specified "Lt. wt." indicates light weight concrete with a maximum density of 110 pcf + 3 pcf; the light weight concrete aggregates shall be expanded shale except that 50% or less of the fine aggregate may be regular sand; the light weight concrete shall have 4 to 7 percent entrained air; and minimum compressive strength of stone or light weight concrete shall be 3000 psi at 28 days. The concrete thickness refers to concrete above steel deck units.
3. The concrete shall be provided with shrinkage and temperature reinforcement placed approximately one inch from top of slab. The ratio of reinforcement area to concrete cross section area above top of steel deck units shall be not less than .001 each way, nor shall the reinforcement be less than 6" x 10" - #8/#8 wire mesh.
4. Maximum span is clear span.
5. Deck units shall be galvanized.
6. No ducts or electrical conduits shall be embedded in the slab.
7. Structural consideration of the deck systems may further limit the requirements herein.
8. Identification, including the company name and the designation of the deck type shall be provided on each deck unit.

#### SPECIAL NOTES

- a) For unrestrained assembly rating of 2-hr., the minimum thickness shall be 18 MSG for fluted units.
- b) The deck units shall be attached to supports with ½" diameter effective size puddle welds at edges and 16" o.c. between edges. Adjacent units shall be button-punched or welded together 36" o.c.
- c) The unrestrained assembly rating is one hour.
- d) The unrestrained assembly is not fire-rated.
- e) The deck units shall be attached to supports with ½" diameter effective size puddle welds 12" o.c. Adjacent units shall be button-punched or welded together 36" o.c. along side joints.
- f) For unrestrained assembly rating of 2 hours, the minimum unit thickness shall be 22 MSG fluted and 20/20 MSG cellular.
- g. The unrestrained assembly rating is 1 hour with W8 x 17 minimum size beam and 2 hour with W8 x 28 minimum size beam.