

BXUV.G702 -

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. G702

October 17, 2017

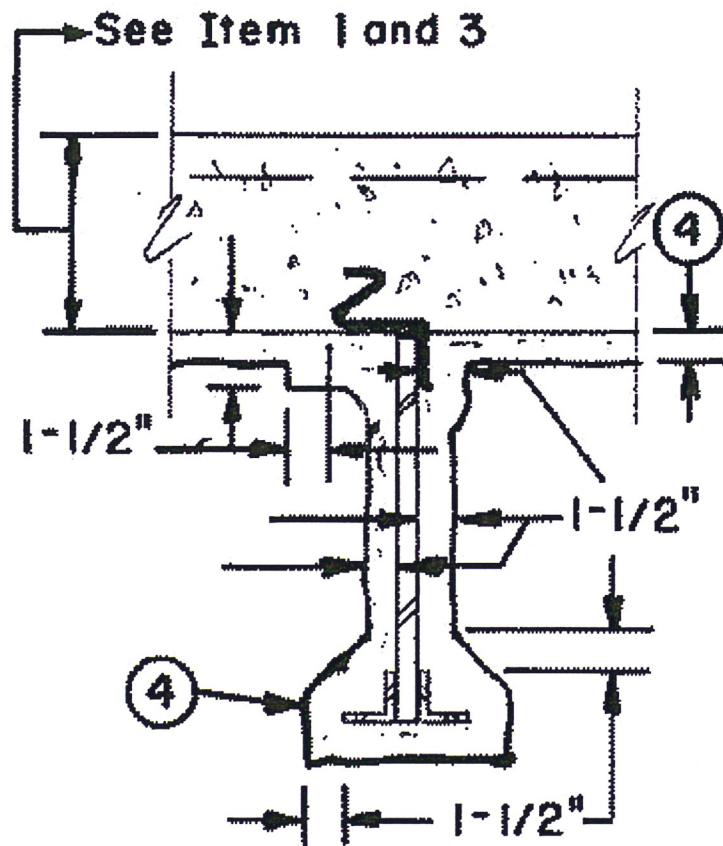
Restrained Assembly Ratings — 1, 1-1/2, 2 or 3 Hr (See Items 1, 3, 3A and 4)

Unrestrained Assembly Rating — 1, 1-1/2 or 2 Hr (See Items 1, 3 and 4)

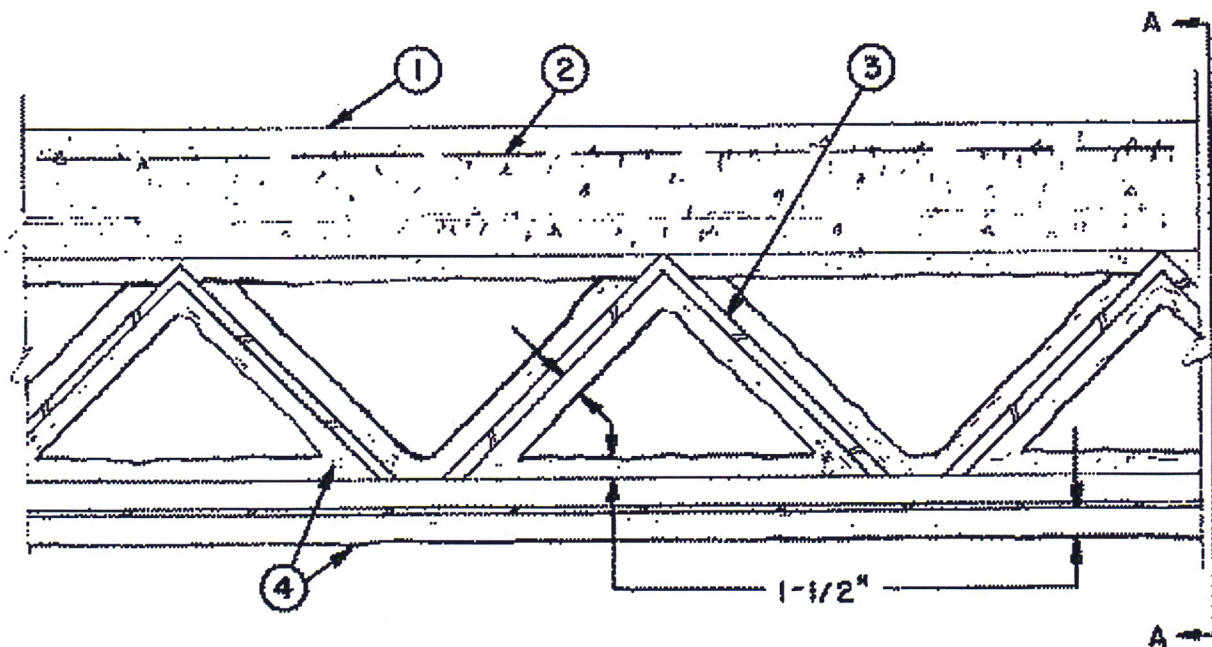
Unrestrained Beam Rating — 1, 1-1/2 or 2 Hr (See Items 3 and 4)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



Sec. AA



1. Normal-Weight Or Lightweight Aggregate Concrete — Normal weight concrete, carbonate or siliceous aggregate, 150 pcf unit weight, 3500 psi compressive strength, vibrated. Lightweight concrete, expanded shale, clay, or slate aggregate by rotary-kiln method, 117 pcf unit weight, 3500 psi compressive strength, vibrated, 2 oz air entrainment per bag of cement. Concrete may be cast over removable plywood forms for all ratings or over corrugated steel deck forms (Item 3A) for 2 Hr or lesser ratings. Min thickness of concrete topping over plywood forms is 3 in. Min thickness over top of corrugated steel forms (Item 3A) is 2-3/4 in. with Types D500, D510 joists, or mini joists Types TC, RTC or SRTC. Min concrete thickness, as measured from the bottom of the steel floor units with Types MD2000, MD and RMD joists is 4 in.

When no Spray-Applied Fire Resistive Materials protection is applied to the underside of concrete slabs, the Restrained and Unrestrained Assembly Ratings depend on the type of concrete aggregate and joist spacing as shown below, and are limited to a max 2 Hr ratings:

Restrained or Unrestrained Assembly Rating Hr	Normal Weight *		Lightweight *		Min Concrete Cover on Wire Fabric From Bottom of Slab In.
	Concrete Slab Thk In	Joist Spacing	Concrete Slab Thk In	Joist Spacing	
		50-1/2 In. OC Max		66 In. OC Max	
1	3-3/4	4-1/2	3	4-1/2	1
1-1/2	4-1/2	4-1/2	3-1/2	4-1/2	1-1/8
2	5-1/4	5-1/4	4	4-1/2	1-1/4

*Thicknesses of slab are measured from top of steel form units or top of plywood forms.

2. **Welded Wire Fabric** — As required for structural capacity but not less than the min areas determined in accordance with the latest ACI Specifications.

3. **Structural Steel Members** — * — Hambro joists with top chord embedded in concrete, spaced 50-1/2 in. O.C. max with protected floors and 66 in. O.C. max for unprotected concrete slabs (see Item 1). Two types of joists available, i.e., open web types designated D-500, and MD2000, or fabricated from single sheet of steel designated D-510. For short spans, mini joists, Types TC, RTC, SRTC, MD or RMD may be used as alternates to above joists. Max hourly rating with D-510 joists is 2 Hr. Min nom depth of D-510 joist is 8 in., min, steel thickness is 0.070 in. For D-500 or MD2000 joists, min area of bottom chord and web members depends on the thickness of Spray-Applied Fire Resistive Materials on the joist as shown in Item 4 below.

HAMBRO STRUCTURAL SYSTEMS, DIV OF CANAM STEEL CORP — Types D-500, D500LH, MD2000, or D-510. For short spans, Types TC, RTC, SRTC, MD and RMD joists.

3A. **Steel Form Units** — (Not shown), For use in 2 Hr or less rated assemblies only. 1-1/2 in. deep, 22 gauge galv fluted steel floor and form units for use with Types MD2000, MD and RMD joists. Optional nom 5/8 in. deep corrugated steel form units, nom 2-1/2 in. pitch, 28 gauge galv or uncoated for use with Types D-500, D510, TC, RTC and SRTC joists. Steel form units are not considered in calculating the load carrying capacity of the slab.

3B. **Permanent Roll Bars** — (Not shown, Optional) — Installed perpendicular to joists to support corrugated steel forms, Item 3A. Hat-shaped steel section, 1/2 in. wide, 2 or 2-1/2 in. deep, 18 gauge steel. Ends engaged into slots near top of joists, spaced 30 in. O.C. max.

3C. **Steel Joists** — (Not shown) — As an alternate to Structural Steel members (Item 3), Type 16K6 min size.

3D. **Horizontal Bridging** — (Not shown) — For use with noncomposite joists (Item 3C). Min 1-1/4x1-1/4x1/8 in. thick steel angles. Number and spacing per SJI Specifications. Welded to top and bottom chords of each joist. Min thickness of Spray-Applied Fire Resistive Materials on bridging is 1-1/2 in.

4. **Spray-Applied Fire Resistive Materials*** — All surfaces to which material is applied must be free of dirt, loose scale and oil before spraying. Applied by mixing with water and spraying in more than one coat approx 3/4 in. thick, to the required thickness on the joists and permanent roll bars (Item 3B) as tabulated below.

Type of Joist	Bottom Chord Sq In.	Min Area of Joist Web Sq In.	Thkns of Spray Applied Fire Resistive Mtl In.	Hr Rating
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D-500, 16K6 or MD2000	.708	.442	1-1/2	3 Hr or less Restrained Assembly 1-1/2 or 1 Hr Unrestrained Assembly 1-1/2 or 1 Hr Unrestrained Beam
D-500 or MD2000	.560	.299	2 with metal lath, 2-1/2 with- out metal lath (see item 5)	2 Hr or less Restrained Assembly 2 Hr or less Unrestrained Assembly 2 Hr or less Unrestrained Beam
D-510	—	—	1-5/8	2 Hr or less Restrained Assembly 1-1/2 or 1 Hr Unrestrained Assembly 1-1/2 or 1 Hr Unrestrained Beam

Material applied in one or thinner multiple coats to underside of steel form units, to a final thickness of 1/2 in. following the contour of the form units. When the thickness of flat reinforced-concrete slab is a min 3 or 4-1/2 in. for the 50-1/2 in. or the 66 in. joist spacing, respectively, per Item 1, but less than the tabulated min thicknesses in Item 1, the underside of the concrete slab shall be protected with Spray-Applied Fire Resistive Materials according to the table below:

Concrete Type	1 Hr Restrained Assembly Rating	2 Hr Restrained Assembly Rating	3 Hr Restrained Assembly Rating
Normal-Weight	3/8	3/4	1-1/4
Lightweight	—	3/8	1

For 2 h Unrestrained Assembly Rating with flat normal weight reinforced-concrete slab with min 3/4 in. concrete cover to the reinforcing steel, and 3/8 in. thickness of protection material on the bottom of the slab, the slab thicknesses and joist protection shall be according to the table below:

Concrete Type	Concrete Slab Thkns In.	Type of Joist	Min Bottom Chord Steel Area Sq In.	Min Area of Joist Web Sq In.	Thkns of Spray Applied Fire Resistive Mtl on Joist In.
Carbonate Aggregate	3-1/4	D-500	0.560	0.299	2 with metal lath and 2-1/2 without metal lath
Siliceous Aggregate	3-3/4	D-500	0.560	0.299	2 with metal lath and 2-1/2 without metal lath
Carbonate Aggregate	3-1/4	D-510	—	—	1-5/8
Siliceous Aggregate	3-3/4	D-510	—	—	1-5/8

Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G, Z-106/HY. Min avg and min ind density of 40/36 pcf respectively for Types Z-146, Z-146PC and Z-146T cementitious mixture. Min avg and min ind density of 50/45 pcf respectively for Types Z-156, Z-156T and Z-156PC. Application to steel deck requires the installation of expanded metal lath with Types Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC only. Min avg and min ind density of 19/18 pcf respectively for Type 7GP and 7HD. For method of density determination see Design Information Section.

GCP KOREA INC — Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6s, Monokote Acoustic 1.

PYROK INC — Type LD.

SOUTHWEST FIREPROOFING PRODUCTS CO — Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD.

GCP APPLIED TECHNOLOGIES INC — Types MK-6/HY, MK-6/HY Extended Set, MK-6s, MK-10HB, MK-10HB Extended Set, MK-1000HB, MK-1000HB Extended Set, Z-106/G, Z-106/HY, Z-146, Z-146PC, Z-146T, Z-156, Z-156PC, Z-156T, Monokote Acoustic 1, RG

5. Metal Lath — (Optional, not shown) — Metal lath may be used to facilitate the spray application of Spray-Applied Fire Resistive Materials to steel bar joists and trusses. Diamond mesh, 3/8 in. expanded steel lath, 1.7 to 3.4 lb/sq yd is secured to one side of each steel joist with No. 18 SWG galv steel wire at joist web and bottom chord members, spaced 15 in. OC. max. When used, the metal lath is to be fully covered with Spray-Applied Fire Resistive Materials with no min thickness requirements.

5A. Non-Metallic Fabric Mesh — (Optional, not shown) — As an alternate to metal lath, glass fiber fabric mesh, weighing approximately 2.5 oz/sq yd, polypropylene fabric mesh, weighing approximately 1.25 oz/sq yd or equivalent, may be used to facilitate the spray application. The mesh is secured to one side of each joist web member. The method of attaching the mesh must be sufficient to hold the mesh and the spray-applied resistive material in place during application and until it has cured. An acceptable method of attaching the mesh is by embedding it in min 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced a max 12 in. O.C. along the top chord of the joist. Another method of securing the mesh is by using 1-1/4 in. long by 1/2 in. wide hairpin clips formed from 18 SWG or heavier steel wire.

6. Metal Lath — (Not Shown) — Required when Type 7HD is applied to concrete slab — Metal lath shall be 3/8 in. expanded diamond mesh, weighing 3.4 lb per sq yd. Secured to underside through steel washers with an outside diam of 1/2 in. with fasteners spaced 12 in. OC in both directions with lath edges overlapped approx 3 in.

7. Metal Lath — (Not Shown) — (Required with Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC, otherwise optional) — Metal lath shall be 3/8 in. expanded diamond mesh, weighing 2.5 lb per sq yd. Secured to underside of steel deck with No. 12 by 3/8 in. pan head self-drilling, self-tapping screws and steel washers with an outside diam of 1/2 in. screws spaced 12 in. OC in both directions with lath edges overlapped approx 3 in.

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