ONLINE CERTIFICATIONS DIRECTORY

Design No. P732
BXUV.P732
Fire Resistance Ratings - ANSI/UL 263

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

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. P732

July 30, 2014

Restrained Assembly Ratings — 1, 1-1/2, 2 or 3 Hr (See Item 10)

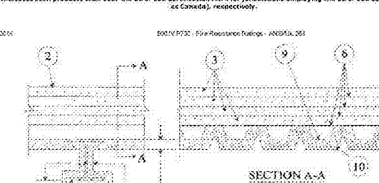
Unrestrained Assembly Ratings — 3/4, 1, 1-1/2, 2 or 3 Hr (See Item 10)

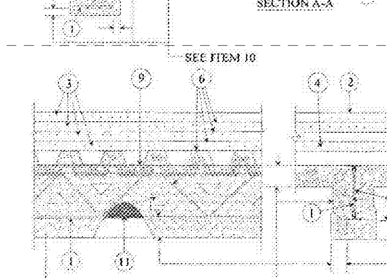
Unrestrained Beam Ratings — 1, 1-1/2, 2 or 3 Hr (See Item 10)

Restricted Load Condition — See Items 1 and 10C

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.**





1. **Beam** — Min W8x16 or W6x16 or Steel Joist — 10K1 or 16K2 min size with a max tensile stress of 30,000 psi or 12K3 or 12K5 min size with a max tensile stress of 24,000 psi.

2. **Roof Covering*** — Consisting of hot mopped or cold application bituminous materials compatible with the insulation(s) described herein which provide Class A, B or C coverings. See Roofing Materials and Systems Directory — Roof Covering Materials (TEVT).

2A. **In lieu of Item 2, roof covering consisting of single-ply Roofing Membrane*** — that is either ballasted, adhered or mechanically attached as permitted under the respective manufacturer's Classification. See Fire Resistance Directory — Roof Membrane (CHCI).

2B. **Metal Roof Deck Panels*** — (Not shown) — In addition to or in lieu of Item 2 or 2A, the roof covering may consist of a mechanically fastened metal roof deck panel assembly. See Fire Resistance Directory — Metal Roof Deck Panels (CETW).

3. **Roof Insulation — Foamed Plastic** — Polyisocyanurate foamed plastic insulation boards nom 48 by 48 or 96 in., to be applied in one or more layers. Boards to be installed with end joints staggered a min of 6 in. Min thickness shall be selected from the Table below. No limit on max overall thickness.

Restrained or Unrestrained Assembly Rating Hr	Min Insulation Thkns In. With Gypsum Wallboard	Without Gypsum Wallboard
1	1	2
1-1/2	1-1/2	3
2	1	3
3	2	3

ATLAS ROOFING CORP — Type ACFoam II, ACFoam III, ACFoam-II SL, ACFoam IV.

GAF — EnergyGuard RH, Tapered EnergyGuard RH

GAF — Isotherm R.

CARLISLE SYNTEC INCORPORATED — Types HP, HP-H, HP-N, HP-W.

DOW ROOFING SYSTEMS L L C — "Dow Tennico Polyisocyanurate Insulation", "Dow Tennico ISO 2000 Insulation", "Dow Termico ISO HP-FR".

FIRESTONE BUILDING PRODUCTS CO L L C — "ISO 95+ GL", "ISO 95+ FR", "ISO 95+ GW", "ISO 300", "ISO 95+ CAN", "ISOGARD HD Composite Board" or "RESISTA".

GENFLEX ROOFING SYSTEMS L L C — "GenFlex ISO".

HUNTER PANELS — H-Shield

JOHNS MANVILLE — ENRGY 3 25 psi, ENRGY 3, Tapered ENRGY 3, Tapered ENRGY 3 25 psi, ENRGY 3 AGF, Tapered ENRGY 3 AGF, ENRGY 3 25 psi AGF, Tapered ENRGY 3 25 psi AGF, ENRGY 3 CGF, Tapered ENRGY 3 CGF, ENRGY 3 25 psi CGF, Tapered ENRGY 3 25 psi CGF, ISO-3, Tapered ISO-3, ValuTherm, Tapered ValuTherm, ValuTherm 25 psi, Tapered ValuTherm 25 psi, ValuTherm AGF, Tapered ValuTherm AGF, ValuTherm 25 psi AGF, Tapered ValuTherm 25 psi AGF, ValuTherm CGF, Tapered ValuTherm CGF, ValuTherm 25 psi CGF, Tapered ValuTherm 25 psi CGF.

LOADMASTER SYSTEMS INC — Type Loadmaster polyisocyanurate insulation

RMAX OPERATING L L C — Type Multi-Max-3, Multi-Max FA-3, Ultra-Max, Ultra-Max Plus, Tapered Ultra-Max Plus, Tapered Thermaroof 3, Tapered Thermaroof FA-3, Tapered Ultra-Max.

SIKA SARNAFIL INC — Sarnatherm, Sarnatherm Ultra, Sarnatherm Tapered, Sarnatherm Ultra Tapered.

SOPREMA INC — Sopra-ISO, Sopra-ISO Tapered, Sopra-ISO+, Sopra-ISO+ Tapered, Sopra-ISO Plus, Sopra-ISO Plus Tapered.

3A. **Building Units*** — Not Shown — As an alternate to Item 3, composite polyisocyanurate foamed plastic insulation board with an adhered nailing surface, nom 48 by 96 in., may be used with the following limitations. These composite building units have ventilation slots internal to the panels. The thickness of the panel depends upon the thinnest portion of the polyisocyanurate insulation. The following dimensions apply to the polyisocyanurate insulation, min thickness is as indicated in accordance with Item 3. There is no limit on the max insulation thickness.

JOHNS MANVILLE — Type ISO-VENT.

3B. **Building Units*** — Polyisocyanurate foamed plastic insulation boards, nom [illegible] by 96 in., faced on the top surface with oriented strand board or plywood. Min thickness of the polyisocyanurate core is [illegible] in. No limit on max overall thickness. Boards to be installed with end joints staggered [illegible] in adjacent rows. Adhesive (Item 6) may be applied between the building units and the vapor retarder (or gypsum wallboard if vapor retarder is not used).

ATLAS ROOFING CORP — [illegible] base insulation and Vented R, C[illegible]

FIRESTONE BUILDING PRODUCTS CO L L C — Nail Base.

SOPREMA INC — Sopra-ISO CV 3.

3C. **Roof Insulation-Mineral and Fiber Boards*** — (Not Shown) — Optional, Applied in one or more layers over the Foamed Plastic (Item 3) to be applied with adhesive (Item 6), asphalt or coal tar pitch (Item 7) or mechanically fastened (Item 8).

JOHNS MANVILLE

ROXUL INC — MonoBoard™, MonoBoard™ Plus, "MonoBoard Plus S", TopRock®DD, TopRock® DD Plus or TopRock DD Plus S.

SOPREMA INC — SopraRock®MD, SopraRock®MD Plus, SopraRock®DD and SopraRock®DD Plus.

3D. **Building Units*** — As an alternate to Item 3, polyisocyanurate foamed plastic insulation boards, nom 48 by 48 or 96 in., faced on the top surface with oriented strand board. Min thickness of the polyisocyanurate core is 1.3 in. for the 1 hr rating without gypsum wallboard (Item 4) and for the 1, 1-1/2 and 2 hr ratings with gypsum wallboard and 2.6 for the 1-1/2 hr ratings without gypsum wallboard. No limit on max overall thickness. Boards to be installed with end joints staggered a min of 6 in. in adjacent rows.

JOHNS MANVILLE — Nailboard.

3E. **Building Units*** — As an alternate to Item 3, polyisocyanurate foamed plastic insulation boards faced on the underside (or both sides) with mineral fiber board. Min thickness of the polyisocyanurate core is 1.3 in. for the 1 hr rating without gypsum wallboard (Item 4) and for the 1-1/2 and 2 hr ratings with wallboard and 2.6 in. for the 1-1/2 hr ratings without gypsum wallboard. No limit on max overall thickness. Boards to be installed with end joints staggered a min of 6 in. adjacent rows. Adhesive (Item 6) may be applied between the building units and the vapor retarder (or gypsum wallboard if vapor retarder is not used).

FIRESTONE BUILDING PRODUCTS CO L L C — "ISO 95+ Composite"

JOHNS MANVILLE — Fesco-Foam.

3F. **Building Units*** — As an alternate to Item 3, polyisocyanurate foamed plastic insulation boards faced on the underside with wood fiber board. Min thickness of the polyisocyanurate core is 1.5 in. for the 1 hr rating without gypsum wallboard (Item 4) and for the 1-1/2 and 2 hr ratings with wallboard and 2.6 in. for the 1-1/2 hr ratings without gypsum wallboard. No limit on max overall thickness. Boards to be installed with end joints staggered a min of 6 in. in adjacent rows.

FIRESTONE BUILDING PRODUCTS CO L L C — "ISO 95+ Composite".

JOHNS MANVILLE — ENRGY 2 Plus.

3G. **Building Units*** — As an alternate to Item 3, polyisocyanurate foamed plastic insulation boards, nom 48 by 48 or 96 in., faced on the top surface with gypsum board. Min thickness of the polyisocyanurate core is 1.3 in. for 1 hr rating without gypsum wallboard (Item 4) and for the 1-1/2 and 2 hr ratings with wallboard (Item 4) and 2.6 in. for the 1-1/2 ratings without gypsum wallboard (Item 4). No limit on overall thickness. Boards to be installed with end joints staggered a min of 6 in. in adjacent rows. Adhesive (Item 6) may be applied between the building units and the vapor retarder (or gypsum wallboard if vapor retarder is not used).

JOHNS MANVILLE — ENRGY 2 Gypsum Composite.

3H. **Roof Insulation — Mineral and Fiber Boards*** — As an alternate to Item 3, to be applied in one or more layers with or without adhesive applied between vapor barrier and roof deck units, vapor barrier and board and each layer of board. When more than one layer is required, each layer of board to be offset in both directions from layer below a min of 6 in. in order to lap all joints. Min thickness is 2 in. when Item 2A or 2B is used. Min thickness is 1 in. otherwise.

BNCA INSULATION PRODUCTS INC — Permalite.

GAF — GAFTEMP Perlite.

JOHNS MANVILLE

3I. **Roof Insulation - Foamed Plastic*** — (Not Shown) As an alternate to Item 3 through 3H, polystyrene foamed plastic insulation boards, applied in one or more layers over gypsum wallboard. Min. thickness is 1.0 in. with no max overall thickness max density 2.5 pcf. When applied in more than one layer, each layer to be offset in both directions from layer below a min. of 6 in. in order to lap all joints. Boards secured to gypsum wallboard (Item 4) with glaze coat or adhesive (Item 6). Adhesive and/or asphalt glaze coat may be omitted when Item 2A is used. See Foamed Plastic (BRYX) category in the Building Materials Directory or Foamed Plastic (CCVW) category in the Fire Resistance Directory for names of manufacturers.

3J. **Fiber, Sprayed*** — (Not Shown) — For 1 hr rating only — As an alternate to Items 3 through 3I, Spray applied cellulose insulation material. The fiber is applied with water to a min. thickness of 18 in. as measured from the top plane of the roof deck in accordance with the application instructions supplied with the product. Minimum density of 2.6 pcf. Gypsum board not required over steel roof deck. Min. 1 in. thickness of Spray-Applied Fire Resistive Material* (Items 10, 10A, 10C) required on underside of steel deck. When Item 3J is used, Roof Covering (Items 2, 2A and 2B) shall not be directly applied over sprayed fiber.

U S GREENFIBER L L C — Cocoon stabilized cellulose insulation.

3K. **Roof Insulation - Foamed Plastic*** — (Not Shown) - Optional, a minimum of 1/4 in. thick - Placed over minimum 1-1/2 in. thick polyisocyanurate Foamed Plastic (Item 3) to be applied with adhesive (Item 6), asphalt or coal tar pitch (Item 7) or mechanically fastened (Item 8). Boards to be installed with end joints to be offset in both directions from layer below a min of 6 in. in order to lap all joints.

JOHNS MANVILLE — Invinsa.

3L. **Foamed Plastic*** — (Optional) - (Not Shown) - Maximum 1 in. thick polyisocyanurate foamed plastic insulation boards, nom 48 by 48 or 96 in. Boards may be applied as the top layer in addition to the specified min thickness of any roofing system described herein, as long as the roofing system states that there is no limit on maximum thickness. Joints offset in both directions from layer below.

FIRESTONE BUILDING PRODUCTS CO L L C — "ISOGARD HD"

3M. **Foamed Plastic*** — As an alternate to Items 3 - 3I, polyurethane foamed plastic roof insulation. When used, gypsum board (Item 4) is required. Formed by the simultaneous spraying of two liquid components applied over the gypsum board (Item 4) in accordance with the manufacturer's instructions. Min thickness shall be selected from the table above. No limit on max overall thickness.

BASF CORP — Types FE 305 2.7, FE-348, FE548-2.5, FE348-2.7, FE248-2.8, FE548-3.0, ELASTOSPRAY 81255, ELASTOSPRAY 81275, ELASTOSPRAY 81205 or ELASTOSPRAY 81305.

BASF CORP — Elastospray 5100-2.0, Elastospray 5100-2.5, Elastospray 81302, Elastospray 81272, Elastospray Alpha System, Elastospray 81252.

4. **Gypsum Board** — (Not shown) — (Classified or Unclassified) — May be used to obtain various Restrained or Unrestrained Assembly Ratings as described in Item 10. Supplied in sheets nom 4 by 8 or 12 ft by 5/8 in. thick. Min. weight 2.2 psf. Applied perpendicular to steel roof deck direction with end joints staggered 2 ft in adjacent rows. End joints to occur over crests of steel roof units.

ACADIA DRYWALL SUPPLIES LTD (View Classification) — CKNX.R25370

AMERICAN GYPSUM CO (View Classification) — CKNX.R14196

BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO (View Classification) — CKNX.R19174

CERTAINTEED GYPSUM INC (View Classification) — CKNX.R3660

CGC INC (View Classification) — CKNX.R19751

CONTINENTAL BUILDING PRODUCTS OPERATING CO, L L C (View Classification) — CKNX.R19302

GEORGIA-PACIFIC GYPSUM L L C (View Classification) — CKNX.R2717

LOADMASTER SYSTEMS INC (View Classification) — CKNX.R11309

NATIONAL GYPSUM CO (View Classification) — CKNX.R3501

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM (View Classification) — CKNX.R[illegible]

PANEL REY S A (View Classification) — CKNX.R[illegible]

SIAM GYPSUM INDUSTRY (SARABURI) [illegible] (View Classification) — CKNX.R[illegible]

THAI GYPSUM PRODUCTS [illegible] (View Classification) — CKNX.R27517

UNITED STATES GYPSUM CO (View Classification) — CKNX.R1319

USG MEXICO S A DE C V (View Classification) — CKNX.R16089

5. **Vapor Retarder — (Sheathing Material*)** — (Optional) — (Not shown) — Vinyl film or paper scrim vapor barrier, applied over steel roof deck or gypsum wallboard with adhesive (Item 6), hot asphalt (Item 7) or laid loosely, overlapped approx 2 in. at adjacent edges. See **Sheathing Material** (CHIZ) category for names of manufacturers.

5A. **Sheathing Material*** — (Optional) — In lieu of Item 5, a self-adhered rubberized asphalt roofing underlayment membrane may be placed on top of steel roof deck, gypsum wallboard or on the roof insulation.

W R GRACE & CO - CONN — Grace Ice and Water Shield, Grace Ice and Water Shield HT®, Grace Select, Grace Ultra, and Grace Basic.

6. **Adhesive* — (Optional)** — The vapor retarder, the gypsum wallboard or the first layer of roof insulation may be secured with adhesive to the steel deck surfaces. Also used to attach the vapor retarder to gypsum wallboard, the first layer of insulation to vapor retarder or gypsum wallboard and each additional layer of insulation. Applied in 1/2 in. wide ribbons 6 in. OC at 6.4 gal/100 sq ft. See **Adhesives** (BYWS) category for names of manufacturers.

6A. **Adhesive* - (Optional)** — (Bearing the UL Classification Marking for Roof Systems (TGFU)) — When FAST 100 adhesive is used, the Unrestrained Assembly Ratings are limited to 1, 1-1/2 and 2 hr. The vapor retarder, the gypsum wallboard or the first layer of roof insulation may be secured with adhesive to the steel roof surfaces. Also used to attach the vapor retarder to gypsum wallboard, the first layer of insulation to vapor retarder or gypsum wallboard and each additional layer of insulation. Applied at a max rate of 15.9 g/ft². When FAST 100 adhesive is used, additional **Spray-Applied Fire Resistance Materials* (CHPX)** is required on the deck for the 1-1/2 and 2 hr Unrestrained Assembly Ratings. The thickness specified for the deck shall be increased by 1/16 in. for 1-1/2 hr Unrestrained Assembly Rating and 1/4 in. for 2 hr Unrestrained Assembly Rating.

CARLISLE SYNTEC INCORPORATED — FAST 100

7. **Asphalt or Coal Tar Pitch*** — (Optional) — (Not shown) — The vapor retarder, the gypsum wallboard of the first layer of roof insulation may be secured with asphalt or coal tar pitch to the steel deck surfaces at a max rate of 15 lb/100 sq ft. Also used to attach the vapor retarder to gypsum wallboard, the first layer of insulation to vapor retarder or gypsum wallboard and each additional layer of roof insulation, applied at a max rate of 25 lb/100 sq ft.

8. **Mechanical Fasteners — (Optional)** — (Not shown) — Mechanical screw type fastener with metal or plastic washer designed for this purpose may be used to attach one or more layers of insulation to steel roof deck.

9. **Steel Roof Deck** — (Unclassified) — Min 1-1/2 in. deep and 36 in. wide galv fluted steel deck. Min gauge is No. 22 MSG. Ends overlapped at supports a min 1-1/2 in. and welded to supports 12 in. OC and at side laps. Side laps fastened with 1/4 in. long hex head, self-drilling, self-tapping steel screws spaced a max of 36 in. OC. **Classified Steel Floor and Form Units*** — Noncomposite 1-1/2 to 3 in. deep, 24 to 36 in. wide, min 22 MSG galvanized steel units. Ends overlapped at supports a min 1-1/2 in. and welded to supports 12 in. OC and at side laps. Side laps fastened with 3/4 in. long No. 12 self-drilling, self-tapping steel screws at 36 in. OC. As alternate to screw fasteners adjacent units may be button-punched or welded together 36 in. OC along side joints.

ASC STEEL DECK, DIV OF ASC PROFILES L L C — Types BH-36, BHN-36, BHN-35-1/4, DGB-36, B-36, BN-36, BN-35-1/4, NH-32, NHN-32, DGN-32, N-32 and NN-32. All units may be galvanized or Prime Shield™. Non-cellular decks may be vented designated with a "V" suffix to the product name.

CANAM STEEL CORP — Type P-3606, P-3615, P-2436, P-2404, P-2403, and P-2432 noncomposite.

CANAM STEEL CORP — Types B, F, N. Units may be phos/ptd or ptd/ptd.

CONSOLIDATED SYSTEMS INC — Types B, BI, F, N and NI. Units may be ptd/ptd.

NEW MILLENNIUM BUILDING SYSTEMS L L C — Types B, BI, F, N. Units may be phos/painted, ptd/ptd, or galvanized. Painted units may be used for ratings up to 2 h.

VERCO DECKING INC - A NUCOR CO — Types PLB, HSB, PLN and N, or Types PLN3, HSN3. Ptd/ptd units may be used for ratings up to 2 h.

VULCRAFT, DIV OF NUCOR CORP — Types BW, F, High Strength B, High Strength BW, N, ptd/ptd units may be used for ratings up to 2 h.

VULCRAFT, DIV OF NUCOR CORP — Galv Types 1.5B, 1.5BI, 1.5F, 3N and 3NI, phos/ptd units may be used for ratings up to 2 h.

Note: Type Z-106 Spray-Applied Fire Resistive Materials to be used with galv steel roof units only.

10. **Spray-Applied Resistive Material*** — Applied by mixing with water and spraying in more than one coat to final thicknesses as shown in the illustration above and in the table below to steel surfaces which must be clean and free of dirt, loose scale and oil. Steel deck surface must be "spatter" coated with Type SK-3 Spray-Applied Fire Resistive Materials prior to application of spray-applied resistive material. Type SK-3 spray-applied resistive material applied in accordance with the manufacturer's application instructions. When steel deck is used the area between the steel deck and the beams top flange shall be filled. Min average and min individual density of 15/14 pcf, respectively. For method of density determination, see Design Information Section. Thickness of the spatter coat is included in the total final thickness of the protection material.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Steel deck thickness # with Gypsum Wallboard	Steel deck thickness # Without Gypsum Wallboard	Beam Thickness full flange W8x28 Beam	Beam Thickness 1/2 flange## W8x28 Beam
1	0@	1	N/A	1	7/16	1/2
1	1	1	9/16 ***	1	7/16	1/2
1	1	1	3/8	1	7/16	1/2
1	1	1	1 *	1-5/8 *	7/16	1/2
1 1/2	1	1	3/4	1 1/4	9/16	13/16
1 1/2	1 1/2	1 1/2	13/16	1 3/8	5/8	13/16
1 1/2	1 1/2	1 1/2	1 1/2 *	2 1/8 *	5/8	13/16
2	1	1	1	1 1/2	3/4	1 1/16
2	1 1/2	1 1/2	1	1 1/2	3/4	1 1/16
2	2	2	1 1/8	1 11/16	7/8	1 1/16
2	2	2	2 *	2 5/8 *	7/8	1 1/16
2	1 1/2	1 1/2	1 1/2	2 1/8	1 3/16	1 5/8
3	2	2	1 1/2	2 1/8	1 3/16	1 5/8
3	3	3	1 5/8	2 3/8	1 3/8	1 5/8

\# The required minimum thickness of Spray-Applied Fire Resistive Materials on the steel deck is increased by 1/16 inch for 1-1/2 hr Un-restrained assembly rating and 1/4 inch for 2 hr Unrestrained Assembly rating when Item 6A is used.

\#\# When the thickness applied to the lower flange edges is reduced by one half, the 1/2 flange thickness is applicable.

* No minimum insulation thickness required

***Minimum insulation thickness (Item 3) 2 inches.

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 10K1 more than 4 ft OC	10K1 less than 4 ft OC	16K2 more than 4 ft OC	16K2 less than 4 ft OC
1	0@	1	1 1/8	1	15/16	15/16
1	1	1	1 1/8	1	15/16	15/16
1 1/2	1	1	1 5/16	1 5/16	1 1/4	1 3/16
1 1/2	1 1/2	1 1/2	1 7/16	1 7/16	1 1/4	1 3/16
2	1	1	1 7/16	1 7/16	1 9/16	1 1/2
2	1 1/2	1 1/2	1 7/16	1 7/16	1 9/16	1 1/2
2	2	2	2 3/16	2 3/16	1 9/16	1 1/2
3	1 1/2	1 1/2	3 1/4	2 13/16	2 1/4	2 1/8
3	2	2	3 1/4	2 13/16	2 1/4	2 1/8
3	3	3	3 1/4	2 13/16	2 1/4	2 1/8

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	W6x16 Beam Thickness
1	1	1	9/16
1 1/2	1	1	5/8
1 1/2	1 1/2	1 1/2	13/16
2	1	1	7/8
2	1 1/2	1 1/2	7/8
2	2	2	[illegible]
3	1 1/2	1 1/2	[illegible]
3	2	2	1 1/4
3	3	3	1 1/2

ARABIAN VERMICULITE INDUSTRIES — Types MK-6/HY, MK-6/HY Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-1000/HB, MK-1000/HB Extended Set, SK-3.

GRACE KOREA INC — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, SK-3.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, RG, SK-3.

10A. **Alternate Spray-Applied Fire Resistive Materials*** — Applied by mixing with water and spraying in one or more coats to final thicknesses as shown in the table below to steel beam surfaces which must be clean and free of dirt, loose scale and oil. When Type Z-106/G is used, the steel deck surface must be "spatter" coated with Type SK-3 Spray-Applied Fire Resistive Materials prior to application of spray-applied resistive material. Type SK-3 spray-applied resistive material applied in accordance with the manufacturer's application instructions. When steel deck is used the area between the steel deck and the beams top flange shall be filled. Min avg and min ind density of 22/19 pcf, respectively. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Steel deck thickness # with Gypsum Wallboard	Steel deck thickness # Without Gypsum Wallboard	Beam Thickness full flange W8x28 Beam	Beam Thickness 1/2 flange## W8x28 Beam
1	0@	1	N/A	1	7/16	1/2
1	1	1	9/16 ***	1	7/16	1/2
1	1	1	3/8	1	7/16	1/2
1	1	1	1 *	1-5/8 *	7/16	1/2
1 1/2	1	1	3/4	1 1/4	9/16	13/16
1 1/2	1 1/2	1 1/2	13/16	1 3/8	5/8	13/16
1 1/2	1 1/2	1 1/2	1 1/2 *	2 1/8 *	5/8	13/16
2	1	1	1	1 1/2	3/4	1 1/16
2	1 1/2	1 1/2	1	1 1/2	3/4	1 1/16
2	2	2	1 1/8	1 11/16	7/8	1 1/16
2	2	2	2 *	2 5/8 *	7/8	1 1/16
2	1 1/2	1 1/2	1 1/2	2 1/8	1 3/16	1 5/8
3	2	2	1 1/2	2 1/8	1 3/16	1 5/8
3	3	3	1 5/8	2 3/8	1 3/8	1 5/8

\# The required minimum thickness of Spray-Applied Fire Resistive Materials on the steel deck is increased by 1/16 inch for 1-1/2 hr Un-restrained assembly rating and 1/4 inch for 2 hr Unrestrained Assembly rating when Item 6A is used.

\#\# When the thickness applied to the lower flange edges is reduced by one half, the 1/2 flange thickness is applicable.

* No minimum insulation thickness required

***Minimum insulation thickness (Item 3) 2 inches.

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 10K1 more than 4 ft OC	10K1 less than 4 ft OC	16K2 more than 4 ft OC	16K2 less than 4 ft OC
1	0@	1	1 1/8	1	15/16	15/16
1	1	1	1 1/8	1	15/16	15/16
1 1/2	1	1	1 5/16	1 5/16	1 1/4	1 3/16
1 1/2	1 1/2	1 1/2	1 7/16	1 7/16	1 1/4	1 3/16
2	1	1	1 7/16	1 7/16	1 9/16	1 1/2
2	1 1/2	1 1/2	1 7/16	1 7/16	1 9/16	1 1/2
2	2	2	2 3/16	2 3/16	1 9/16	1 1/2
3	1 1/2	1 1/2	3 1/4	2 13/16	2 1/4	2 1/8
3	2	2	3 1/4	2 13/16	2 1/4	2 1/8
3	3	3	3 1/4	2 13/16	2 1/4	2 1/8

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	W6x16 Beam Thickness
1	1	1	9/16
1 1/2	1	1	5/8
1 1/2	1 1/2	1 1/2	13/16
2	1	1	7/8
2	1 1/2	1 1/2	7/8
2	2	2	1 1/16
3	1 1/2	1 1/2	1 1/4
3	2	2	1 1/4
3	3	3	1 1/2

ARABIAN VERMICULITE INDUSTRIES — Types Z-106, Z-106/G, Z-106/HY.

GRACE KOREA INC — Types Z-106, Z-106G, Z-106/HY.

W R GRACE & CO - CONN — Types Z-106, Z-106G, Z106/HY.

10B. **Alternate Spray-Applied Fire Resistive Materials*** — Applied by mixing with water and spraying in one or more coats to final thicknesses as shown in the table below to steel beam surfaces which must be clean and free of dirt, loose scale and oil. When steel deck is used, the area between the steel deck and the beams top flange shall be filled. Application to steel roof deck requires the installation of expanded metal lath. See Item 11A. Min avg and min ind density of 50/46 pcf respectively for Types Z-146, Z-146PC and Z-146T cementitious mixture. Min avg and min ind density of 50/42 pcf respectively for Types Z-156, Z-156T and Z-156PC. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Steel deck thickness # with Gypsum Wallboard	Steel deck thickness # Without Gypsum Wallboard	Beam Thickness full flange W8x28 Beam	Beam Thickness 1/2 flange## W8x28 Beam
1	0@	1	N/A	1-1/16	7/16	1/2
1	1	1	9/16 ***	1	7/16	1/2
1	1	1	5/8	1	7/16	1/2
1	1	1	1 *	1-7/16*	7/16	1/2
1 1/2	1	1	3/4	1 1/4	9/16	13/16
1 1/2	1 1/2	1 1/2	13/16	1 3/8	5/8	13/16
1 1/2	1 1/2	1 1/2	1 1/2 *	1-7/8*	5/8	13/16
2	1	1	1	1 1/2	3/4	1 1/16
2	1 1/2	1 1/2	1	1 1/2	3/4	1 1/16
2	2	2	1 1/8	1 11/16	7/8	1 1/16
2	2	2	2 *	2-5/16*	7/8	1 1/16
3	1 1/2	1 1/2	1 1/2	2 1/8	1 3/16	1 5/8
3	2	2	1 1/2	2 1/8	1 3/16	1 5/8
3	3	3	1 5/8	2 3/8	1 5/8	1 5/8

\# The required minimum thickness of Spray-Applied Fire Resistive Materials on the steel deck is increased by 1/16 inch for 1-1/2 hr Un-restrained assembly rating and 1/4 inch for 2 hr Unrestrained Assembly rating when Item 6A is used.

\#\# When the thickness applied to the lower flange edges is reduced by one half, the 1/2 flange thickness is applicable.

* No minimum insulation thickness required

***Minimum insulation thickness (Item 3) 2 inches.

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 10K1 more than 4 ft OC	10K1 less than 4 ft OC	16K2 more than 4 ft OC	16K2 less than 4 ft OC
1	0@	1	1 1/8	1	15/16	15/16
1	1	1	1 1/8	1	15/16	15/16
1 1/2	1	1	1 5/16	1 5/16	[illegible]	1 3/16
1 1/2	1 1/2	1 1/2	1 7/16	1 7/16	1 1/4	1 3/16
2	1	1	[illegible]	1 7/16	[illegible]	1 1/2
2	1 1/2	1 1/2	[illegible]	1 7/16	[illegible]	1 1/2
2	2	2	[illegible]	2 3/16	1 9/16	1 1/2
3	1 1/2	1 1/2	[illegible]	2 13/16	[illegible]	2 3/8
3	2	2	3 1/[illegible]	[illegible]	[illegible]	2 1/8
3	3	3	3 1/4	[illegible]	2 1/4	2 1/8

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1-hour.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	W6x16 Beam Thickness
1	1	1	9/16
1 1/2	1	1	5/8
1 1/2	1 1/2	1 1/2	13/16
2	1	1	7/8
2	1 1/2	1 1/2	7/8
2	2	2	1 1/16
3	1 1/2	1 1/2	1 1/4
3	2	2	1 1/4
3	3	3	1 1/2

ARABIAN VERMICULITE INDUSTRIES — Type Z-146 investigated for exterior use.

GRACE KOREA INC — Type Z-146 investigated for exterior use.

W R GRACE & CO - CONN — Type Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC investigated for exterior use.

10C. **Alternate Spray-Applied Fire Resistive Materials*** — Applied by mixing with water and spraying in more than one coat to final thicknesses as shown in the illustration above and in the table below to steel surfaces which must be clean and free of dirt, loose scale and oil. When steel deck is used the area between the steel deck and the beams top flange shall be filled. For minimum and maximum density of: Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, SK-3, RG, SK-3 see Item 10; Types Z-106, Z-106/G, Z-106/HY, Z-106/G see Item 10A; Type Z-146 see Item 10B.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness** 12K3 more than 4 ft OC	Joist thickness** 12K3 less than 4 ft OC
1	00	1	15/16	15/16
1	1	1	15/16	15/16
1 1/2	1 1/2	1 1/2	1 1/4	1 3/16
2	2	2	1 9/16	1 1/2
3	3	3	2 1/4	2 1/8

**Design load shall stress the 12K3 joist to a maximum tensile strength of 24,000 psi, which represents 80% of the maximum allowable design loading. Based on the Steel Joist Institute (SJI) Publication, "Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders" for guidance on how to increase the design loading accordingly.

@ When the maximum clear span of the steel decking is 5 ft. 2 in. or less, the Unrestrained Assembly Rating is 1 hour.

ARABIAN VERMICULITE INDUSTRIES — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, SK-3, Z-106, Z-106/G, Z-106/HY, Type Z-146 investigated for exterior use.

GRACE KOREA INC — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, SK-3, Types Z-106, Z-106/G, Z-106/HY, Type Z-146 investigated for exterior use.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended, MK-10 HB, MK-10 HB Extended Set, MK-1000/HB, MK-1000/HB Extended Set, RG, SK-3, Types Z-106, Z-106/G, Z106/HY, Type Z-146 investigated for exterior use.

11. **Nonmetallic Fabric Mesh** — (Optional) — As an alternate to the optional use of metal lath, glass fiber fabric mesh, weighing approx 2.5 oz/sq yd, polypropylene fabric mesh, weighing approx 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 Spray-Applied Fire Resistive Materials material in place during application until it has cured. An acceptable method to attach the mesh is by embedding the mesh in min 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced 6 max of 12 in. OC along the top chord of the bar joist. Another method to secure the mesh is by 1-1/4 in. long by 1/2 in. wide hairpin clips formed from No. 18 SWG or heavier steel wire.

The method of attaching the mesh must be sufficient to hold the mesh and the spray applied Spray-Applied Fire Resistive Materials material in place during application until it has cured. An acceptable method to attach the mesh is by embedding the mesh in min 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced 6 max of 12 in. OC along the top chord of the bar joist. Another method to secure the mesh is by 1-1/4 in. long by 1/2 in. wide hairpin clips formed from No. 18 SWG or heavier steel wire.

11A. **Metal Lath** — (Not Shown) — (Required with Item 10B, 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 edges overlapped approx 3 in.

11B. **Metal Lath** — (Not Shown) — (Required on both sides of joists with Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC, otherwise optional) — Metal lath may be used to facilitate the spray application of Spray-Applied Fire Resistive Materials on steel bar joists and trusses. The 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 its min thickness requirements.

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

Last Updated on 2014-07-01

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ONLINE CERTIFICATIONS DIRECTORY

System No. CW-D-1014
XHDG.CW-D-1014
Perimeter Fire-containment Systems

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Design/System/Construction/Assembly Usage Disclaimer

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- 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.

XHDG - Perimeter-fire-containment Systems

See General Information for Perimeter-fire-containment Systems

System No. CW-D-1014

May 06, 2013

F Rating — 2 Hr

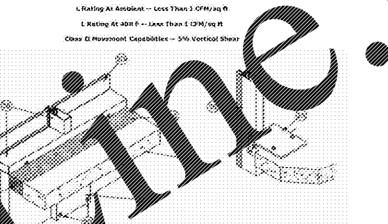
T Rating — 1/2 Hr

Linear Opening Width — 4 In. Max

L Rating At Ambient — Less Than 1 CFM/sq ft

L Rating At 400 F — Less Than 1 CFM/sq ft

Class II Movement Capabilities — 5% Vertical Shear



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Brackets** — Min 3 in. (76 mm) by 3 in. (76 mm) by 1/4 in. steel angles attached through the mullion on each side with min 3/8 in. (10 mm) diam steel bolts with steel nuts and washers. The brackets are attached to a min 8 in. (203 mm) by 3-1/4 in. (83 mm) by 1/2 in. (13 mm) thick steel angles with a min 4 in. (31 mm) long with min 1/2 in. (13 mm) diam steel bolts with steel nuts and washers. The 8 in. (203 mm) by 3-1/4 in. (92 mm) angle is secured to the top of floor with two min 1/2 in. (13 mm) diam steel masonry anchors in conjunction with steel washers.

A1. **Mullion Mounting Brackets** — As an alternate to Item 2A, min 8 in. (203 mm) wide by 3/4 in. (19 mm) thick extruded aluminum Halfen mounting brackets with one nom 2 in. (51 mm) high leg for support and attachment of mullion and with one leg at least 6 in. (152 mm) longer than width of linear opening between floor assembly and mullion. Mounting bracket attached to top of floor with two min 1/2 in. (13 mm) diam steel masonry anchors in conjunction with washer plates supplied with mounting bracket.

B. **Framing** — The two-piece rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be min 2-1/2 in. (64 mm) wide by 7-1/2 in. (191 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1.52 m) OC and secured to mullion mounting brackets (Item 2A) at each floor level. Interior face of mullions to be max 4 in. (102 mm) from edge of floor assembly. Transoms to be spaced min 24 in. (610 mm) OC. The minimum height from the top of the floor to the bottom of the vision panel sill is 0 in. The maximum height from the top of the floor to the bottom of horizontal transom is 3 in. (76 mm).

C. **Spandrel Panels** — The spandrel panels shall consist of one of the following types:

a. **Glass Panels** — Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

b. **Aluminum Panels** — Nom 1/8 in. (3 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

c. **Stone Panels** — Nom 1-3/16 in. (46 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

D. **Vision Panels** — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass or nom 1 in. (25 mm) thick insulated glass units with two layers of nom 1/4 in. (6 mm) thick transparent heat-strengthened glass separated by a 1/2 in. (13 mm) air space. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. **Curtain Wall Insulation*** — Min. 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder. Impasse® Horizontal Hangers are installed in the insulation batt 6 in. (152 mm) from each mullion end and spaced max 16 in. (406 mm) OC across at the window of transom. One Impasse® Vertical Hanger is installed along both vertical mullion sides of the insulation batt at 6 in. (152 mm) up from the bottom of the insulation batt. Insulation batt is then installed in spandrel area flush with the interior surface of the framing with no vertical or horizontal seams. Impasse® Horizontal Hangers are screw attached to top horizontal transom. Impasse® Vertical Hangers are screw attached to vertical mullions using min No. 10 by min. 1/2 in. (13 mm) self-drilling/self-tapping screws. No attachment to the lower horizontal transom is required.

THERMAFIBER INC — FIRESPAN® 90

F. **Mullion Covers - Curtain Wall Insulation*** — Nom 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder, supplied in min 24 by 48 in. (559 by 1219 mm) boards. Min. 12 in. (305 mm) wide strips to be centered over mullions secured to curtain wall insulation (Item 2E) with a min. of four Spiral Anchors (Item 2G) spaced a max 12 in. (305mm) OC. Mullion covers to tightly abut the bottom of the forming material (Item 3A).

THERMAFIBER INC — FIRESPAN® 90

G. **Light Gauge Framing* - Spiral Anchor** — Galv steel wire spiral anchor used to secure the curtain wall insulation (Item 2F and 2G). Nom length of spiral anchors to be 3-3/4 in. (95 mm), spaced max 12 in. (305 mm) OC.

THERMAFIBER INC — Spiral Anchor

H. **Aluminum Sandwich Panel** — (Optional, Not Shown) - Min 1/8 in. (3.2 mm) solid aluminum panel or aluminum composite panel installed on exterior surface of curtain wall

insulation (Item 2E).

3. **Safing System** — Max separation between edge of floor assembly and face of framing members (at time of installation) is 4 in. (102 mm). The safing system is designed to accommodate vertical shear movement up to a max of 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Nom 4 pcf (64 kg/m³) density mineral wool batt insulation. Batt sections cut to 4 in. (102 mm) width and stacked to a thickness which is min 25 percent greater than the width of the linear gap between the curtain wall insulation and the edge of the concrete floor slab. The forming material is compressed and inserted cut-edge-first into linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly-butted seam is permitted between mullions. Additional piece of forming material to be friction-fit into gap between batt sections above mullion mounting clip at each mullion location.

THERMAFIBER INC — SAF

B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3 mm) wet thickness (min 1/16 in. (1.5 mm) dry thickness) of fill material spray-applied over top of forming material and lapping min 1/2 in. (13 mm) onto the top surface of the floor and onto the curtain wall insulation (Item 2E) and mullion covers (Item 2F).

SPECIFIED TECHNOLOGIES INC — SpecSeal AS200 Elastomeric Spray or SpecSeal Fast Tack Spray

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Last Updated on 2013-05-08

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400 Galleria Pkwy . Suite 100 . Atlanta, Ga 30339 . Phone: 404.733.5493

Architecture Planning Facilitation Design

CGLS ARCHITECTS

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DATE	NO.	DESCRIPTION
03/27/18		GDOE PRELIMINARY SUBMITTAL / DESIGN DEVELOPMENT
06/19/18		50% CONSTRUCTION DOCUMENTS
09/17/18		GDOE CHECK-SET/ PERMIT SET
10/10/18		FINAL GDOE SUBMITTAL
11/01/18		ISSUED FOR PROPOSALS

DOE FACILITY CODE: 660 -3066

RIVERWOOD HIGH SCHOOL-PHASE 3-8
AUDITORIUM/GYMNASIUM ADDITION

5900 RAIDER DRIVE NW SANDY SPRINGS, GA 30328

FULTON COUNTY SCHOOLS RFP NO. 411-19

SHEET TITLE
U.L. ASSEMBLIES

PROJECT NO. 16015.02

DATE: 09/17/18

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