HP Geotech
HEPWORTH-PAWLAK GEOTECHNICAL

Hepworth-Pawlak Geotechnical, Inc.
5020 County Road 154
Glenwood Springs, Colorado 81601
Phone: 970-945-7988

Fax: 970-945-8454
email: hpgeo@hpgeotech.com

January 10, 2012

Bill Critton
c/o Tri-State Trucking
P.O. Box 789
Vernal, Utah 84078

Job No. 106 0684

Subject: Observation of Excavation, Proposed Maintenance Shop, north of Rulison Exit and I-70, Garfield County, Colorado

Dear Mr. Critton:

As requested by Wes Sorenson, a representative of Hepworth-Pawlak Geotechnical, Inc. observed the excavation at the subject site on January 10, 2012 to evaluate the soils exposed for foundation support. The findings of our observations and recommendations for the foundation design are presented in this report. We previously conducted a subsoil study for design of foundations at the site and presented our findings in a report dated February 6, 2007, Job No. 106 0684.

The building is located similar to that shown in our previous report. Spread footings placed on the natural soils and sized for an allowable bearing pressure of 1,500 psf were designed for the building support based on our previous report recommendations.

At the time of our visit to the site, the foundation excavation had been cut in mainly one level from about 3 to 3½ feet below the adjacent ground surface. The soils exposed in the bottom of the excavation consisted of silty sandy clay with rock fragments. The footing areas had been formed and reinforcement steel had been placed. Construction blankets had covered the excavation and the soils at bearing level were not frozen. No free water was encountered in the excavation and the soils were slightly moist.

The soil conditions exposed in the excavation are consistent with those previously encountered on the site and suitable for support of spread footings designed for the recommended allowable bearing pressure of 1,500 psf. Precautions should be taken to prevent wetting of the bearing soils that could result in foundation settlement and building distress. The bearing soils should be protected from frost and concrete should not be placed on frozen soils. Other recommendations presented in our previous report which are applicable should also be observed.

The recommendations submitted in this letter are based on our observation of the soils exposed within the foundation excavation and the previous limited subsurface exploration at the site. Variations in the subsurface conditions below the excavation could increase

the risk of foundation movement. We should be advised of any variations encountered in the excavation conditions for possible changes to recommendations contained in this letter. Our services do not include determining the presence, prevention or possibility of mold or other biological contaminants (MOBC) developing in the future. If the client is concerned about MOBC, then a professional in this special field of practice should be consulted.

If you have any questions or need further assistance, please call our office.

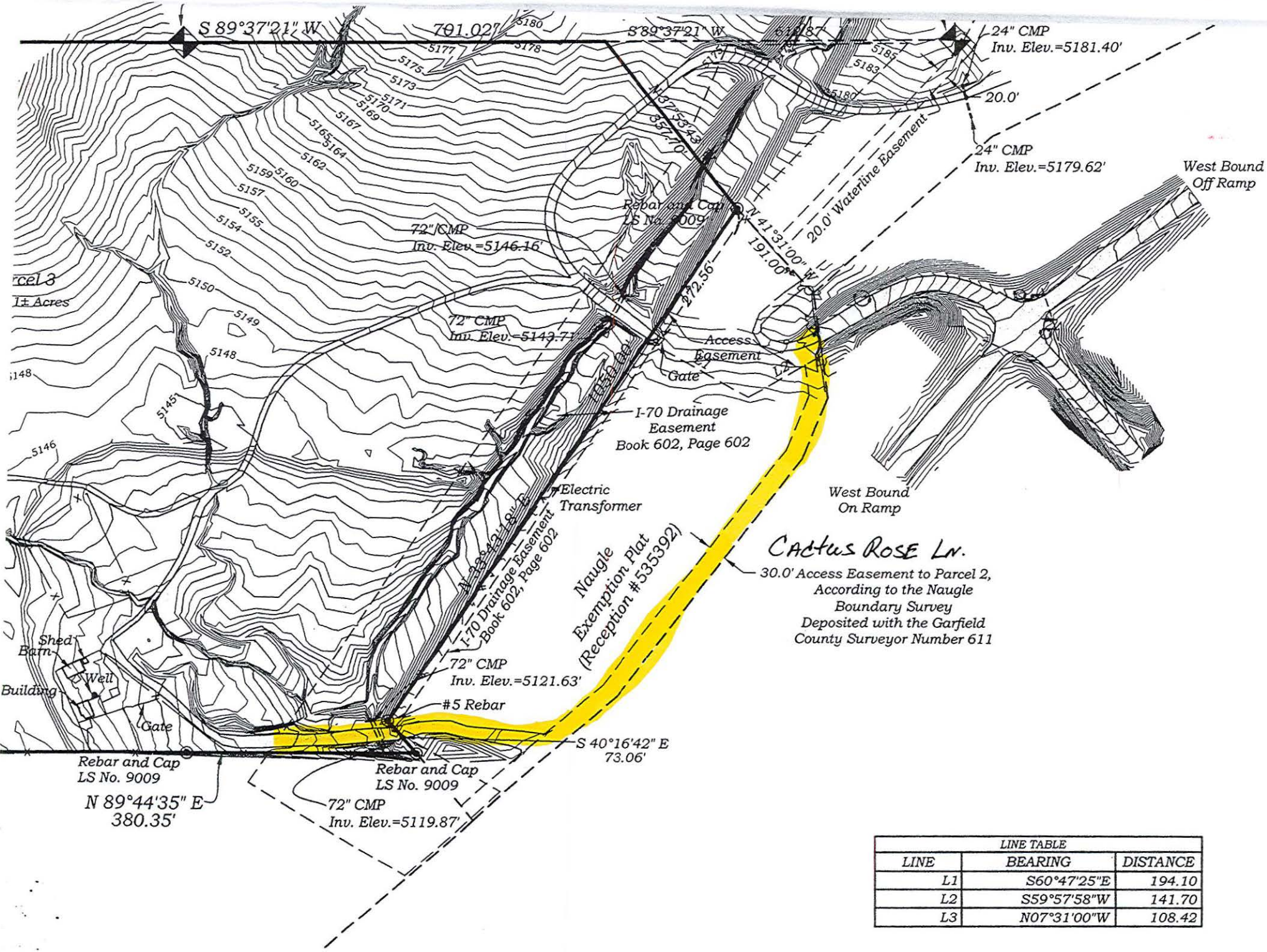
Sincerely,

HEPWORTH – PAWLAK GEOTECHNICAL, INC.

Steven L. Pawlak, P.E.

SLP/ksw

cc: Garfield County Building Department – Lola (vmercer@garfield-county.com)



LINE TABLE		
LINE	BEARING	DISTANCE
L1	S60°47'25"E	194.10
L2	S59°57'58"W	141.70
L3	N07°31'00"W	108.42

INSULATION
COMPANY

LETTER OF TRANSMITTAL

To: Garfield County Building Official

Date: 2/20/13

Re: Tri State Trucking Building, Rifle, CO

Attached: Grace Construction Products – Monokote
2 Hr Rating Opinion – From Grace Technical Department
3 Hr Rating Opinion – From Grace Technical Department
UL P732 and UL X772 Designs (as per Opinion Sheets)
Calculation Page – From Grace Technical Department

Action: For your use.

Notes:

Transmitted by: Richard Kihnley

AI Insulation Company 1241 Heritage Drive Carbondale, CO 81623
970-945-5088 p 970-945-5154 f

Grace Construction Products

W. R. Grace & Co.
62 Whittemore Avenue
Cambridge, MA 02140

T: 617-498-4935
F: 617-498-4419
M: 781-258-6463
E:john.a.dalton@grace.com
W: grace.com

John Dalton
Grace Technical Services
Fire Protection Products

GRACE

Date: February 14, 2013

Contact: Richard Kihnley
Aspen Insulation

Project: Tri-State Trucking
Rifle, CP

Re: Fire Rating of Tapered Steel

Dear Mr. Kihnley,

You have requested our opinion on the provision of an ASTM E-119 fire resistance rating to a series of tapered steel beams and columns on the above named project.

It is our understanding that there exists a requirement to provide a 2-hour rating to the members. We have reviewed the plans that you submitted and it is our opinion that the required hourly ratings may be achieved via an application of Monokote® SFRM to the members at the thicknesses indicated below:

Drawing #	Member	Beam / column	UL Design	Thickness (in)
51555601 E-03	1	C	X772	2
	2	B	P732	1-5/16
	3	B	P732	1-1/2
	4	B	P732	1-1/2
	5	B	P732	1-3/16
	6	B	P732	1-3/16
	7	B	P732	1-1/4
	8	B	P732	1-1/4
	9	B	P732	1-3/16
	10	B	P732	1-3/16
	11	B	P732	1-1/4
	12	B	P732	1-1/2
	13	B	P732	1-1/2
	14	C	X772	2

Drawing #	Member	Beam / column	UL Design	Thickness (in)
51555601 E-04	1	C	X772	2
	2	B	P732	1-5/16
	3	B	P732	1-1/2
	4	B	P732	1-1/2
	5	B	P732	1-1/4
	6	B	P732	1-1/4
	7	B	P732	1-1/2
	8	B	P732	1-1/2
	9	B	P732	1-1/4
	10	B	P732	1-1/4
	11	B	P732	1-1/2
	12	B	P732	1-1/2
	13	B	P732	1-5/16
	14	C	X772	2

We trust that this information meets your needs. Please feel free to contact should you have any additional questions.

The above information should be submitted to the Authority Having Jurisdiction (AHJ) for review and approval.

Sincerely,

John Dalton
Technical Service Manager
Fire Protection Products
W.R. Grace

Grace Construction Products

W. R. Grace & Co.
62 Whittemore Avenue
Cambridge, MA 02140

T: 617-498-4935
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John Dalton
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GRACE

Date: February 14, 2013

Contact: Richard Kihnley
Aspen Insulation

Project: Tri-State Trucking
Rifle, CP

Re: Fire Rating of Tapered Steel

Dear Mr. Kihnley,

You have requested our opinion on the provision of an ASTM E-119 fire resistance rating to a series of tapered steel beams and columns on the above named project.

It is our understanding that there exists a requirement to provide a 3-hour rating to the members. We have reviewed the plans that you submitted and it is our opinion that the required hourly ratings may be achieved via an application of Monokote® SFRM to the members at the thicknesses indicated below:

Drawing	Member	Beam / column	UL Design	Thickness (in)
51555601 E-03	1	C	X772	3-3/16
	2	B	P732	2-1/16
	3	B	P732	2-1/16
	4	B	P732	1-15/16
	5	B	P732	1-7/8
	6	B	P732	1-7/8
	7	B	P732	1-15/16
	8	B	P732	1-15/16
	9	B	P732	1-7/8
	10	B	P732	1-7/8
	11	B	P732	1-15/16
	12	B	P732	2-1/16
	13	B	P732	2-1/16
	14	C	X772	3-3/16

Drawing	Member	Beam / column	UL Design	Thickness (in)
51555601 E-04	1	C	X772	3-3/16
	2	B	P732	2-1/16
	3	B	P732	2-1/16
	4	B	P732	2-1/16
	5	B	P732	1-15/16
	6	B	P732	1-15/16
	7	B	P732	2-1/16
	8	B	P732	2-1/16
	9	B	P732	1-15/16
	10	B	P732	1-15/16
	11	B	P732	2-1/16
	12	B	P732	2-1/16
	13	B	P732	2-1/16
	14	C	X772	3-3/16

We trust that this information meets your needs. Please feel free to contact should you have any additional questions.

The above information should be submitted to the Authority Having Jurisdiction (AHJ) for review and approval.

Sincerely,

John Dalton
Technical Service Manager
Fire Protection Products
W.R. Grace

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 Listed or Classified 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 as Classified, Listed, or Recognized.

Fire Resistance Ratings - ANSI/UL 263

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

Design No. P732

January 11, 2013

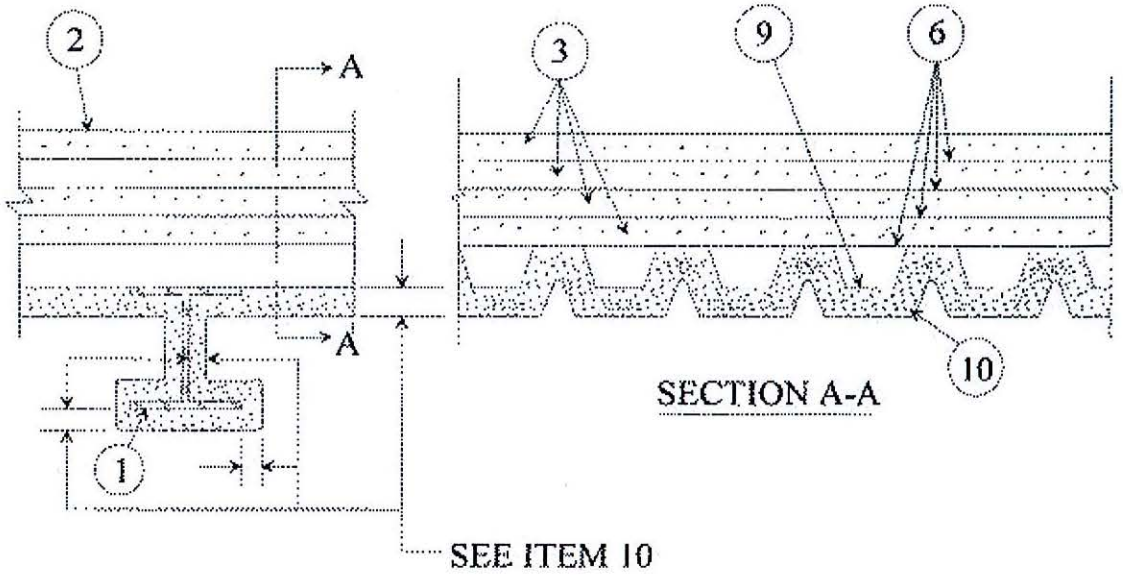
Restrained Assembly Ratings — 1, 1-1/2, 2 or 3 Hr (See Item 10)

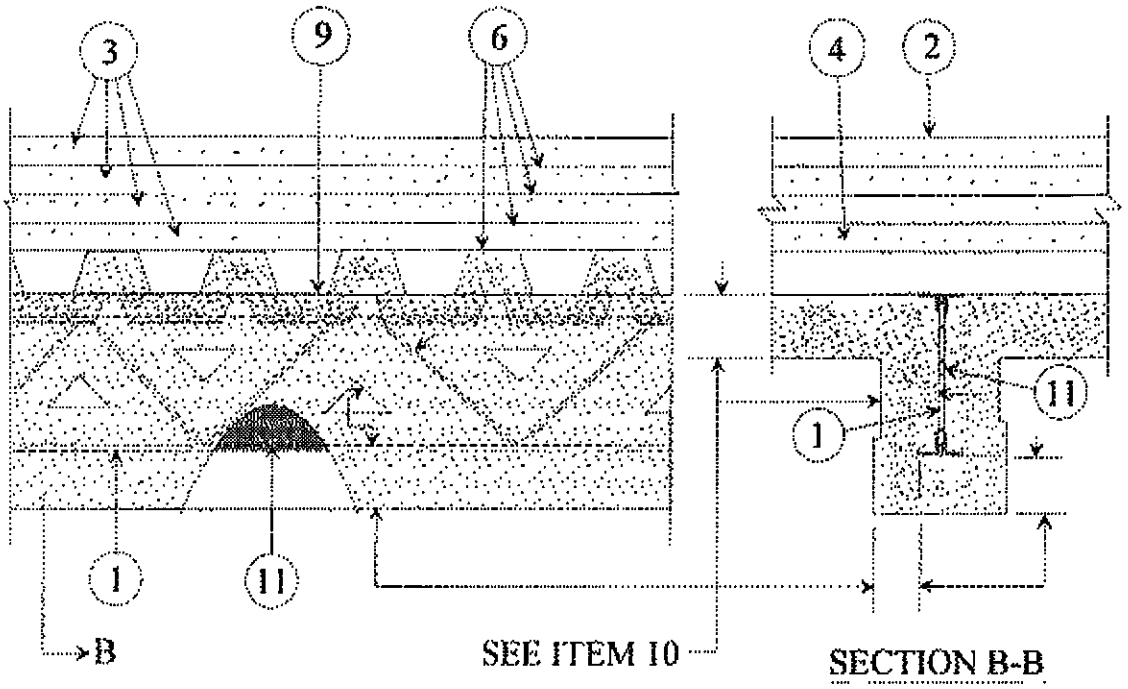
Unrestrained Assembly Ratings — 3/4, 1, 1-1/2, 2 or 3 Hr (See Item 10)

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

Restricted Load Condition — See Items 1 and 10C

Load Restricted for Canadian Applications — See Guide BXUV7





1. **Beam** — Min W6x16 or W8x28 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	2	3
3	2	3

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

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

DOW ROOFING SYSTEMS L L C — "Dow Termico Polyisocyanurate Insulation", "Dow Termico ISO 3000 Insulation", "Dow Termico ISO HP-FR".

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

GAF MATERIALS CORP — EnergyGuard RH, Tapered EnergyGuard RH

GAF MATERIALS CORP — Isotherm R.

GENFLEX ROOFING SYSTEMS L L C — "GenFlex ISO"

HUNTER PANELS — H Shield

JOHNS MANVILLE — ENRGY 3 25 PSI

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 r, Sarnatherm r Ultra, Sarnatherm r Tapered, Sarnatherm r Ultra Tapered.

SOPREMA INC — Colgrip ,SOPRA-ISO s, SOPRA-ISO s Tapered, SOPRA-ISO PLUS s, SOPRA-ISO PLUS s Tapered, SOPRA-ISO H PLUS s and SOPRA-ISO H PLUS s 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 48 or 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 measured 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 48 by 48 or 96 in., faced on the top surface with oriented strand board or plywood. Min thickness of the polyisocyanurate core is 1.3 in. No limit on max 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).

ATLAS ROOFING CORP — ACFoam Nailbase Insulation and Vented R, CrossVent.

FIRESTONE BUILDING PRODUCTS CO L L C — Nail Base.

SOPREMA INC — SOPRA-ISO B s

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 1.3 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. 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.

BMCA INSULATION PRODUCTS INC — Permalite.

GAF MATERIALS CORP — GARTEMP 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 asphalt 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 of 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 10 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, 10B) 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 coat tar pitch ((tem 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 minimum 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 - 3J, 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 303 2.7, FE-348, FE348-2.5, FE348-2.7, FE348-2.8, FE348-3.0, ELASTOSPRAY 81255, ELASTOSPRAY 81275, ELASTOSPRAY 81285 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. See **Gypsum Board** (CKNX) category for names of manufacturers.

5. **Vapor Retarder — Sheathing Material* —** (Optional) — (Not shown) — Vinyl film or paper scrim vapor barrier, applied to steel roof deck or gypsum wallboard with adhesive (Item 6), hot asphalt (Item 7) or laid loosely, overlapped approx 2 in. on adjacent sheets. 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 which 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 Basik.

6. **Adhesive* — (Optional)** — The vapor retarder, the gypsum wallboard or the first layer of roof insulation may be secured with adhesive to the steel crest 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 0.4 gal/100 sq ft. See **Adhesives** (BYWR) 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 crest 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 19.8 g/ft^2. 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 crest 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 the 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 1/2 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 fluted 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 INC — 24 through 36 in. wide, Types DGB Hi-Form, B Hi-Form, DGB, B, DGN Hi-Form, N Hi-Form, DGN, and N. All units may be galvanized or Prime Shield™.

ONLINE CERTIFICATIONS DIRECTORY

Design No. X772

BXUV.X772

Fire-resistance Ratings - ANSI/UL 263

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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.
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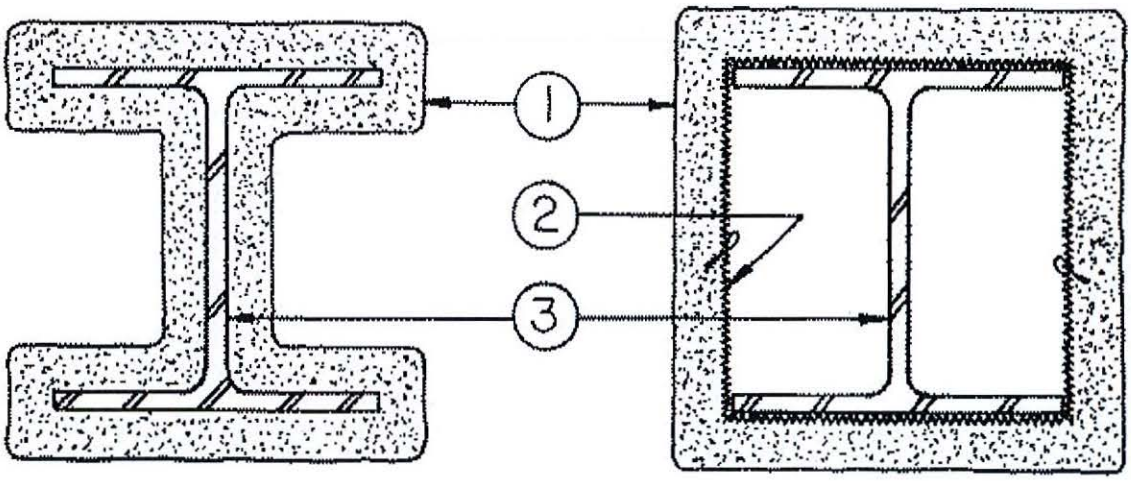
Fire-resistance Ratings - ANSI/UL 263

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

Design No. X772

February 12, 2013

Ratings — 1, 1-1/2, 2, 3 and 4 h.



1. **Spray-Applied Fire Resistive Materials*** — Applied by mixing with water and spraying in more than one coat to the thicknesses shown below, to steel surfaces which are clean and free of dirt, loose scale, and oil. 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 19/18 pcf respectively for Types 7GP and 7HD. 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. For method of density determination, see Design Information Section, Sprayed Material.

The thickness of Spray-Applied Fire Resistive Materials to be applied to all surfaces of the column (Item 1) required for rating periods of 1 h, 1-1/2 h, 2 h, 3 h, 4 h may be determined by the equation:

$$h = R$$

1.05 (W/D) + 0.61

Where:

h = Spray-Applied Fire Resistive Materials thickness in the range 0.25-3.875 in.

R = Fire resistance rating in hours (1 - 4 h)

D = Heated perimeter of steel column in inches

W = Weight of steel column in lbs per foot

W/D = 0.33 to 6.62

As an alternate to the equation, the minimum thickness of Spray-Applied Fire Resistive Materials required for various fire resistance ratings of contour sprayed or boxed columns may be determined from the table below:

Min Col Size	W/D	Min Thk In.				
		1 Hr	1-1/2 Hr	2 Hr	3 Hr	4 Hr
W4x13	0.556	7/8	1-5/16	1-1/16	2-1/2	3-3/8
W5x16	0.55	7/8	1-5/16	1-1/16	2-1/2	3-3/8
W5x19	0.644	13/16	1-3/16	1-9/16	2-3/8	3-1/8
W6x9	0.338	1-1/8	1-1/2	2	2 1/2	3-13/16
W6x12	0.448	15/16	1-7/16	1-7/8	2-3/4	3-3/4
W6x15	0.431	1	1-7/16	1-5/16	2-13/16	3-13/16
W6x16	0.584	13/16	1-1/4	1-11/16	2-1/2	3-5/16
W6x20	0.563	7/8	1-1/4	1-1/16	2-1/2	3-3/8
W6x25	0.696	3/4	1-1/8	1-1/2	2-1/4	3
W8x10	0.327	1-1/16	1-5/8	2-1/8	3-3/16	N/A
W8x13	0.421	1	1-7/16	1-5/16	2-7/8	3-13/16
W8x15	0.481	15/16	1-3/8	1-3/16	2-11/16	3-5/8
W8x18	0.499	15/16	1-3/8	1-3/16	2 5/8	3 9/16
W8x21	0.577	7/8	1-1/4	1-1/16	2-1/2	3-5/16
W8x24	0.591	13/16	1-1/4	1-1/16	2-1/2	3-5/16
W8x28	0.688	3/4	1-3/16	1-3/8	2	2-11/16
W8x31	0.665	13/16	1-3/16	1-9/16	2-5/16	3-1/16
W8x35	0.749	3/4	1-1/8	1-7/16	2-1/8	2-7/8
W8x40	0.849	11/16	1	1 1/3	2	2-11/16
W8x48	1	5/8	5/8	1-3/16	1-13/16	2-7/16
W8x58	1.2	9/16	13/16	1-1/8	1-5/8	2-3/16
W8x67	1.37	1/2	3/4	1	1-1/2	2
W10x12	0.347	1-1/16	1-9/16	2-1/16	3-1/16	4-1/8
W10x15	0.429	1	1-7/16	1-15/16	2-13/16	3-13/16
W10x17	0.482	15/16	1-3/8	1-13/16	2-11/16	3-5/8
W10x19	0.538	7/8	1-5/16	1-3/4	2-9/16	3-7/16
W10x22	0.523	7/8	1-5/16	1-3/4	2-9/16	3-1/2
W10x26	0.612	13/16	1-1/4	1-5/8	2-7/16	3-1/4

W10x30	0.699	3/4	1-1/8	1-1/2	2-1/4	3
W10x33	0.661	13/16	1-3/16	1-9/16	2-5/16	3-1/8
W10x39	0.78	3/4	1-1/16	1-3/8	2-1/8	2-13/16
W10x45	0.888	11/16	1	1-5/16	1-15/16	2-9/16
W10x49	0.84	11/16	7/8	1-1/8	1-11/16	2-1/2
W10x54	0.922	11/16	15/16	1-1/4	1-7/8	2-9/16
W10x60	1.01	5/8	7/8	1-3/16	1-13/16	2-7/16
W10x68	1.15	9/16	7/8	1-1/8	1-11/16	2-1/4
W10x77	1.28	9/16	13/16	1-1/16	1-9/16	2-1/16
W10x88	1.45	1/2	3/4	1	1-7/16	1-15/16
W10x100	1.64	7/16	11/16	7/8	1-5/16	1-3/4
W10x112	1.81	7/16	5/8	13/16	1-1/4	1-5/8
W12x14	0.363	1-1/16	1-1/2	2	3	4-1/16
W12x16	0.41	1	1-1/2	1-15/16	2-7/8	3-7/8
W12x19	0.485	15/16	1-3/8	1-13/16	2-11/16	3-5/8
W12x22	0.56	7/8	1-5/16	1-11/16	2-1/2	3-3/8
W12x26	0.531	7/8	1-5/16	1 3/4	2 9/16	3-7/16
W12x30	0.607	13/16	1-1/4	1-5/8	2-7/16	3-1/4
W12x35	0.703	3/4	1-1/8	1-1/2	2-1/4	2-15/16
W12x40	0.734	3/4	1-1/8	1-7/16	2-3/16	2-7/8
W12x45	0.829	11/16	1-1/16	1-3/8	2	2-11/16
W12x50	0.909	11/16	15/16	1-1/4	1-15/16	2-9/16
W12x53	0.855	11/16	1	1-5/16	2	2-5/8
W12x58	0.925	11/16	15/16	1-1/4	1-7/8	2-1/2
W12x65	0.925	11/16	15/16	1-1/4	1-7/8	2-1/2
W12x72	1.02	5/8	7/8	1-3/16	1-13/16	2-7/16
W12x79	1.11	5/8	7/8	1-1/8	1-11/16	2-5/16
W12x87	1.22	9/16	13/16	1-1/16	1-5/8	2-1/8
W12x96	1.34	1/2	3/4	1	1-1/2	2
W12x106	1.47	1/2	3/4	15/16	1-7/16	1-7/8
W12x120	1.65	7/16	11/16	7/8	1-5/16	1-3/4
W12x136	1.86	7/16	5/8	13/16	1-3/16	1-9/16
W12x152	2.04	3/8	9/16	3/4	1-1/8	1-1/2
W12x170	2.26	3/8	9/16	11/16	1-1/16	1-3/8
W12x190	2.5	5/16	1/2	5/8	15/16	1-1/4
W12x210	2.73	5/16	7/16	9/16	7/8	1-3/16
W12x230	2.96	5/16	7/16	9/16	13/16	1-1/8
W12x252	3.2	5/16	7/16	9/16	13/16	1-1/16
W12x279	3.5	1/4	3/8	1/2	3/4	15/16
W12x305	3.76	1/4	3/8	1/2	11/16	15/16
W12x336	4.06	1/4	5/16	7/16	5/8	7/8
W14x22						

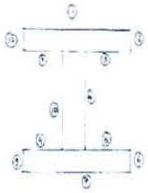
	0.476	15/16	1-3/8	1-13/16	2-11/16	3-5/8
W14x26	0.559	7/8	1-5/16	1-11/16	2-1/2	3-3/8
W14x30	0.562	7/8	1-1/4	1-11/16	2-1/2	3-3/8
W14x34	0.633	13/16	1-3/16	1-5/8	2-3/8	3-3/16
W14x38	0.706	3/4	1-1/8	1-1/2	2-1/4	2-15/16
W14x43	0.752	3/4	1-1/8	1-7/16	2-1/8	2-7/8
W14x48	0.835	11/16	1-1/16	1-3/8	2	2-11/16
W14x53	0.915	11/16	15/16	1-1/4	1-15/16	2-9/16
W14x61	0.928	11/16	15/16	1-1/4	1-7/8	2-1/2
W14x68	1.04	5/8	7/8	1-3/16	1-3/4	2-3/8
W14x74	1.12	9/16	7/8	1-1/8	1-11/16	2-1/4
W14x82	1.23	9/16	13/16	1-1/16	1-5/8	2-1/8
W14x90	1.08	5/8	7/8	1-1/8	1-3/4	2-5/16
W14x99	1.18	9/16	13/16	1-1/8	1-5/8	2-3/16
W14x109	1.29	9/16	13/16	1-1/16	1-9/16	2-1/16
W14x120	1.42	1/2	3/4	1	1-7/16	1-15/16
W14x132	1.56	1/2	11/16	15/16	1-3/8	1-13/16
W14x145	1.64	7/16	11/16	7/8	1-5/16	1-3/4
W14x159	1.78	7/16	5/8	13/16	1-1/4	1-5/8
W14x176	1.96	3/8	9/16	3/4	1-1/8	1-1/2
W14x193	2.14	3/8	9/16	3/4	1-1/16	1-7/16
W14x211	2.32	3/8	1/2	11/16	1	1-3/8
W14x233	2.55	5/16	1/2	5/8	15/16	1-1/4
W14x257	2.78	5/16	7/16	9/16	7/8	1-3/16
W14x283	3.03	5/16	7/16	9/16	13/16	1-1/16
W14x311	3.3	1/4	3/8	1/2	3/4	1
W14x342	3.58	1/4	3/8	1/2	11/16	15/16
W14x370	3.84	1/4	3/8	7/16	11/16	7/8
W14x398	4.09	1/4	5/16	7/16	5/8	7/8
W14x426	4.32	1/4	5/16	7/16	5/8	13/16
W14x455	4.59	1/4	5/16	3/8	9/16	3/4
W14x500	4.95	1/4	5/16	3/8	9/16	3/4
W14x550	5.34	1/4	1/4	3/8	1/2	11/16
W14x605	5.82	1/4	1/4	5/16	1/2	5/8
W14x665	6.21	1/4	1/4	5/16	7/16	9/16
W14x730	6.76	5/16	5/16	5/16	3/8	9/16
W16x26	0.499	15/16	1-3/8	1-13/16	2-5/8	3-9/16
W16x31	0.592	13/16	1-1/4	1-5/8	2-7/16	3-1/4
W16x36	0.617	13/16	1-1/4	1-5/8	2-7/16	3-3/16
W16x40	0.686	13/16	1-3/16	1-9/16	2-5/16	3-1/16
W16x45	0.767	3/4	1-1/16	1-7/16	2-1/8	2-13/16
W16x50						

	0.846	11/16	1	1 5/16	2	2-11/16
W16x57	0.963	5/8	15/16	1-1/4	1-7/8	2-1/2
W16x67	0.936	11/16	15/16	1-1/4	1-7/8	2-1/2
W16x77	1.07	5/8	7/8	1-1/8	1 3/4	2-5/16
W16x89	1.22	9/16	13/16	1-1/16	1-5/8	2-1/8
W16x100	1.37	1/2	3/4	1	1-1/2	2
W18x35	0.602	13/16	1-1/4	1-5/8	2-7/16	3-1/4
W18x40	0.688	3/4	1-3/16	1-1/2	2-1/4	3
W18x46	0.786	3/4	1-1/16	1-3/8	2-1/16	2-13/16
W18x50	0.778	3/4	1-1/16	1-3/8	2-4/39	2-13/16
W18x55	0.85	11/16	1	1 5/16	2	2-11/16
W18x60	0.923	11/16	15/16	1-1/4	1-7/8	2-9/16
W18x65	0.997	5/8	7/8	1-3/16	1-13/16	2-7/16
W18x71	1.08	5/8	7/8	1-1/8	1-3/4	2-5/16
W18x76	0.971	5/8	15/16	1-1/4	1-13/16	2-1/2
W18x86	1.09	5/8	7/8	1-1/8	1-11/16	2-5/16
W18x97	1.22	9/16	13/16	1-1/16	1-5/8	2-1/8
W18x106	1.33	1/2	3/4	1	1-1/2	2
W18x119	1.48	1/2	3/4	15/16	1-7/16	1-7/8
W21x44	0.672	13/16	1-3/16	1-9/16	2-5/16	3-1/16
W21x50	0.754	3/4	1-1/8	1-7/16	2-1/8	2-7/8
W21x57	0.857	11/16	1	1-5/16	2	2-5/8
W21x62	0.846	11/16	1	1-5/16	2	2-11/16
W21x68	0.926	11/16	15/16	1-1/4	1-7/8	2-1/2
W21x73	0.989	5/8	15/16	1-3/16	1-13/16	2-7/16
W21x83	1.12	9/16	7/8	1-1/8	1-11/16	2-1/4
W21x93	1.24	9/16	13/16	1-1/16	1-5/8	2-1/8
W21x101	1.13	9/16	7/8	1-1/8	1-11/16	2-1/4
W21x111	1.24	9/16	13/16	1-1/16	1-5/8	2-1/8
W21x122	1.35	1/2	3/4	1	1-1/2	2
W21x132	1.45	1/2	3/4	1	1-7/16	1-15/16
W21x147	1.61	7/16	11/16	7/8	1 5/16	1 3/4
W24x55	0.749	3/4	1-1/8	1-7/16	2-1/8	2-7/8
W24x62	0.844	11/16	1	1-5/16	2	2-11/16
W24x68	0.837	11/16	1-1/16	1-3/8	2	2-11/16
W24x76	0.933	11/16	15/16	1-1/4	1-7/8	2-1/2
W24x84	1.02	5/8	7/8	1-3/16	1-13/16	2-7/16
W24x94	1.14	9/16	7/8	1-1/8	1-11/16	2-1/4
W24x104	1.07	5/8	7/8	1-1/8	1-3/4	2-5/16
W24x117	1.2	9/16	13/16	1-1/8	1-5/8	2-3/16
W24x131	1.33	1/2	3/4	1	1-1/2	2
W24x146						

	1.48	1/2	3/4	15/16	1-7/16	1-7/8
W24x162	1.63	7/16	11/16	7/8	1-5/16	1-3/4
W27x84	0.921	11/16	15/16	1-1/4	1-7/8	2-9/16
W27x94	1.03	5/8	7/8	1-3/16	1-3/4	2-3/8
W27x102	1.11	5/8	7/8	1-1/8	1-11/16	2-5/16
W27x114	1.23	9/16	13/16	1-1/16	1-5/8	2-1/8
W27x146	1.35	1/2	3/4	1	1-1/2	2
W27x161	1.48	1/2	3/4	15/16	1-7/16	1-7/8
W27x178	1.63	7/16	11/16	7/8	1-5/16	1-3/4
W30x99	1	5/8	7/8	1-3/16	1-13/16	2-7/16
W30x108	1.09	5/8	7/8	1-1/8	1-11/16	2-5/16
W30x116	1.16	9/16	7/8	1-1/8	1-11/16	2-1/4
W30x124	1.24	9/16	13/16	1-1/16	1-5/8	2-1/8
W30x132	1.32	9/16	13/16	1-1/16	1-9/16	2-1/16
W30x173	1.47	1/2	3/4	15/16	1-7/16	1-7/8
W30x191	1.62	7/16	11/16	7/8	1-5/16	1-3/4
W30x211	1.76	7/16	5/8	7/8	1-1/4	1-11/16
W33x118	1.08	5/8	7/8	1-1/8	1-3/4	2-5/16
W33x130	1.18	9/16	13/16	1-1/8	1-5/8	2-3/16
W33x141	1.28	9/16	13/16	1-1/16	1-9/16	2-1/16
W33x152	1.37	1/2	3/4	1	1-1/2	2
W33x201	1.58	1/2	11/16	15/16	1-3/8	1-13/16
W33x221	1.73	7/16	5/8	7/8	1-1/4	1-11/16
W33x241	1.87	7/16	5/8	13/16	1-3/16	1-9/16
W36x135	1.15	9/16	7/8	1-1/8	1-11/16	2-1/4
W36x150	1.27	9/16	13/16	1-1/16	1-9/16	2-1/16
W36x160	1.35	1/2	3/4	1	1-1/2	2
W36x170	1.43	1/2	3/4	1	1-7/16	1-15/16
W36x182	1.52	1/2	11/16	15/16	1-3/8	1-7/8
W36x194	1.62	7/16	11/16	7/8	1-5/16	1-3/4
W36x210	1.74	7/16	5/8	7/8	1-1/4	1-11/16
W36x230	1.69	7/16	11/16	7/8	1-5/16	1-11/16
W36x245	1.79	7/16	5/8	13/16	1-1/4	1-5/8
W36x260	1.9	7/16	5/8	13/16	1-3/16	1-9/16
W36x280	2.03	3/8	9/16	3/4	1-1/8	1-1/2
W36x300	2.17	3/8	9/16	3/4	1-1/16	1-7/16

The thicknesses contained in the table below are applicable when the Spray-Applied Fire Resistive Materials applied to columns' flange tips are reduced to one-half that shown in the table below:

Min Col Size	W/D	Min Thk In.				
		1 Hr	1-1/2 Hr	2 Hr	3 Hr	4 Hr
W6x9	0.338	1-1/8	1-5/8	2-1/16	3-1/8	4-3/16

W			E-04 -1		E-04 -2		E-04 -3		E-0
			Start	End	Start	End	Start	End	Start
Width of Outside Flange (in) - Flange 1			6	6	6	6	5	5	5
Height of Outside Flange (in) - Flange 1			0.25	0.25	0.25	0.25	0.25	0.25	0.25
Width of Inside Flange (in) - Flange 2			6	6	6	6	5	5	5
Height of Inside Flange (in) - Flange 2		Only fill out the yellow cells	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Cross Sectional Area of flanges (sq.in)			3	3	3	3	2.5	2.5	2.5
Depth of Web (in)			10	18	18	18	20	20	20
Thickness of web (in)			0.1345	0.1345	0.1644	0.1644	0.1345	0.1345	0.1644
Cross Sectional Area of Web (sq.in)			1.345	2.421	2.9592	2.9592	2.69	2.69	3.288
Cross Sectional Area of Member (sq. in)			4.345	5.421	5.9592	5.9592	5.19	5.19	5.788
Cross Sectional Area of Member (sq. ft)			0.0302	0.0376	0.0414	0.0414	0.0360	0.0360	0.0402
Length for W/D calculation in ft			1	1	1	1	1	1	1
Density of steel in pcf			490	490	490	490	490	490	490
Wt of steel per linear foot			**14.79**	**18.45**	**20.28**	**20.28**	**17.66**	**17.66**	**19.70**
			Length of Section (in)		Length of Section (in)		Length of Section (in)		Length of S
	If this is a beam make the dimensions in those cells in line 18 equal to 0	1	6	6	0	0	0	0	0
		2	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		3	2.93275	2.93275	2.9178	2.9178	2.43275	2.43275	2.4178
		4	10	18	18	18	20	20	20
		5	2.93275	2.93275	2.9178	2.9178	2.43275	2.43275	2.4178
		6	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		7	6	6	6	6	5	5	5
		8	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		9	2.93275	2.93275	2.9178	2.9178	2.43275	2.43275	2.4178
		10	10	18	18	18	20	20	20
		11	2.93275	2.93275	2.9178	2.9178	2.43275	2.43275	2.4178
		12	0.25	0.25	0.25	0.25	0.25	0.25	0.25
D			44.731	60.731	54.6712	54.6712	55.731	55.731	55.6712
W/D			**0.33**	**0.30**	**0.37**	**0.37**	**0.32**	**0.32**	**0.35**
UL Design P732 (Roof beams - 2 hours)					1-5/16		1-1/2		1-1/2
UL Design X772 (Columns - 3 hours)			3-3/16						

1 -4	E-04 -5		E-04 -6		E-04 -7		E-04 -8		E-04 -9		E-04
End	Start	End	Start	End	Start	End	Start	End	Start	End	Start
5	5	5	5	5	5	5	5	5	5	5	5
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
5	5	5	5	5	5	5	5	5	5	5	5
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
2.5	3.75	3.75	3.75	3.75	2.5	2.5	2.5	2.5	3.75	3.75	3.75
20	20	20	20	20	20	20	20	20	20	20	20
0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644	0.1644
3.288	3.288	3.288	3.288	3.288	3.288	3.288	3.288	3.288	3.288	3.288	3.288
5.788	7.038	7.038	7.038	7.038	5.788	5.788	5.788	5.788	7.038	7.038	7.038
0.0402	0.0489	0.0489	0.0489	0.0489	0.0402	0.0402	0.0402	0.0402	0.0489	0.0489	0.0489
1	1	1	1	1	1	1	1	1	1	1	1
490	490	490	490	490	490	490	490	490	490	490	490
19.70	**23.95**	**23.95**	**23.95**	**23.95**	**19.70**	**19.70**	**19.70**	**19.70**	**23.95**	**23.95**	**23.95**
ection (in)	Length of Section (in)		Length of Section (in)		Length of Section (in)		Length of Section (in)		Length of Section (in)		Length of S
0	0	0	0	0	0	0	0	0	0	0	0
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178
20	20	20	20	20	20	20	20	20	20	20	20
2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
5	5	5	5	5	5	5	5	5	5	5	5
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178
20	20	20	20	20	20	20	20	20	20	20	20
2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178	2.4178
0.25	0.375	0.375	0.375	0.375	0.25	0.25	0.25	0.25	0.375	0.375	0.375
55.6712	56.1712	56.1712	56.1712	56.1712	55.6712	55.6712	55.6712	55.6712	56.1712	56.1712	56.1712
0.35	**0.43**	**0.43**	**0.43**	**0.43**	**0.35**	**0.35**	**0.35**	**0.35**	**0.43**	**0.43**	**0.43**
	1-1/4		1-1/4		1-1/2		1-1/2		1-1/4		1-1/4

-10	E-04 -11		E-04 -12		E-04 -13		E-04 -14	
End	Start	End	Start	End	Start	End	Start	End
5	5	5	5	5	6	6	6	6
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5	5	5	5	5	6	6	6	6
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
3.75	2.5	2.5	2.5	2.5	3	3	3	3
20	20	20	20	20	18	18	18	10
0.1644	0.1644	0.1644	0.1345	0.1345	0.1644	0.1644	0.1345	0.1345
3.288	3.288	3.288	2.69	2.69	2.9592	2.9592	2.421	1.345
7.038	5.788	5.788	5.19	5.19	5.9592	5.9592	5.421	4.345
0.0489	0.0402	0.0402	0.0360	0.0360	0.0414	0.0414	0.0376	0.0302
1	1	1	1	1	1	1	1	1
490	490	490	490	490	490	490	490	490
23.95	**19.70**	**19.70**	**17.66**	**17.66**	**20.28**	**20.28**	**18.45**	**14.79**
ection (in)	Length of Section (in)		Length of Section (in)		Length of Section (in)		Length of Section (in)	
0	0	0	0	0	0	0	6	6
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
2.4178	2.4178	2.4178	2.43275	2.43275	2.9178	2.9178	2.93275	2.93275
20	20	20	20	20	18	18	18	10
2.4178	2.4178	2.4178	2.43275	2.43275	2.9178	2.9178	2.93275	2.93275
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5	5	5	5	5	6	6	6	6
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
2.4178	2.4178	2.4178	2.43275	2.43275	2.9178	2.9178	2.93275	2.93275
20	20	20	20	20	18	18	18	10
2.4178	2.4178	2.4178	2.43275	2.43275	2.9178	2.9178	2.93275	2.93275
0.375	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
56.1712	55.6712	55.6712	55.731	55.731	54.6712	54.6712	60.731	44.731
0.43	**0.35**	**0.35**	**0.32**	**0.32**	**0.37**	**0.37**	**0.30**	**0.33**
	1-1/2		1-1/2		1-5/16			
							3-3/16	

TECHNICAL GUIDE SPECIFICATION

Monokote® MK-6®/HY® & MK-6®s

Standard Density Cementitious Fireproofing

PART 1 GENERAL

1.01 SUMMARY

A. Work under this section consists of the furnishing of all labor, materials, equipment, and services necessary for, and incidental to, the complete and proper installation of all aggregate slurry fireproofing and related work as shown on the drawings or specified herein, and in accordance with all applicable requirements of the contract documents.

B. Conform to all applicable building code requirements of all authorities having jurisdiction.

1.02 RELATED SECTIONS

A. Section (_____): Structural Steel

B. Section (_____): Concrete

C. Section (_____): Metal Deck

D. Section (_____): Roof Insulation

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E84 Surface Burning Characteristics
2. ASTM E119 Standard Methods of Fire Tests of Building Construction and Materials
3. ASTM E605 Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members
4. ASTM E736 Cohesion/Adhesion of Sprayed Fire-Resistive Material Applied to Structural Members
5. ASTM E759 Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
6. ASTM E760 Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
7. ASTM E761 Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
8. ASTM E859 Air Erosion of Sprayed Fire-Resistive Material Applied to Structural Members
9. ASTM E937 Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members
10. ASTM E1354 Cone Calorimeter
11. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

B. Bureau of Building Inspection: City of San Francisco

1. Abrasion Resistance Test Method
2. Impact Penetration Test Method

C. Underwriters Laboratories Inc. (UL) Fire Resistance Directory (Latest Edition)

1. UL/ANSI 263 Fire Tests of Building Construction Materials

D. Uniform Building Code (UBC)

1. UBC Standard No. 7-6 – Thickness and Density Determination for Spray Applied Fireproofing
2. UBC Standard No. 7-7 – Methods for Calculating Fire Resistance of Steel, Concrete and Wood Construction

E. Association of the Wall and Ceiling Industry (AWCI)

1. AWCI Technical Manual 12-A: Standard Practice for the Testing and Inspection of Spray Applied Fire-Resistive Materials
2. AWCI Technical Manual 12: Design Selection Utilizing Spray Applied Fire-Resistive Materials

F. International Building Code (IBC)

1.04 DEFINITIONS

A. Aggregate slurry Fireproofing as defined by Underwriters Laboratories Inc. (CHPX) in the latest edition of the UL Fire Resistance Directory.

1.05 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's instructions for proper application of aggregate slurry fireproofing.

B. Fire Testing:

a. Submit evidence that the aggregate slurry fireproofing has been subjected to full-scale UL 263/ASTM E119 fire testing at Underwriters Laboratories Inc., or an other accredited laboratory, by the manufacturer.

C. Thickness Schedule: Provide schedule indicating material to be used, structural elements to be protected with spray applied fireproofing, hourly rating and material thickness provided and appropriate references.

D. Test Data: Independent laboratory test results for fireproofing shall be submitted for the following performance criteria:

1. Bond Strength per ASTM E736
2. Compressive Strength per ASTM E761
3. Deflection per ASTM E759
4. Bond Impact per ASTM E760
5. Air Erosion per ASTM E859
6. Corrosion Resistance per ASTM E937
7. Abrasion Resistance (Test Method developed by City of San Francisco, Bureau of Building Inspection)
8. Impact Penetration (Test Method developed by City of San Francisco, Bureau of Building Inspection)
9. High Speed Air Erosion per ASTM E859
10. Surface Burning Characteristics per ASTM E84
11. Combustibility per ASTM E1354 Cone Calorimeter
12. Mold Resistance per ASTM G21

1.06 QUALITY ASSURANCE

A. Fireproofing work shall be performed by a firm acceptable to the aggregate slurry fireproofing material manufacturer.

B. Products, execution, and fireproofing thicknesses shall conform to the applicable code requirements for the required fire-resistance ratings.

C. Contractor, fireproofing subcontractor and independent testing laboratory shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, inspection procedures and other issues.

1.07 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered in original unopened packages, fully identified as to manufacturer, brand or other identifying data and bearing the proper independent testing laboratory labels for Surface Burning Characteristic and Fire Resistance Classification.

B. Material shall be stored off the ground, under cover, and in a dry location until ready for use. All bags that have been exposed to water before use shall be found unsuitable and discarded. Stock of material is to be rotated and used prior to its expiration date.

1.08 PROJECT/SITE CONDITIONS

A. A minimum air and substrate temperature of 4.4°C (40°F) shall be present before application of spray applied fireproofing. A minimum air and substrate temperature of 4.4°C (40°F) must be maintained during and for 24 hours after application of the spray applied fireproofing. Provide enclosures with heat to maintain temperature.

B. Provide ventilation in poorly ventilated areas to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

1.09 SEQUENCING AND SCHEDULING

A. Sequence and coordinate application of aggregate slurry fireproofing with work in other sections which would interfere with efficient fireproofing application.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Fireproofing shall be aggregate slurry mixture as manufactured by Grace Construction Products, Grace Korea Inc, W. R. Grace & Co.-Conn., or its processing distributors.

2.02 MATERIALS

A. Materials shall be Monokote® MK-6® factory-blended aggregate slurry fireproofing.

NOTE TO SPECIFIER: Product Selection
Monokote MK-6/HY and MK-6s afford the same level of fire protection at identical protection thicknesses. Both MK-6/HY and MK-6s meet or exceed all performance criteria listed in this specification. By simply specifying "Monokote MK-6," the fireproofing subcontractor can select the product that will provide the most efficient fire protection for the specific project conditions. Both MK-6/HY and MK-6s can be used on flat plate cellular decking. Where cellular decking and non-concrete roof assemblies are present, include a requirement in Section 2.03 (Accessories) for Spatterkote® SK-3.

B. Physical Performance Characteristics: Fireproofing material shall meet the following physical performance standards:

1. Dry Density: The field density shall be measured in accordance with ASTM Standard E605. Minimum average density shall be that required by the manufacturer, or as listed in the UL Fire Resistance Directory for each rating indicated, or as required by the authority having jurisdiction, or a minimum average 240 kg/m^3 (15 pcf) whichever is greater.
2. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.
3. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.
4. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 9.6 kN/m^2 (200 psf) and a minimum individual bond strength of 7.2 kN/m^2 (150 psf).
5. Air Erosion: Maximum allowable total weight loss of the fireproofing material shall be 0.00 g/m^2 (0.00 g/ft^2) when tested in accordance with ASTM E859. Sample surface shall be "as applied" (not pre-purged) and the

total reported weight loss shall be the total weight loss over a 24 hour period from the beginning of the test.

6. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 12.7 m/s (47 km/h) [2500 ft/min (29 mph)] when tested per ASTM E859.
7. Compressive Strength: The fireproofing shall not deform more than 10% when subjected to compressive forces of 71 kPa (1,483 psf) when tested in accordance with ASTM E761.
8. Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
9. Abrasion Resistance: No more that 15 cm^3 shall be abraded or removed from the fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection
10. Impact Penetration: The fireproofing material shall not show a loss of more than 6 cm^3 when subjected to impact penetration tests in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
11. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
    Flame Spread 0
    Smoke Development 0
12. Resistance to Mold: The fireproofing material shall be formulated at the time of manufacturing with a mold inhibitor. Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of 28 days for general use.
13. Combustibility: Material shall have a maximum total heat release of 20 MJ/m^2 and a maximum 125 kw/m^{2^2} peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E1354 at a radiant heat flux of 75 kw/m^2 with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.

NOTE TO SPECIFIER: In-Place Performance Standards:

Laboratory fire tests (ASTM E119/UL 263) do not measure in-place durability during the design life of the structure. For example, the work of other trades or air movement in return air plenums can affect the ability of the fireproofing to remain intact on the steel. The physical performance criteria recommended above establish minimum levels of acceptable in-place performance for structural steel fire protection. Performance criteria include resistance to damage, bond strength, air erosion and mold resistance protection. Monokote MK-6 meets or exceeds these recognized performance standards for long term fire protection of steel structures.

C. Fire Resistance Classification: The spray applied fireproofing material shall have been tested and reported by Underwriters Laboratories Inc., or an other accredited laboratory, in accordance with the procedures of ANSI/ASTM E119 and shall be listed in the Underwriters Laboratories Fire Resistance Directory or the directory of an other accredited testing laboratory.

D. Mixing water shall be clean, fresh, and suitable for domestic consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.

2.03 ACCESSORIES

A. Provide accessories to comply with manufacturer's recommendations and to meet fire resistance design and code requirements. Such accessories include, but are not limited to, any required or optional items such as Spatterkote SK-3; bonding agents, mechanical attachments; application aids such as metal lath, scrim, or netting; and Monokote Accelerator.

2.04 SOURCE QUALITY CONTROL

A. Submit evidence that the aggregate slurry fireproofing has been tested per ASTM E119 by Underwriters Laboratories Inc or an other accredited testing laboratory. Include evidence that the fire testing was sponsored by the manufacturer and that the material tested was produced at the manufacturer's facility under the supervision of laboratory personnel.

PART 3 EXECUTION

3.01 EXAMINATION

A. All surfaces to receive spray applied fireproofing shall be provided free of oil, grease, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate. Where necessary, cleaning or other corrections of surfaces to receive fireproofing shall be the responsibility of the supplier of the incompatible surface.

NOTE TO SPECIFIER: Primed/painted Substrates

Structural Steel:

Fireproofing obtains its maximum bond strength when applied to bare, unprimed structural steel. Priming of interior structural steel is generally unnecessary, adds to the cost of the structure and may adversely affect the fire resistance rating and the bond of the fireproofing to the substrate. We recommend the following be added to the structural steel specification: "Interior structural steel to receive application of spray applied fireproofing shall be free of primer and paint coatings."

Metal Decking

Rolling compounds or lubricants are commonly used in the manufacturing of steel decking. These compounds may impair proper bonding of fireproofing to the substrate. Lubricants are available which, when used in the appropriate quantities, will not adversely affect the bond of the fireproofing to the steel deck.

The direct application of spray applied fireproofing to painted steel decking is only permitted on UL classified painted steel decks. Classification of painted decking is achieved by large-scale fire testing at UL with the specified fireproofing material. Mechanical attachment is required on unclassified painted steel decks to maintain the fire-resistive rating. The use of painted steel decks is detailed in the UL Fire Resistance Directory under Steel Floor and Form Units (CHWX).

We recommend that Section 05300 Metal Decking states: 'Steel deck manufacturer shall supply deck free of lubricants or oils, which would impair the adhesion of the spray, applied fireproofing. The deck manufacturer shall certify that the painted steel deck is UL classified and has been fire tested with the appropriate fireproofing material."

B. Application of the fireproofing shall not begin until the contractor, applicator and fireproofing testing laboratory (inspector) have examined surfaces to receive fireproofing and determined that the surfaces are acceptable to receive the fireproofing material.

3.02 PREPARATION

A. Prior to application of the fireproofing material, a bonding agent, approved by the fireproofing material manufacturer, shall be applied to all concrete substrates to receive fireproofing.

B. Other trades shall install clips, hangers, support sleeves and other attachments required to penetrate the fireproofing, prior to application of the fireproofing materials.

C. Other trades shall not install ducts, piping, equipment or other suspended items until the fireproofing is complete.

D. Complete placing of concrete on floor and roof decking prior to application of the fireproofing to the underside of steel deck and supporting beams and joists.

E. On roof decks without a concrete cover, complete all roofing applications and roof mounted equipment installation prior to application of the fireproofing to the underside of roof decking and supporting beams and joists. Prohibit all roof traffic upon commencement of the fireproofing and until the fireproofing material is dry.

F. Protection of permanently exposed walls or floors, or special surfaces:
(Please indicate special protection requirements by location in a finish schedule on the plans or herein. Eliminate subparagraph F if not applicable).

NOTE TO SPECIFIER: Surface Protection

Application of spray applied fireproofing results in overspray onto surfaces in the immediate spray area. Where concrete, masonry or other surfaces subject to overspray need protection, detail that these specific surfaces shall be protected with masking, drop cloths or other satisfactory covering.

3.03 APPLICATION

A. Equipment and application procedures shall conform to the material manufacturer's application instructions.

B. Post appropriate cautionary "Slippery When Wet" signs in all areas in contact with wet fireproofing material. Erect appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixing areas and other areas exposed to wet fireproofing material.

C. Apply a discontinuous textured spray of Spatterkote SK-3 in accordance with manufacturer's instructions to all cellular steel floor units with flat plate on the bottom and to roof deck assemblies as required to meet the fire resistance ratings, before application of the Monokote fireproofing to these surfaces

3.04 FIELD QUALITY CONTROL

A. The architect will select, and the owner will pay an independent testing laboratory to randomly sample and verify the thickness and the density of the fireproofing in accordance with provisions of ASTM E605, or the "Inspection Procedure for Field-applied Sprayed Fire Protection Materials" as published by the Association of Wall and Ceiling Contractors International (AWCI), or the Uniform Building Code Standard No. 7-6. Fireproofing density samples should be tested in accordance with the displacement method in ASTM E605 to determine in-place fireproofing density.

B. The architect will select, and the owner will pay an independent testing laboratory to randomly sample and verify the bond strength of the fireproofing in accordance with provisions of ASTM E736.

C. The results of the above tests shall be made available to all parties at the completion of pre-designated areas which shall have been determined during the pre-job conference.

3.05 CLEANING

A. After the completion of fireproofing work, application equipment shall be removed.

B. Except as detailed in Section 3.02F, floors shall be left in a scraped condition.

3.06 PATCHING

A. All patching and repairing of spray applied fireproofing, due to damage by other trades, shall be performed with same materials under this section, and paid for by the trade(s) responsible for the damage.

3.07 FIRE RATING SCHEDULE

Elements

Fire-Resistance Rating (time in hours) schedule shall be as follows:

Structural Component	Hourly Rating Requirement	Design Reference	Restrained* (Check one)	Unrestrained* (Check one)
Columns	_____ hr.	_____	(N/A)	(N/A)
Floor Assemblies (Decks)	_____ hr.	_____	( )	( )
Floor Beams/Joists	_____ hr.	_____	( )	( )
Roof Assemblies (Decks)	_____ hr.	_____	( )	( )
Roof Beams/Joists	_____ hr.	_____	( )	( )

* Qualified structural engineer, in compliance with all applicable codes and regulations, shall determine whether restrained or unrestrained criteria applies to the conditions of support of all structural components.

NOTE TO SPECIFIER: Restrained/Unrestrained Criteria

According to the International Code Council's International Building Code, "Fire resistance rated assemblies tested in accordance with ASTM E119/UL 263 shall be considered unrestrained unless evidence satisfactory to the authority having jurisdiction is furnished by a registered design professional showing that the construction qualifies for a restrained classification."

Evidence shall demonstrate that an equivalent or greater degree of restraint will be provided to the building assembly during a fire condition as was provided to the tested assembly during the fire test at UL. Restrained conditions, defined in the UL Fire Resistance Directory, for the fire test assemblies shall have an approximate stiffness (EI/L) of 700,000 – 850,000 kip- in. along the test frame and remain constant throughout the fire test.

Section 714.1 of the IBC states, "The fire-resistance rating of structural members and assemblies shall comply with the requirements for the type of construction and shall not be less than the rating required for the fire resistance rated assemblies supported." The hourly rating of floor and roof supports must be equal to their corresponding assembly regardless of the classification of restraint.

For Technical Assistance call toll free at 866-333-3SBM (3726).

Visit our web site at www.graceconstruction.com

W. R. Grace & Co.-Conn. 62 Whittemore Avenue Cambridge, MA 02140

Lindauer • Dunn, Inc.
STRUCTURAL ENGINEERS

802 ROOD AVENUE
GRAND JUNCTION, CO 81501
(970) 241-0900
FAX (970) 243-2430

DATE: October 12, 2012

TO: Raul Gawrys Architecture & Planning
100 Elk Run, Suite 222
Basalt, CO 81621

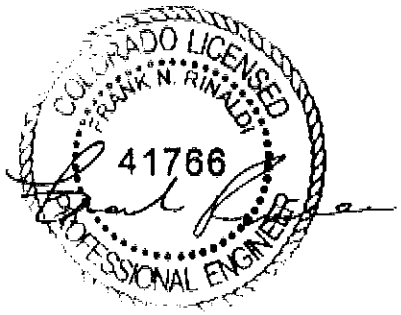
FROM: Frank Rinaldi

SUBJECT: Tri-State Trucking
Garfield County, Colorado
Lindauer Dunn, Inc. Job # 10.106

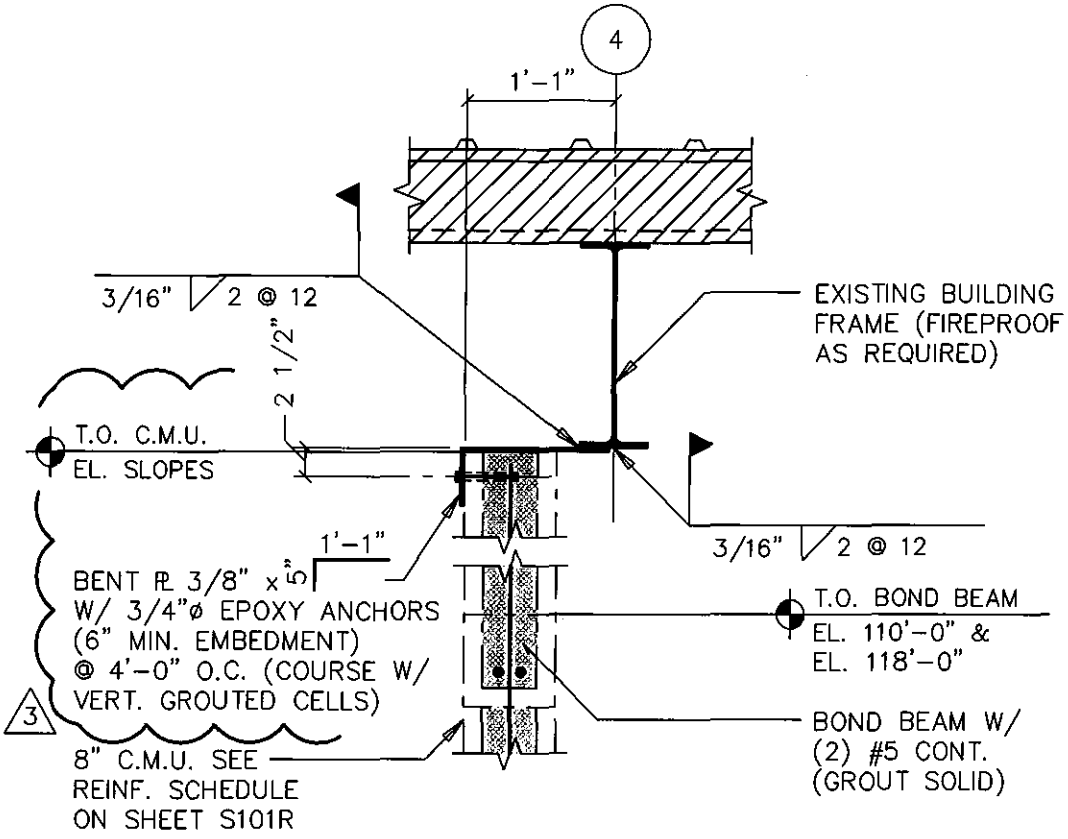
It was brought to our attention that the horizontal ladur reinforcement in the interior fire walls was spaced at 24" instead of 16" o.c. specified on the plans. Upon review of this, we have determined that 24" o.c. spacing is adequate for these two walls.

If you have any questions, please do not hesitate to call.

Sincerely,
Lindauer Dunn, Inc.



Frank N. Rinaldi. P.E.



SECTION 3/S101R 3/4"=1'-0"

Tri-State Trucking
Office & Maintenance Facility
Garfield County, Colorado

FOR: Raul Gawrys Arch.

Sheet
SK1

Sheet Information	
Date	11/05/12
Job #	10.106
Scale	As Noted
Drawn	JDG
Checked	FNR
Approved	FNR

3 REVISION #3

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Tri-State Trucking
Garfield County, Colorado
OBSERVATION REPORT

DATE: October 12, 2012

TO: Raul Gawrys Architecture & Planning
100 Elk Run, Suite 222
Basalt, CO 81621

FROM: Frank Rinaldi

SUBJECT: Tri-State Trucking
Garfield County, Colorado
Lindauer Dunn, Inc. Job # 10.106

We have observed the foundation reinforcement for the fire wall revision to the above mentioned structure. Observations were performed in accordance with Section 1702 of the 2009 IBC. The rebar was found to be in compliance with the structural plans.

It was also brought to our attention that the window headers in the office area were supported by one king stud and one trimmer stud. This is adequate for these framed openings

If you have any questions, please do not hesitate to call.

Sincerely,
Lindauer Dunn, Inc.

Frank N. Rinaldi. P.E.

Flammable and Combustable Products on Hand at Tri State Trucking Rulison Location

Currently On Hand:	Quanity:	Size:			
Adhesive Cleaner	2	6 oz			
High Power Brake Cleaner	24	12.5 oz			
Dri Lube Plus Aerosol	4	11 oz			
Krylon BBQ & Stove Paint	2	18 oz			
Krylon John Deere Yellow Paint	8	18 oz			
Flourescent Orange Marking Paint	12	18 oz			
Sprayway Glass Cleaner	6	16 oz			
Zep Z-Fresh Potpourri	2	2 oz			
Napa 50/50 Prediluted Antifreeze & Coolant	24	Gallon			
Premalube Xtreme (Bulk)	12	14.5 oz			
AirwickAir Freshener	2	12 oz			
Napa Prem Perf Automatic Transmission Fluid	24	Qt			
Marvel Mystery Oil	4	Gallon			
Diesel Fuel Supplement Advanced Formula	12	Gallon			
Citgo Economy MP ATF	24	Qt			
Lucas X-Tra Heavy Duty Grease	48	14.5 oz			
Napa Compressor Oil	1	Qt			
Napa Prem Perf HD Sae 30 Motor Oil	2	Qt			
Buffing Solution (Rubber Cleaner)	2	6 oz			
Thread Sealant with Teflon	2	8 oz			
Engine Starting Fluid	24	11 oz			
Penray Air Brake Antifreeze	24	Qt			
Kimball Midwest Penetrating Oil	24	18 oz			
Kimball Midwest Penetrating Grease	24	13 oz			
Oxygen	50	lbs			
Acetelyn	25	lbs			
Power Service Diesel Fuel Supplement	24	Gallon			
Delo 15W40 Oil	36	Gallon			
Delo 75W90 Oil	24	Qt			
Iso 32 Hydraulic Fluid	5	Gallon			
Molylube	3	Gallon			
When Shop Is Completed Supplied By Petrowest:					
Iso 32 Hydraulic Fluid - 55 Gallon Drums	2				
Molylube - 55 Gallon Drums	2				
75W90 Gear Oil - 55 Gallon Drums	2				
15W40 Oil - 400 Gallons Container	1				

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COMcheck Software Version 3.9.0
Envelope Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**
Project Title : TriState Trucking

Construction Site:
Garfield County

Owner/Agent:

Designer/Contractor:
Bighorn Consulting Engineers
Grand Junction, CO

Section 2: General Information

Building Location (for weather data):	**Parachute, Colorado**
Climate Zone:	**5b**
Building Type for Envelope Requirements:	**Non-Residential**
Vertical Glazing / Wall Area Pct.:	**2%**

Activity Type(s)	Floor Area
Metal building shop (Warehouse)	12500
Attached office (Office)	4220

Section 3: Requirements Checklist

Envelope PASSES: Design 8% better than code.

Climate-Specific Requirements:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Floor 1: Slab-On-Grade:Unheated	394	---	---	---	---
Floor 2: Wood-Framed	2520	19.0	0.0	0.051	0.051
Roof 1: Metal Building, Screw Down	12586	19.0	0.0	0.130	0.065
Roof 2: Attic Roof with Wood Joists	2520	38.0	0.0	0.027	0.034
Exterior Wall 1: Metal Building Wall	9900	13.0	13.0	0.046	0.057
Door 1: Insulated Metal, Swinging	63	---	---	0.700	0.700
Door 2: Insulated Metal, Non-Swinging	2016	---	---	0.500	1.450
Exterior Wall 2: Wood-Framed, 16" o.c.	1913	19.0	0.0	0.067	0.089
Window 1: Vinyl Frame:Double Pane with Low-E, Clear, SHGC 0.28	172	---	---	0.350	0.350
Door 3: Insulated Metal, Swinging	42	---	---	0.700	0.700
Door 4: Glass (> 50% glazing):Metal Frame, Entrance Door, SHGC 0.69	42	---	---	0.810	1.200

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- ☐ 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- ☐ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ☐ 3. Component R-values & U-factors labeled as certified.
- ☐ 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- ☐ 5. 'Other' components have supporting documentation for proposed U-Factors.
- ☐ 6. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.

☐ 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.

☐ 8. Cargo doors and loading dock doors are weather sealed.

☐ 9. Recessed lighting fixtures are: (i) Type IC rated and sealed or gasketed; or (ii) installed inside an appropriate air-tight assembly with a 0.5 inch clearance from combustible materials and with 3 inches clearance from insulation material.

☐ 10. Building entrance doors have a vestibule equipped with closing devices.
Exceptions:

- ☐ Building entrances with revolving doors.
- ☐ Doors that open directly from a space less than 3000 sq. ft. in area.

☐ 11. Vapor retarder installed.

Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2006 IECC requirements in COM*check* Version 3.9.0 and to comply with the mandatory requirements in the Requirements Checklist.

Shawn Brill - engineer		12-20-11
Name - Title	Signature	Date

COMcheck Software Version 3.9.0
Interior Lighting Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**
Project Title : TriState Trucking

Construction Site:
Garfield County

Owner/Agent:

Designer/Contractor:
Bighorn Consulting Engineers
Grand Junction, CO

Section 2: Interior Lighting and Power Calculation

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B x C)
Metal building shop (Warehouse)	12500	0.8	10000
Attached office (Office)	4220	1	4220
		Total Allowed Watts =	14220

Section 3: Interior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Metal building shop (Warehouse 12500 sq.ft.)				
Linear Fluorescent 3: 46" T5 28W / Electronic	6	25	168	4200
Attached office (Office 4220 sq.ft.)				
Linear Fluorescent 1: F: 48" recessed / 48" T8 32W / Electronic	4	53	128	6784
Incandescent 1: B: Restroom can lights / Incandescent 60W	1	6	60	360
Incandescent 2: C: Lobby can lights / Incandescent 100W	1	6	100	600
Linear Fluorescent 2: D: 2x2 recessed / 24" T8U 32W / Electronic	2	1	64	64
Incandescent 3: E: Vanity can lights / Incandescent 60W	1	4	60	240
			Total Proposed Watts =	12248

Section 4: Requirements Checklist

Lighting Wattage:

☐ 1. Total proposed watts must be less than or equal to total allowed watts.

Allowed Watts	Proposed Watts	Complies
14220	12248	YES

Controls, Switching, and Wiring:

☐ 2. Independent controls for each space (switch/occupancy sensor).

Exceptions:

- ☐ Areas designated as security or emergency areas that must be continuously illuminated.
- ☐ Lighting in stairways or corridors that are elements of the means of egress.

☐ 3. Master switch at entry to hotel/motel guest room.

☐ 4. Individual dwelling units separately metered.

☐ 5. Each space required to have a manual control also allows for reducing the connected lighting load by at least 50 percent by either controlling all luminaires, dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps, switching the middle lamp luminaires independently of other lamps, or switching each luminaire or each lamp.

Exceptions:

- ☐ Only one luminaire in space.
- ☐ An occupant-sensing device controls the area.
- ☐ The area is a corridor, storeroom, restroom, public lobby or sleeping unit.
- ☐ Areas that use less than 0.6 Watts/sq.ft.

☐ 6. Automatic lighting shutoff control in buildings larger than 5,000 sq.ft.

Exceptions:

- ☐ Sleeping units, patient care areas; and spaces where automatic shutoff would endanger safety or security.

☐ 7. Photocell/astronomical time switch on exterior lights.

Exceptions:

- ☐ Lighting intended for 24 hour use.

☐ 8. Tandem wired one-lamp and three-lamp ballasted luminaires (No single-lamp ballasts).

Exceptions:

- ☐ Electronic high-frequency ballasts; Luminaires on emergency circuits or with no available pair.

Interior Lighting PASSES: Design 14% better than code.

Section 5: Compliance Statement

Compliance Statement: The proposed lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2006 IECC requirements in COM*check* Version 3.9.0 and to comply with the mandatory requirements in the Requirements Checklist.

Shawn Brill- engineer		12-20-11
Name - Title	Signature	Date

COM*check* Software Version 3.9.0
Exterior Lighting Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**
Project Title : TriState Trucking

Construction Site:
Garfield County

Owner/Agent:

Designer/Contractor:
Bighorn Consulting Engineers
Grand Junction, CO

Section 2: Exterior Lighting Area/Surface Power Calculation

A Exterior Area/Surface	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B x C)	F Proposed Watts
Areas under canopy (Attached canopy)	914 ft2	1.25	Yes	1143	900
			Total Tradable Watts* =	1143	900
			Total Allowed Watts =	1143	
			Total Allowed Supplemental Watts** =	57	

* Wattage tradeoffs are only allowed between tradable areas/surfaces.

** A supplemental allowance equal to 5% of total allowed wattage may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Section 3: Exterior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Areas under canopy (Attached canopy 914 ft2): Tradable Wattage				
Incandescent 1: R: Building mounted ext lights / Incandescent 100W	1	9	100	900
			Total Tradable Proposed Watts =	900

Section 4: Requirements Checklist

Lighting Wattage:

☐ 1. Within each non-tradable area/surface, total proposed watts must be less than or equal to total allowed watts. Across all tradable areas/surfaces, total proposed watts must be less than or equal to total allowed watts.

Compliance: Passes.

Controls, Switching, and Wiring:

☐ 2. All exemption claims are associated with fixtures that have a control device independent of the control of the nonexempt lighting.

☐ 3. All lighting fixtures are controlled by a photosensor or astronomical time switch that is capable of automatically turning off the fixture when sufficient daylight is available or the lighting is not required.

Exceptions:

☐ Covered vehicle entrance/exit areas requiring lighting for safety, security and eye adaptation.

Exterior Lighting Efficacy:

☐ 4. All exterior building grounds luminaires that operate at greater than 100W have minimum efficacy of 60 lumen/watt.

Exceptions:

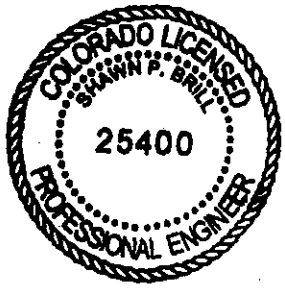
☐ Controlled by motion sensor or exempt from consideration under the provisions of Section 505.6.2.

Exterior Lighting PASSES: Design 25% better than code.

Section 5: Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2006 IECC requirements in COM*check* Version 3.9.0 and to comply with the mandatory requirements in the Requirements Checklist.

Shawn Brill - engineer		12-20-11
Name - Title	Signature	Date



COM*check* Software Version 3.9.0
Mechanical Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**
Project Title : TriState Trucking

Construction Site:
Garfield County

Owner/Agent:

Designer/Contractor:
Bighorn Consulting Engineers
Grand Junction, CO

Section 2: General Information

Building Location (for weather data): **Parachute, Colorado**
Climate Zone: **5b**

Section 3: Mechanical Systems List

Quantity	System Type & Description
1	HVAC System 1 (Unknown) : Heating: 4 each - Unit Heater, Gas, Capacity = 175 kBtu/h, Efficiency = 80.00% Ec
1	HVAC System 2 (Single Zone) : Heating: 1 each - Central Furnace, Gas, Capacity = 70 kBtu/h Cooling: 1 each - Split System, Capacity = 30 kBtu/h, Efficiency = 13.00 SEER, Air-Cooled Condenser
1	HVAC System 3 (Single Zone) : Heating: 1 each - Central Furnace, Gas, Capacity = 70 kBtu/h Cooling: 1 each - Split System, Capacity = 18 kBtu/h, Efficiency = 13.00 SEER, Air-Cooled Condenser

Section 4: Requirements Checklist

Requirements Specific To: HVAC System 1 :

☐ 1. Equipment minimum efficiency: Unit Heater (Gas): 80.00 % Ec

Requirements Specific To: HVAC System 2 :

☐ 1. Equipment minimum efficiency: Split System: 10.00 SEER
☐ 2. Newly purchased heating equipment meets the heating efficiency requirements

Requirements Specific To: HVAC System 3 :

☐ 1. Equipment minimum efficiency: Split System: 10.00 SEER
☐ 2. Newly purchased heating equipment meets the heating efficiency requirements

Generic Requirements: Must be met by all systems to which the requirement is applicable:

☐ 1. Plant equipment and system capacity no greater than needed to meet loads
Exception(s):

- ☐ Standby equipment automatically off when primary system is operating
- ☐ Multiple units controlled to sequence operation as a function of load

☐ 2. Minimum one temperature control device per system
☐ 3. Minimum one humidity control device per installed humidification/dehumidification system
☐ 4. Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
Exception(s):

- ☐ Continuously operating zones

- ☐ 2 kW demand or less, submit calculations

☐ 5. Outside-air source for ventilation; system capable of reducing OSA to required minimum

☐ 6. R-5 supply and return air duct insulation in unconditioned spaces
R-8 supply and return air duct insulation outside the building
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
Exception(s):

- ☐ Ducts located within equipment
- ☐ Ducts with interior and exterior temperature difference not exceeding 15°F.

☐ 7. Mechanical fasteners and sealants used to connect ducts and air distribution equipment

☐ 8. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics
Exception(s):

- ☐ Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification

☐ 9. Hot water pipe insulation: 1 in. for pipes <=1.5 in. and 2 in. for pipes >1.5 in.
Chilled water/refrigerant/brine pipe insulation: 1 in. for pipes <=1.5 in. and 1.5 in. for pipes >1.5 in.
Steam pipe insulation: 1.5 in. for pipes <=1.5 in. and 3 in. for pipes >1.5 in.
Exception(s):

- ☐ Piping within HVAC equipment.
- ☐ Fluid temperatures between 55 and 105°F.
- ☐ Fluid not heated or cooled with renewable energy.
- ☐ Runouts <4 ft in length.

☐ 10. Operation and maintenance manual provided to building owner

☐ 11. Load calculations per acceptable engineering standards and handbooks

☐ 12. Thermostatic controls have 5°F deadband
Exception(s):

- ☐ Thermostats requiring manual changeover between heating and cooling
- ☐ Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.

☐ 13. Balancing devices provided in accordance with IMC (2006) 603.17

☐ 14. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings
Exception(s):

- ☐ Gravity dampers acceptable in buildings <3 stories
- ☐ Gravity dampers acceptable in systems with outside or exhaust air flow rates less than 300 cfm where dampers are interlocked with fan

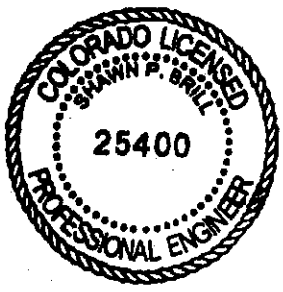
☐ 15. Exhaust air heat recovery included for systems 5,000 cfm or greater with more than 70% outside air fraction or specifically exempted
Exception(s):

- ☐ Systems serving spaces that are not cooled and heated to <60°F.
- ☐ Commercial kitchen hoods (grease) classified as Type 1 by NFPA 96.
- ☐ Systems exhausting toxic, flammable, paint, or corrosive fumes or dust.
- ☐ Where the largest exhaust source is less than 75% of the design outdoor airflow.
- ☐ Systems requiring dehumidification that employ energy recovery in series with the cooling coil.

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2006 IECC requirements in COM*check* Version 3.9.0 and to comply with the mandatory requirements in the Requirements Checklist.

Shawn Brill - engineer		12-20-11
Name - Title	Signature	Date



COMcheck Software Version 3.9.0
Mechanical Requirements Description

2006 IECC

The following list provides more detailed descriptions of the requirements in Section 4 of the Mechanical Compliance Certificate.

Requirements Specific To: HVAC System 1 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency:
   Unit Heater (Gas): 80.00 % Ec

Requirements Specific To: HVAC System 2 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency:
   Split System: 10.00 SEER
2. The specified heating equipment is covered by Federal minimum efficiency requirements. New equipment of this type can be assumed to meet or exceed ASHRAE 90.1 Code requirements for equipment efficiency.

Requirements Specific To: HVAC System 3 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency:
   Split System: 10.00 SEER
2. The specified heating equipment is covered by Federal minimum efficiency requirements. New equipment of this type can be assumed to meet or exceed ASHRAE 90.1 Code requirements for equipment efficiency.

Generic Requirements: Must be met by all systems to which the requirement is applicable:

1. All equipment and systems must be sized to be no greater than needed to meet calculated loads. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.
   Exception(s):
   - The equipment and/or system capacity may be greater than calculated loads for standby purposes. Standby equipment must be automatically controlled to be off when the primary equipment and/or system is operating.
   - Multiple units of the same equipment type whose combined capacities exceed the calculated load are allowed if they are provided with controls to sequence operation of the units as the load increases or decreases.
2. Each heating or cooling system serving a single zone must have its own temperature control device.
3. Each humidification system must have its own humidity control device.
4. The system or zone control must be a programmable thermostat or other automatic control meeting the following criteria:
   a) capable of setting back temperature to 55°F during heating and setting up to 85°F during cooling,
   b) capable of automatically setting back or shutting down systems during unoccupied hours using 7 different day schedules,
   c) have an accessible 2-hour occupant override,
   d) have a battery back-up capable of maintaining programmed settings for at least 10 hours without power.
   Exception(s):
   - A setback or shutoff control is not required on thermostats that control systems serving areas that operate continuously.
   - A setback or shutoff control is not required on systems with total energy demand of 2 kW (6,826 Btu/h) or less.
5. The system must supply outside ventilation air as required by Chapter 4 of the International Mechanical Code. If the ventilation system is designed to supply outdoor-air quantities exceeding minimum required levels, the system must be capable of reducing outdoor-air flow to the minimum required levels.
6. Air ducts must be insulated to the following levels:
   a) Supply and return air ducts for conditioned air located in unconditioned spaces (spaces neither heated nor cooled) must be insulated with a minimum of R-5. Unconditioned spaces include attics, crawl spaces, unheated basements, and unheated garages.
   b) Supply and return air ducts and plenums must be insulated to a minimum of R-8 when located outside the building.
   c) When ducts are located within exterior components (e.g., floors or roofs), minimum R-8 insulation is required only between the duct and the building exterior.
   Exception(s):
   - Duct insulation is not required on ducts located within equipment.
   - Duct insulation is not required when the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F.
7. Mechanical fasteners and seals, mastics, or gaskets must be used when connecting ducts to fans and other air distribution equipment, including multiple-zone terminal units.

8. All joints, longitudinal and transverse seams, and connections in ductwork must be securely sealed using weldments; mechanical fasteners with seals, gaskets, or mastics; mesh and mastic sealing systems; or tapes. Tapes and mastics must be listed and labeled in accordance with UL 181A and shall be marked '181A-P' for pressure sensitive tape, '181A-M' for mastic or '181A-H' for heat-sensitive tape. Tapes and mastics used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked '181B-FX' for pressure-sensitive tape or '181B-M' for mastic. Unlisted duct tape is not permitted as a sealant on any metal ducts.
   Exception(s):
   - Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification.
9. All pipes serving space-conditioning systems must be insulated as follows:
   Hot water piping for heating systems:
   1 in. for pipes <=1 1/2-in. nominal diameter,
   2 in. for pipes >1 1/2-in. nominal diameter.
   Chilled water, refrigerant, and brine piping systems:
   1 in. insulation for pipes <=1 1/2-in. nominal diameter,
   1 1/2 in. insulation for pipes >1 1/2-in. nominal diameter.
   Steam piping:
   1 1/2 in. insulation for pipes <=1 1/2-in. nominal diameter,
   3 in. insulation for pipes >1 1/2-in. nominal diameter.
   Exception(s):
   - Pipe insulation is not required for factory-installed piping within HVAC equipment.
   - Pipe insulation is not required for piping that conveys fluids having a design operating temperature range between 55°F and 105°F.
   - Pipe insulation is not required for piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
   - Pipe insulation is not required for runout piping not exceeding 4 ft in length and 1 in. in diameter between the control valve and HVAC coil.
10. Operation and maintenance documentation must be provided to the owner that includes at least the following information:
    a) equipment capacity (input and output) and required maintenance actions
    b) equipment operation and maintenance manuals
    c) HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions; desired or field-determined set points must be permanently recorded on control drawings, at control devices, or, for digital control systems, in programming comments
    d) complete narrative of how each system is intended to operate.
11. Heating and cooling system design loads for sizing systems and equipment must be determined using generally accepted engineering standards and handbooks acceptable to the adopting authority (for example, ASHRAE Handbook of Fundamentals).
12. Thermostats controlling both heating and cooling must be capable of maintaining a 5°F deadband (a range of temperature where no heating or cooling is provided).
    Exception(s):
    - Deadband capability is not required if the thermostat does not have automatic changeover capability between heating and cooling.
    - Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.
13. Balancing devices provided in accordance with IMC (2006) 603.17.
14. Outdoor air supply and exhaust systems must have motorized dampers that automatically shut when the systems or spaces served are not in use. Dampers must be capable of automatically shutting off during preoccupancy building warm-up, cool-down, and setback, except when ventilation reduces energy costs (e.g., night purge) or when ventilation must be supplied to meet code requirements. Both outdoor air supply and exhaust air dampers must have a maximum leakage rate of 3 cfm/ft2 at 1.0 in w.g. when tested in accordance with AMCA Standard 500.
    Exception(s):
    - Gravity (non-motorized) dampers are acceptable in buildings less than three stories in height.
    - Systems with a design outside air intake or exhaust capacity of 300 cfm (140 L/s) or less that are equipped with motor operated dampers that open and close when the unit is energized and de-energized, respectively.
15. Individual fan systems with a design supply air capacity of 5000 cfm or greater and minimum outside air supply of 70% or greater of the supply air capacity must have an energy recovery system with at least a 50% effectiveness. If an air economizer is also required, heat recovery must be bypassed or controlled to permit air economizer operation.
    Exception(s):
    - Systems serving spaces that are not cooled and heated to <60°F.
    - Commercial kitchen hoods (grease) classified as Type 1 by NFPA 96.
    - Systems exhausting toxic, flammable, paint, or corrosive fumes or dust.
    - Where the largest exhaust source is less than 75% of the design outdoor airflow.
    - Systems requiring dehumidification that employ energy recovery in series with the cooling coil.

October 26, 2011

Raul Gawrys
Architecture / Planning
P.O. Box 825
Basalt , Colorado 81621

Re: Onsite Wastewater System (OWS) Report Proposed for the Tri-State Trucking facility, Garfield County Colorado
SE Job #: 11162.01

Dear Raul:

This letter report presents our findings in regard to the feasibility of design and approval of an engineered Onsite Wastewater System (OWS) for the above referenced Site. Our design recommendations are based on current knowledge of the site, observation of the site conditions and information provided by others for use in supporting your application to Garfield County. Our design recommendations are feasible with respect to current conditions, water usage, setback issues and geotechnical considerations. Our recommendations are in accordance with Garfield County and the State of Colorado ISDS Regulations.

Conclusions

We have reviewed the existing site conditions and the existing commercial improvements. The area east of the proposed trucking facility drive/parking area has been evaluated for use as a treatment/absorption field area. Based on our findings we believe that the design and installation of an OWS system is feasible in accordance with Garfield County and the State of Colorado Regulations. The proposed system will handle the domestic wastewater from the Tri State Trucking, trucking service facility. Our design recommendations for an OWS include the installation of a 1500-gallon concrete septic tank and a 1000 gallon dosing tank equipped with a duplex pump biotube vault dosing assembly and associated piping and controls. The primary treated effluent will discharge to a slighty mounded pressure dosed sand filter bed with gravelless chamber and pressure pipe distribution system. The sand filter treatment/absorption system will provide secondary treatment of wastewater with infiltration into the ground. The system will meet all required standards and setbacks for a sand filter bed system. The sand filter treatment system can be installed over the native soils. The system will meet all required setbacks and be installed within the septic envelope indicated on the plan. Our design is outlined below and delineated on the attached site plan.

Subsurface Conditions

A subsurface investigation was conducted on January 19, 2007 by Hepworth-Pawlak Geotechnical, Inc (HP). The results are in the HP report dated February 6, 2007, Job Number 106 0684. The sub soils, below ½ foot of topsoil, consist of interstratified, stiff sandy, silty, clay and rock fragments to depths of 8 feet. No free water was encountered in the pit at the time of the investigation.

Percolation testing was performed in three test holes, which yielded similar absorption rates. The fastest measured rate was 120 minutes per inch and the slowest measured rate was 240 minutes per inch. The average percolation rate is 160 minutes per inch and should be suitable to allow infiltration of treated effluent into the soils.

The OWS is designed based on the utilization of imported base material absorption media with imported sand filter treatment material and recovery of the treated effluent by percolation into the native clay soils. We recommend that full pressure dosed treatment sand filter media over native soil be used for secondary treatment and absorption to the native soils. Seasonal high groundwater levels are expected to be over 8 feet below existing surface grades. Additional field observations will be performed during initial construction and during excavation for installation of the tank and field to provide recommendations for subsoil preparation, soil replacement as needed and placement of imported materials.

Design Criteria

The average flow from the trucking/service facility is based on the maximum projected populations that is estimated to be less than 650 gallons per day with a peak design flow less than 1000 gallons per day. We assume that the office and shop facility will have a daily employee population of up to 25 persons with up to15 full time office and 10 shop maintenance personnel at the facility and approximately 10 transient employees coming in and out each day. The proposed OWS will be designed for a maximum of 50 persons. The design flow is calculated in accordance with minimum State ISDS standards based on a peaking factor of 150% and may include increased values for typical water use above the state guidelines. The design flows will be based on standard water usage for commercial uses per types of facilities and employee populations pursuant to Table 1 of the State Guidelines. Typical average water uses include the following:

a. Office per employee = 15 gpd
b. Offsite worker for check in/out (assume % of total per day) = 5 gpd
c. Equivalent factory worker (without showers) = 20 gpd

Based on these projections the design flow is calculated to be 975 gpd.
The design flow are tabulated below.

System	Facility Usage	Employees/transient	Capita Use	Design Flow Rate			
OWS System facilities	Facility description type	employ status full/part	Employ/trans Max. 24-hours #	/capita Usage gpd/cap	Avg QA gpd	Peaking Factor #	Design QD gpd
TRI-STATE Trucking Service	office facilities	fulltime	15	15	225	1.5	337.5
	Transient visitor	parttime	5	5	25	1.5	37.5
	Transient Drivers	fulltime	10	15	150	1.5	225
	Transient visitor	parttime	10	5	50	1.5	75
	shop maintenance	fulltime	10	20	200	1.5	300
Facility-Total			50		650		975

The secondary treatment system will be a sand filter bed with full pressure distribution. For a sand filter design we are assuming a treatment bed loading rate of 0.95 gallons per square foot per day. The infiltration of treated effluent through the basal area at the interface with the soil will be based on the average percolation rate of 160 mpi determined by the previous geotechnical evaluation.

The treatment/absorption system will consist of two sand filter beds installed over native soils with the possible placement of pit run material as needed below the minimum 2 foot layer of sand. The treatment/absorption envelope comprises approximately 4000 Square feet and will accommodate a treatment system with a initial treatment surface area of 1027 S.F. with an underlying basal infiltrative area in excess of 2070 S.F. The sand filter will be alternately pressure dosed over 2 zones through perforated pressure distribution pipes installed on top of the sand layer. The pipes are covered by standard gravelless leaching chambers to act as a spray shield to promote broad dispersal and

an oxygen rich treatment environment. Alternating dosing will be controlled through the duplex pumps and an automatic distributing valve.
The pump assembly and dosing chamber will be installed in a single compartment 1000 gallon dosing tank in series with the septic tank. The vault will utilize a maintainable effluent filter. The transport line from the dosing pump to the absorption field will be installed to allow the drain back of effluent to the dosing basin. The system will be designed to include all standard appurtenances typical of a pressure dosed sand filter systems and installed to meet all required setbacks and minimum horizontal separation distances. Below is a tabular summary of the pressure dosed sand filter design based on the above reported design flows and percolation rates.

Calculations	Minimum	Required	Treatment Absorption Bed Layout						
Design QD flowrate	Load Rate sand filter treatment	Treatment absorption Area	L.F. per 3 S.F. Sand filter	No. Zones per field	L.F. per zone Sand filter	Distribution laterals per zone	Chambers per zone	Chambers per row	Length perfor. laterals
gpd	gal/sf/day	S.F.	L.F.	#	L.F.	#	#	ft	ft
975	0.95	1026	342	2	171	4	52	13	53

Soil Infiltration		Required	Basal Area Infiltrative Surface Area				
Design QD	Average Percrate	Infiltration Basal area	20% Dosing Reduced Area	Field Width	Field Length	Depth Sand Filter	Design Basal Area
gpd	min/inch	S.F.	S.F.	FT.	FT.	ft	S.F.
975	160	2467	1973	35	59	2	2065

If you have any questions or need any additional information please give us a call.

Sincerely,
SOPRIS ENGINEERING

Paul Rutledge
Design Engineer

28377
10/26/2011
Yancy Nichol, P.E.
Principal

Cc;

RECEIVED
DEC 8 2011
GARFIELD COUNTY
BUILDING & PLANNING

Transmittal

To: David Bartholemew
Company: Garfield County Building Department
From: John Petaisto
Date: December 8, 2011
Subject: Tri-State Trucking Building Permit - Revised Civil Plans
SE Job No.: 11162.01

No. of copies	Item	Remarks
2	24x36" Stamped Civil Plans	Revised flipped site plan per Raul Gawry's revised building plans.

If materials received are not listed above, please notify us.

Transmitted by:

- ◊ First Class Mail
- ◊ Express Mail
- ✓ Messenger
- ◊ Pickup
- ◊ U.P.S.
- ◊ Federal Express

inserted into plans. 12/9/11 DB

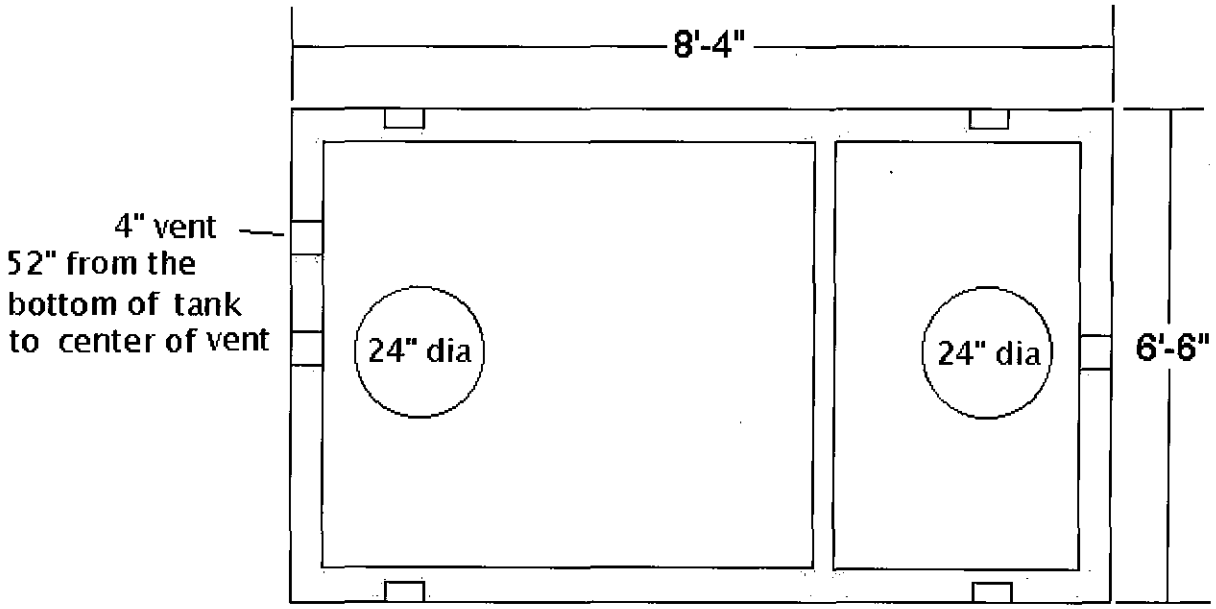
502 main street • suite A3 • carbondale, CO 81623 • (970)704-0311 • fax (970)704-0313

SOPRIS ENGINEERING • LLC civil consultants

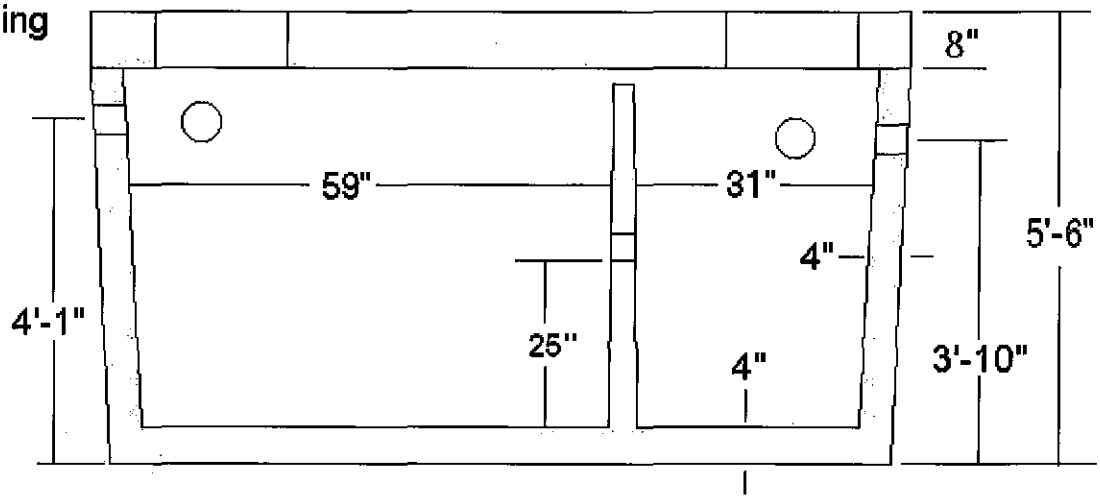
Copeland Concrete Inc.

28803 Hwy 6
Rifle CO 81650
Phone: (970) 625-1112 Fax: (970) 625-1110

1000 gal 1pc.



H-20 loading



1000 sand and oil interceptor - 4000 PSI concrete, reinforced with fiber and rebar meeting ASTM standard C-1116. Top reinforced for H20 loading.

Digging Specs: 7'-6" wide X 9'-6" long. From the outside bottom to the center of the inlet hole is 4'-1", the outlet is 3 inches lower.

Transmittal

To: David Bartholemew
Company: Garfield County Building Department
From: John Petaisto
Date: November 1, 2011
Subject: Tri-State Trucking Building Permit - Civil Plans
SE Job No.: 11162.01

No. of copies	Item	Remarks
2	24x36" Stamped Civil Plans	
2	OWS Report	

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