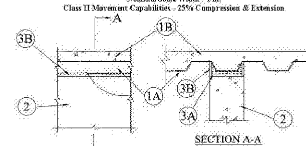
UL DESIGN

Joint Systems
System No. HW-D-0174
September 28, 2003

Assembly Rating — 2 Hr
L Rating at Ambient - Less than 1 CFM/Lin Ft.
L Rating at 400 F - Less than 1 CFM/Lin Ft.
Nominal Joint Width - 1 in.
Class II Movement Capabilities - 25% Compression & Extension



1. **Floor Assembly** — The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Form Units*** — Max 3 in. deep galv steel fluted roof deck.
B. **Concrete** — Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly** — (Not Shown) - As an alternate to the floor assembly, a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly and shall include the following construction features:

A. **Steel Roof Deck** — Max 3 in. deep galv. steel fluted roof deck.
B. **Roof Insulation** — Min 2-1/4 in. thick poured insulating concrete, as measured from the top plane of the deck.

2. **Wall Assembly** — Min 6-1/8 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in Fire Resistance Directory for names of manufacturers.

3. **Joint System** — **Max separation between bottom of floor or roof and top of wall is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system consists of the following:

A. **Forming Material*** — Min 4 pcf mineral wool batt insulation cut into min 5-5/8 in. wide strips, compressed approximately 33 percent in thickness to fill the max 1 in. gap between top of wall and bottom of steel floor or roof deck and recessed from both surfaces of wall to accommodate the required thickness of fill material.

IIG MINWOOL L L C — MinWool-1200 Safing
ROCK WOOL MANUFACTURING CO — Delta Board or Delta -8
ROCKWOOL MALAYSIA SDN BHD — Type Safe
ROXUL INC — Type Safe
THERMAFIBER INC — Type SAF

B. **Fill, Void or Cavity Material* - Sealant** — Min 1/4 in. thickness of sealant installed on each side of wall between top of wall and bottom of floor or roof, flush with each surface of wall.

3M COMPANY — FireBarrier 1000 NS

*Bearing the UL Classification Mark

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Through-penetration Firestop Systems
System No. C-AJ-1364
February 08, 2010

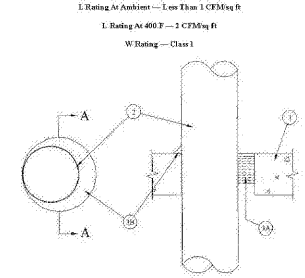
F Rating — 2 Hr

T Rating — 0 Hr

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

L Rating At 400 F — 2 CFM/sq ft

W Rating — Class 1



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 25-7/8 in. (657 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants** — One metallic pipe, tubing or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between tube and periphery of opening shall be min 0 in (point contact) to max 1-7/8 in. (48 mm). Penetrants to be rigidly supported on both sides of floor assembly. The following types and sizes of metallic pipes, tubing or conduit may be used:
A. **Steel Pipe** — Nom 24 in. (610 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. **Iron Pipe** — Nom 24 in. (610 mm) diam (or smaller) cast or ductile iron pipe.
C. **Conduit** — Nom 6 in. (152 mm) diam (or smaller) rigid steel conduit.
D. **Conduit** — Nom 4 in. (102 mm) (or smaller) steel electrical metallic tubing.
E. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tube.
F. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Firestop System** — The details of the firestop system shall be as follows:
A. **Packing Material** — Min 3 in. (76 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Materials* — Sealant** — Min 1/4 in. (6 mm) thickness of fill material applied within the annulus, flush with top surface of floor. Min 1/2 in. (13 mm) diam bead of caulk applied to the penetrant/concrete interface at the point contact location on the top surface of floor.

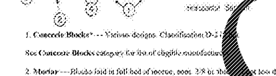
3M COMPANY — FD-1000 NS, FB-3000 SL or FB-3000 WT

*Bearing the UL Classification Mark

Design No. U905
March 11, 2016
Bearing Wall Rating — 2 HR
Nonbearing Wall Rating — 2 HR

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

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



1. **Concrete Blocks*** — Various designs. Classification D-2 (2 hr).

See **Concrete Blocks** category for list of eligible manufacturers.

2. **Mortar** — Blocks laid in full bed of mortar, nom. 3/8 in. thick, of not less than 2-1/4 and not more than 3-1/2 parts of clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. **Portland Cement Stucco or Gypsum Plaster** — Add 1/2 hr to classification if used. Where combustible members are framed in wall, plaster or stucco must be applied on the face opposite framing to achieve a max. Classification of 1-1/2 hr. Attached to concrete blocks (Item 1).

4. **Loose Masonry Fill** — If all core spaces are filled with loose dry expanded slag, expanded clay or shale (Rotary Kiln Process), water repellent vermiculite masonry fill insulation, or silicone treated perlite loose fill insulation add 2 hr to classification.

5. **Foamed Plastic*** — (Optional-Not Shown) — 1-1/2 in. thick max, 4 ft wide sheathing attached to concrete blocks (Item 1).
ATLAS ROOFING CORP — "EnergyShield Pro Wall Insulation" and "EnergyShield Pro 2 Wall Insulation"
CARLISLE COATINGS & WATERPROOFING INC — Type R2+ Sheath
FIRESTONE BUILDING PRODUCTS CO L L C — "Enverge™ CI Foil Exterior Wall Insulation" and "Enverge™ CI Glass Exterior Wall Insulation"
HUNTER PANELS — Types Xci-Class A, Xci 286
RMAX OPERATING L L C — "TSX-8500", "TSX-8510", "Thermasheath-XP", "ECOMAXci", "Thermasheath-3", "Durasheath-3"
THE DOW CHEMICAL CO — Types Thermax Sheathing, Thermax Light Duty Insulation, Thermax Heavy Duty Insulation, Thermax Metal Building Board, Thermax White Finish Insulation, Thermax ci Exterior Insulation, Thermax XARMOR ci Exterior Insulation, Thermax IH Insulation, Thermax Plus Liner Panel, Thermax Heavy Duty Plus (HDP) and TUFF-R™ ci Insulation

5A. **Building Units** — As an alternate to Item 5, min. 1-in thick polyisocyanurate composite foamed plastic insulation boards, nom. 48 by 48 or 96 in.
RMAX OPERATING L L C — "Thermasheath-SI", "ECOBASEci", "ThermaBase-CI"

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Design No. D503
April 28, 2014
Restrained Assembly Ratings - 1 or 2 Hr (See Item 2)
Unrestrained Assembly Ratings - 1 or 2 Hr (See Item 2)
Unrestrained Beam Ratings - 2 Hr

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

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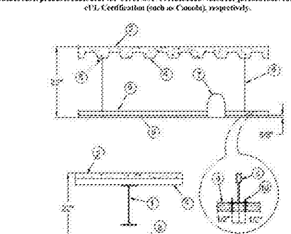

1. **Beam** — W12x19, min size.

2. **Normal Weight Concrete** — Normal weight concrete, carbonate or siliceous aggregate, 152 ± 3 pcf unit weight, 4000 psi compressive strength. Concrete thickness above top of steel floor units min. 2 in. for 1 hr assembly ratings and 3 hr unrestrained beam rating and 2-1/2 in. for 2 hr assembly ratings.

3. **Steel Fiber Reinforcement*** — (Not Shown) — Steel fibers added to concrete mix to control shrinkage cracks in concrete. See Fiber Reinforcement (CBXQ) Category for rate that fibers are added to concrete mix.

4. **Steel Floor Units*** — Min. 2 in. deep, min. 20-gauge galv fluted steel floor units welded to supports. Welds spaced 12 in. OC. Supports spaced max. 10 ft OC. See Steel Floor and Form Units (CBWX) Category for names of manufacturers.

5. **Hanger Tab** — No. 18 GSG galv steel, 2 in. wide by 3-1/2 in. long, hooked at one end for attachment over male side joint of floor units, other end provided with hole for attachment of hanger wire. Spaced along side joints of floor units as required for hanger wire locations.

6. **Hanger Wire** — No. 12 SWG galv steel wire. Hanger wires spaced not over 48 in. O.C. along main runners and located at ends of main runners at walls.

7. **Recessed Luminaires Classified for Fire Resistance*** — Recessed incandescent luminaires having nominal 6 in diam. Spacing of luminaires not to exceed one luminaire per 25 sq ft of ceiling area with a min separation of 3 ft between luminaires. Luminaires installed in accordance with accompanying instructions. Wired in conformance with the National Electrical Code. See **Luminaires Classified for Fire Resistance** (CDHW) Category for names of manufacturers.

8. **Steel Framing Members*** — Main runners nom 12 ft long spaced 48 in. OC. Cross tees nom 4 ft long installed perpendicular to main runners and spaced 24 in. OC. Additional cross tees located 8 in. from and on both sides of each wallboard end joint.

CHICAGO METALLIC CORP — Type 650, 650C, 670, 670C

8A. **Steel Framing Members*** — As an alternate to Item 8. Main runners, cross tees, cross channels and wall angle as listed below:
a. **Main Runners** — Nom 10 or 12 ft long, 15/16 in. or 1-1/2 in. wide face, spaced 4 ft. OC. Main runners suspended by min 12 SWG galv steel hanger wires spaced 48 in. OC. Hanger wires to be located adjacent to main runner/cross tee intersections.
b. **Cross Tees** — Nom 4 ft. long, 1-1/2 in. wide face, installed perpendicular to the main runners, spaced 24 in. OC. Additional cross tees or cross channels used at 8 in. from each side of butted wallboard end joints. The cross tees or cross channels may be riveted or screw attached to the wall angle or channel to facilitate the ceiling installation.
c. **Cross Channels** — Nom 4 ft. long installed perpendicular to main runners spaced 24 in. OC.
d. **Wall Angle or Channel** — Painted or galv steel angle with 1 in. legs or channel with 1 in. legs, 1-9/16 in. deep attached to walls at perimeter of ceiling with fasteners 16 in. OC. To support steel framing member ends and for screw-attachment of the gypsum wallboard.

CGC INC — Type DGL or RX.
USG INTERIORS LLC — Type DGL or RX.

8B. **Steel Framing Members*** — (Not Shown) — As an alternate to Items 8 and 8A - Main runners nom 12 ft long, spaced 72 in. OC. Cross tees, nom 6 ft long, installed perpendicular to main runners and spaced 24 in. OC. Additional 6 ft long cross tees required at each gypsum board end joint with butted gypsum board end joints centered between cross tees spaced 8 in. OC. The main runners and cross tees may be riveted or screw attached to the wall angle or channel to facilitate the ceiling installation.

USG INTERIORS LLC — Type DGL or RX

9. **Gypsum Board*** — 5/8 in. thick, 4 ft wide, installed with long dimension perpendicular to cross tees with side joints centered along main runners. Wallboard fastened to each cross tee with five wallboard screws with one screw located at the mid-span of the cross tee, one screw located 12 in. from and on each side of the cross tee mid-span, and one screw located 1-1/2 in. from each wallboard side joint. Except at wallboard end joints, wallboard screws shall be located on alternating sides of cross tee flange.

At wallboard end joints, wallboard screws shall be located 1/2 in. from the joint. Wallboard fastened to main runners with wallboard screws, 1/2 in. from side joints midway between intersections with cross tees (24 in. OC). End joints of adjacent wallboard sheets shall be staggered not less than 4 ft OC. Wallboard sheets screw-attached to leg of wall angle with wallboard screws spaced 12 in. OC.

When alternate **Steel Framing Members*** (Item 8B) are used, gypsum board sheets installed with long dimension (side joints) perpendicular to the 6 ft long cross tees with the end joints staggered min 4 ft and centered between cross tees which are spaced 8 in. OC. Gypsum board side joints may occur beneath or between main runners. Prior to installation of the gypsum board sheets, backer strips consisting of nom 7-3/4 in. wide pieces of gypsum board are to be laid atop the cross tee flanges and centered over each butted end joint location. The backer strips are to be secured to the flanges of the cross tees at opposite corners of the backer strip with fold down clips to prevent the backer strips from being uplifted during screw-attachment of the gypsum board sheets. Gypsum board fastened to cross tees with 1 in. drywall screws spaced 1 in. and 4 in. from the side joints and max 8 in. OC in the field of the board. The butted end joints are to be secured to the backer strip with No. 10 by 1-1/2 in. long Type G laminating screws located 1 in. from each side of the butted end joint and spaced 1 in. and 4 in. from the side joints and max 8 in. OC in the field of the board.

CGC INC — Type C
UNITED STATES GYPSUM CO — Type C
USG MEXICO S A DE C V — Type C

10. **Screw, Wallboard** — Type S-12, 1 in. long, self-drilling and self-tapping, 0.163 in. thread diam, 5/16 in. diam heads.

11. **Finishing System** — (Not Shown) — Paper tape embedded in compound over joints and covered with additional compound. Exposed screw heads covered with compound. Edges of compound feathered out.

12. **Wall Angle** — (Not Shown) — No. 26 MSG angle with 1-1/8 in. legs, nailed to the walls along perimeter of ceiling to support steel framing member ends and for screw-attachment of the gypsum wallboard.

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

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Design No. U423
July 02, 2014

Bearing Wall Ratings — 45 min, 1, 1-1/2 or 2 Hr (See Items 5 & 7)

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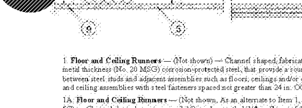

1. **Floor and Ceiling Runners** — (Not shown) — Channel shaped, fabricated from min 0.0329 in., bare metal thickness (No. 20 MSG) corrosion-protected steel, that provide a sound structural connection between steel studs and adjacent assemblies such as floors, ceilings and/or other walls. Attached to floor and ceiling assemblies with steel fasteners spaced not greater than 24 in. OC.

1A. **Floor and Ceiling Runners** — (Not shown, As an alternate to Item 1, For Use With Item 5A and 5C) — Channel shaped runners min 3-1/2 in. deep with 1-1/4 in. flanges fabricated from min. No. 20 MSG corrosion-protected steel. Attached to floor and ceiling assemblies with steel fasteners spaced not greater than 24 in. OC.

2. **Steel Studs** — Min 0.0329 in., bare metal thickness (No. 20 MSG) corrosion-protected steel studs, min 3-1/2 in. wide, cold formed, designed in accordance with the current edition of the Specification for the Design of Cold-Formed Steel Structural Members by the American Iron and Steel Institute (AISI). All design details enhancing the structural integrity of the wall assembly, including the axial design load of the studs, shall be as specified by the steel stud designer and/or producer, and shall meet the requirements of all applicable local code agencies. The max stud spacing shall not exceed 24 in. OC. Studs attached to floor and ceiling runners with 1/2 in. long Type S-12 steel screws on both sides of the studs or by welded or bolted connections designed in accordance with the AISI specifications.

2A. **Steel Studs** — (As an alternate to Item 2, For use with Item 5A and 5C) Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min width, min 1-1/2 in. flanges and 1/4 in. return, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners.

2B. **Steel Studs** — (As an alternate to Item 2 and 2A, For Use With Item 5B) - Min 0.0329 in., (No. 20 MSG) corrosion-protected cold formed steel studs, min 3-1/2 in. deep by 1-5/8 in. wide with 1/2 in. returns. Braced at mid-height and designed in accordance with the current edition of the Specification for the Design of Cold-Formed Steel Structural Members by the American Iron and Steel Institute (AISI). All design details enhancing the structural integrity of the wall assembly, including the axial design load of the studs, shall be as specified by the steel stud designer and/or producer, and shall meet the requirements of all applicable local code agencies. The max stud spacing shall not exceed 24 in. OC. Studs attached to floor and ceiling runners with 1/2 in. long Type S-12 steel screws on both sides of the studs or by welded or bolted connections designed in accordance with the AISI specifications.

2C. **Framing Members - Steel Studs** — (As an alternate to Item 2, For use with Item 5C) Channel shaped, fabricated from min 20 MSG (0.0327 in. thick) corrosion-protected or galv steel, 3-1/2 in. min width, min 1-1/2 in. flanges and 1/4 in. return, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height.

3. **Lateral Support Members** — (Not shown) — Where required for lateral support of studs, support shall be provided by means of steel straps, channels or other similar means as specified in the design of a particular steel stud wall system.

4. **Wood Structural Panel Sheathing** — (Optional, For use with Item 5 only.) - (Not Shown) - 4 ft wide, 7/16 in. thick oriented strand board (OSB) or 15/32 in. thick structural 1 sheathing (plywood) complying with DOC PS1 or PS2, or APA Standard PRP-108, manufactured with exterior glue, applied horizontally or vertically to the steel studs. Vertical joints centered on studs, and staggered one stud space from wallboard joints. Attached to studs with flat-head self-drilling tapping screws with a min. head diam. of 0.292 in. at maximum 6 in. OC. in the perimeter and 12 in. OC. in the field. When used, fastener lengths for gypsum panels increased by min. 1/2 in.

The maximum loading on the steel studs was evaluated with the steel studs braced at mid-height and not braced by the plywood sheathing.

5. **Gypsum Board*** — Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered when load is reduced to 90 percent of max stud capacity. When load is at 100 percent, horizontal edge joints and horizontal butt joints on opposite sides of studs staggered a min of 12 in. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. When used in widths other than 48 in., gypsum panels to be installed horizontally. The thickness and number of layers and percent of design load for the 45 min, 1 hr, 1-1/2 hr, and 2 hr ratings are as follows:

Wallboard Protection on Each Side of Wall

Rating	No. of Layers & Thkns of Panel	% of Design Load
45 Min	1 layer, 1/2 in. thick	100
1 hr	1 layer, 5/8 in. thick	100
1-1/2 hr	2 layers, 1/2 in. thick	100
2 hr	2 layers, 5/8 in. thick	80
2 hr@	2 layers, 5/8 in. thick	100
2 hr	3 layers, 1/2 in. thick	100
2 hr	2 layers, 3/4 in. thick	100

@Rating applicable when Batts and Blankets (Item 7) are used.

CGC INC — 1/2 in. thick Type IP-X2, IPC-AR, C, WRC; or 5/8 in. thick Type SCX, SHX, WRX, IP-X1, AR, C, IP-AR, IP-X2, IPC-AR, ULX, or WRC; 3/4 in. thick Types AR, IP-AR, IP-X3, ULTRACODE.

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR, or WRC; 5/8 in. thick Type AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULX, WRX, or WRC; 3/4 in. thick Types AR, IP-AR or IP-X3, ULTRACODE.

USG MEXICO S A DE C V — 1/2 in. thick Type C, IP-X2, IPC-AR, WRC; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, WRX or WRC; 3/4 in. thick Types AR, IP-AR, IP-X3, ULTRACODE.

5A. **Gypsum Board*** — (As an alternate to Item 5 when used as the base layer on one or both sides of wall. For direct attachment only, not to be used with Item 4) - Nom 5/8 in. or ½ in. may be used as alternate to all 5/8 in. or ½ in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 in. or ½ in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. See Items 1A, 2A & 8A(a). Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 12) or Lead Discs or Tabs (see Item 13).

RAY-BAR ENGINEERING CORP — Type RB-LBG

5B. **Gypsum Board*** — (As an alternate to Items 5 and 5A.) - Nom 5/8 in. thick gypsum panels with square edges, applied horizontally or vertically. For the 1 hour single layer system - when the gypsum board panels are installed horizontally the joints are to be staggered by a minimum of 12 in. on opposite sides of assembly, they are to be secured on each side of the studs with 1-1/4 in. long Type S-12 bugle head steel screws spaced 8 in. OC to the top and bottom tracks and in the field with screws 1 in. and 4 in. from the horizontal joints. When the gypsum board panels are installed vertically all vertical joints must be centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC to the top and bottom tracks and in the field with screws 1 in. and 4 in. from the perimeter. For the 2 hour double layer system - when the gypsum board panels are installed horizontally the joints need not be staggered on opposite sides of assembly. Base layer secured on each side of the studs with 1-1/4 in. long Type S-12 bugle head steel screws spaced 16 in. OC to the top and bottom track and in the field with screws beginning 3 in. and 8 in. from the horizontal joints. Face layer horizontal joints staggered 8 in. from base layer joints and secured with 1-5/8 in. long Type S-12 bugle head steel screws spaced 16 in. OC to the top and bottom tracks and in the field with screws beginning 1 in. and 8 in. from the horizontal joints. Face layer screws offset 8 in. from base layer screws. When the gypsum board panels are installed vertically all vertical joints must be centered over studs and staggered min 1 stud cavity on opposite sides of studs. Face layer gypsum boards secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 16 in. OC with screws 2 in. and 16 in. from the perimeter. Base layer gypsum boards secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 16 in. OC with screws 1-1/2 in. and 8 in. from the perimeter. Face layer screws offset 8 in. from base layer screws.

UNITED STATES GYPSUM CO — 5/8 in. thick Type USGX (Joint tape and compound, Item 9, optional with Type USGX)

5C. **Gypsum Board*** — (As an alternate to Item 5 when used as the base layer on one or both sides of wall. For direct attachment only, not to be used with Item 4). Nominal 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 (or #6 by 1-1/4 in. long bugle head fine driller) steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.

NEW ENGLAND LEAD BURNING CO INC, DBA NELCO — Nelco

5D. **Gypsum Board*** — (As an alternate to Item 5 when used as the base layer on one or both sides of wall. For direct attachment only, not to be used with Item 4) - Nom 5/8 or 3/4 in. may be used as alternate to all 5/8 or 3/4 in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. See Items 1A, 2A & 8A(a). Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 12A) or Lead Discs (see Item 13A).

MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

5E. **Gypsum Board*** — (As an alternate to Item 5 when used as the base layer on one or both sides of wall. For direct attachment only, not to be used with Item 4). Nom 5/8 in. may be used as alternate to all 5/8, shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. See Items 1A, 2A & 8A(a). Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

6. **Fasteners** — (Not shown) — For use with Item 5 - Type S or S-12 steel screws used to attach panels to studs (Item 2 or 2A) and studs (Item 2 or 2A) or furring channels (Item 8). **Single layer systems:** 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 8 in. OC when panels are applied horizontally, or 12 in. OC when panels are applied vertically. **Two layer systems:** First layer- 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in. and 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. **Three layer systems:** First layer- 1 in. long for 1/2 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below.

7. **Batts and Blankets*** — (Required as indicated under Item 5) — Nom 2 in. thick mineral wool batts, friction fitted between studs and runners. See **Batts and Blankets (BKNV or BZJZ) Categories** for names of Classified companies.

7A. **Batts and Blankets*** — (Optional, not shown) — Placed in stud cavities, any glass fiber or mineral wool insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance. See **Batts and Blankets (BKNV or BZJZ) Categories** for names of Classified companies.

7B. **Batts and Blankets*** — (Optional, not shown) — Placed in stud cavities, glass fiber insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.

OWENS CORNING — Type QuietZone Acoustic Batts

7C. **Fiber, Sprayed*** — (optional) As an alternate to Batts and Blankets (Item 7) - Not for use with Items 8A or 8B) — Spray applied mineral wool insulation. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product. See Fiber, Sprayed (CCAZ).

AMERROCK PRODUCTS L P — Type Rockwool

8. **Furring Channels** — (Optional on one or both sides, not shown, for single or double layer systems) — Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 1/2 in. long Type S-12 panhead steel screws. Not for use with type FRX-G gypsum panels and Item 5A or 5C.

8A. **Steel Framing Members (Not Shown)*** — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels** — Formed of No. 25 MSG galv steel, 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with type FRX-G gypsum panels and Item 5A or 5C.
b. **Steel Framing Members*** — Used to attach furring channels (Item 8a) to studs (Item 2). Clips spaced max. 48 in. OC., and secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.

PAC INTERNATIONAL INC — Types RSIC-1, RSIC-1 (2.75).

8B. **Steel Framing Members** — (Not Shown)* — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 8, furring channels and Steel Framing Members as described below:
a. **Furring Channels** — Formed of No. 25 MSG galv steel, 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with type FRX-G gypsum panels and Item 5A or 5C.
b. **Steel Framing Members*** — Used to attach furring channels to studs (Item 2). Clips spaced max. 48 in. OC., and secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.

PLITEQ INC — Type GENIECLIP

9. **Joint Tape and Compound** — Vinyl or casein, dry or premixed joint compound applied in two coats to joints and screw heads of outer layers. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layers. Paper tape and joint compound may be omitted when gypsum boards are supplied with square edges.

10. **Siding, Brick or Stucco** — (Optional, not shown) — Aluminum, vinyl or steel siding, brick veneer or stucco, meeting the requirements of local code agencies. Brick veneer attached to studs with corrugated metal wall ties attached to each stud with steel screws, not more than each sixth course of brick.

11. **Caulking and Sealants*** — (Optional, not shown) — A bead of acoustical sealant applied around the partition perimeter for sound control.

UNITED STATES GYPSUM CO — Type AS

12. **Lead Batten Strips** — (Not Shown, For Use With Item 5A) - Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5A) and optional at remaining stud locations. Required behind vertical joints.

12A. **Lead Batten Strips** — (Not Shown, for use with Item 5D) Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 6) and optional at remaining stud locations.

13. **Lead Discs or Tabs** — (Not Shown, For Use With Item 5A) - Used in lieu of or in addition to the lead batten strips (Item 12) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 5A) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

13A. **Lead Discs** — (Not Shown, for use with Item 5D) Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

14. **Lead Batten Strips** — (Not Shown, For Use With Item 5C) Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.142 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5C) and optional at remaining stud locations.

15. **Lead Tabs** — (Not Shown, For Use With Item 5C) 2 in. wide, 5 in. long with a max thickness of 0.142 in. Tabs friction-fit around front face of stud, the stud folded back flange, and the back face of stud. Tabs required at each location where a screw (that secures the gypsum boards, Item 5C) will penetrate the steel stud. Lead tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead tabs may be held in place with standard adhesive tape if necessary.

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

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COMCHECK

COMcheck Software Version 4.0.8.1
Envelope Compliance Certificate

Project Information
Building Area
Envelope Assemblies
[illegible]

GUTTER AND DOWNSPOUT CALS

LS 354 Auburn, AL
Gutter and Downspout Sizing

Building Parameters	**Depth**		
Bldg Depth at Gutter (ft)	102		
Gutter Length (ft)	30		
Gutter Width (in)	8		
Gutter Depth (in)	8		
DS Width (in)	6		
DS Depth (in)	6		
2012 International Plumbing Code			
100 Year Hourly Rainfall Rate (in per hr) P1106.1	5		
Downspouts:			
Max Hor Projected Roof Area per DS T1106.2(2)	8800		
Actual Hor Projected Roof Area per DS	3060	OK	
Gutters:			
Equivalent Gutter Diameter (in)	8		
Gutter Slope (in per foot)	0.125		
Max Hor Projected Roof Area per Gutter T1106.3	11500		
Actual Hor Projected Roof Area per Gutter	3060	OK	
1993 SMACNA			
Slope Factor	[illegible]		
		10 Yr	100 Yr
5 Minute Intensity (in per hr for 5 min)		[illegible]	[illegible]
Roof Area per DS Area (sf per si)		[illegible]	[illegible]
Downspouts:			
DS Area (sq in)			
Max Roof Area per DS		5400	3960
Actual Factored Roof Area per DS	[illegible]		
Check		OK	OK
Rectangular Gutters (NT [illegible])			
Gutter Depth-to-Width [illegible]	1.0000		
[illegible]	1.0000		
[illegible]	1.4392		
[illegible]		37.26169	40.115119
Min Gutter Width [illegible]		6.8236	7.5289
Check		OK	OK
Min Gutter Depth (in)		6.8236	7.5289
Check		OK	OK

UNIT MIX TABULATION

LS 354 Auburn, AL LifeStorage — Stinard Architecture, Inc.
Unit Mix Tabulation — 3/12/2019

SF per Unit		20	25	50	55	75	60	90	135	100	140	150	200	250	300		
Conditioned Storage:																	
1st Floor	**Gross SF**	**4x5**	**5x5**	**5x10**	**5x11**	**5x15**	**6x10**	**9x10**	**9x15**	**10x10**	**10x14**	**10x15**	**10x20**	**10x25**	**10x30**	**Total**	
Units		0	7	25	0	3	0	3	1	29	1	11	8	3	4	95	Total Units
Total SF	14,931	0	175	1,250	0	225	0	270	135	2,900	140	1,650	1,600	750	1,200	10,295	Net Rentable
2nd Floor	**Gross SF**	**4x5**	**5x5**	**5x10**	**5x11**	**5x15**	**6x10**	**9x10**	**9x15**	**10x10**	**10x14**	**10x15**	**10x20**	**10x25**	**10x30**	**Total**	
Units		0	23	18	0	23	1	0	1	26	1	37	1	0	0	131	Total Units
Total SF	15,905	0	575	900	0	1,725	60	0	135	2,600	140	5,550	200	0	0	11,885	Net Rentable
Total	**Gross SF**	**4x5**	**5x5**	**5x10**	**5x11**	**5x15**	**6x10**	**9x10**	**9x15**	**10x10**	**10x14**	**10x15**	**10x20**	**10x25**	**10x30**	**Total**	
Units		0	30	43	0	26	1	3	2	55	2	48	9	3	4	226	Total Units
Total SF	30,836	0	750	2,150	0	1,950	60	270	270	5,500	280	7,200	1,800	750	1,200	22,180	Net Rentable
% Units		0%	13%	19%	0%	12%	0%	1%	1%	24%	1%	21%	4%	1%	2%	100%	
																98	Avg SF/Unit
																72%	Efficiency
Accessible Units:		4x5	5x5	5x10	5x11	5x15	6x10	9x10	9x15	10x10	10x14	10x15	10x20	10x25	10x30	Total	
Up to 200 @	5%	0	0	3	0	0	0	0	0	3	0	2	2	0	0	10	5%
Over 200 @	2%	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3%
Total		0	1	3	0	0	0	0	0	3	0	2	2	0	0	11	

Note: Unit sizes indicated are nominal, and are subject to variation.

STATE OF ALABAMA
SCOTT D. STINARD
REGISTERED ARCHITECT

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ISSUE: FOR CONSTRUCTION
REVISIONS:

PROJECT NUMBER 201839
DATE 3-15-19

SHEET NUMBER
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