Development Services

From Concept to Construction

Phone: 503-823-7300 Email: bds@portlandoregon.gov 1900 SW 4th Ave, Portland, OR 97201
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APPEAL SUMMARY

Status: Decision Rendered - Held over from ID 27535 (2/23/22) for additional information

Appeal ID: 27588	**Project Address:** 701 NE Burnside St
Hearing Date: 3/16/22	**Appellant Name:** Tom Jaleski
Case No.: B-009	**Appellant Phone:** 971.238.5266
Appeal Type: Building	**Plans Examiner/Inspector:** Corey Stanley
Project Type: commercial	**Stories:** 4 **Occupancy:** R-2, B, M **Construction Type:** V-A
Building/Business Name:	**Fire Sprinklers:** Yes - throughout
Appeal Involves: Reconsideration of appeal	**LUR or Permit Application No.:**
Plan Submitted Option: pdf [File 1] [File 2] [File 3] [File 4] [File 5]	**Proposed use:** Residential

APPEAL INFORMATION SHEET

Appeal item 1

Code Section	§703.3, §704.3, §707.5.1., §713.4, , 703.3, §704.3, §711.2.3, §703.3 & §704.3
Requires	ORIGINAL TEXT: §703.3 Alternative Methods for Determining Fire Resistance The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required fire resistance of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures; Fire-resistance designs documented in approved sources. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721. Calculations in accordance with Section 722. Engineering analysis based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E119 or UL 263. Alternative protection methods as allowed by Section 104.11. Fire-resistance designs certified by an approved agency. §704.3 Protection of the Primary Structural Frame Other Than Columns Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a fire-resistance rating and support more than two floors or one floor and roof, or support a load-bearing wall or a non-load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required fire-resistance rating. Exception: Individual encasement protection on all sides shall be permitted on all exposed sides

	provided that the extent of protection is in accordance with the required fire-resistance rating, as determined in Section 703. §707.5.1. Supporting Construction. The supporting construction for a fire barrier shall be protected to afford the required fire-resistance rating of the fire barrier supported. Hollow vertical spaces within a fire barrier shall be fireblocked in accordance with Section 718.2 at every floor level. Exceptions: The maximum required fire-resistance rating for assemblies supporting fire barriers separating tank storage as provided for in Section 415.9.1.2 shall be 2 hours, but not less than required by Table 601 for the building construction type. Supporting construction for 1-hour fire barriers required by Table 509 in buildings of Types IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code. §713.4 Fire-resistance Rating Shaft Enclosures Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. Shaft enclosures shall have a fire-resistance rating not less than the floor assembly penetrated but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1. RECONSIDERATION TEXT: NO CHANGE
Code Modification or Alternate Requested	ORIGINAL TEXT: The proposed steel beam assembly is supporting a 2-hour shaft wall, consisting of a vertical exit enclosure (stairwell), which serves all levels of the building. It is assumed the beam could be exposed to fire and the assembly will require continuous protection from all sides. RECONSIDERATION TEXT: NO CHANGE
Proposed Design	ORIGINAL TEXT: The proposed assemblies consist of a beam supporting a 2-Hour rated floor assembly above. The encasement of the beam includes two layers of Type “X” Gypsum and a minimum of one (1) layer of 3/4” mineral wool board around the three exposed sides of the beam; additionally two (2) layers of 5/8” Type “X” gypsum are proposed to entirely cover the mineral board and encase the assembly as displayed in Figure 1. Figure 2, within attached EJ#1, has a special condition approved for the Lobby that requires to have a 2-hour floor-ceiling envelope, also requiring the beam passing thru this space to be 2-hour individually encased and protected as well. See Figure 3 in EJ for Architectural Detail #15, the 2-hour rated floor/ceiling assembly. RECONSIDERATION TEXT: Installation of one (1) layer of 3/4" Albi DriClad Mineral Fiber Board through UL design S301. The mineral boards shall be installed with strips a min 4 inches wide, every 2 feet within beam span, friction fit, material is then cut to box in the steel beam assembly with 1 inch overhang, noggins along the bottom flanges friction fit, Albi Screws a min 2.25 inch 6 inch OC fasten the mineral boards to maintain independence of the assembly UL S301. The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly. In addition the project proposes to encase UL Design S301 with two (2) layers of 5/8" Types “X” gypsum wallboard, installed per UL Design N501 to exceed the minimum 2-hour fire-resistance rating as detailed in EJ #1. Through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type “X" gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501.

Reason for alternative	ORIGINAL TEXT: Installation of one (1) layer of 3/4" Albi DriClad Mineral Fiber Board and two (2) layers of 5/8" Types “X” gypsum wallboard will meet the 2-hour requirement as installed for the proposed beam assembly. Where the mineral board requires two layers, the boards shall overlap with a min of 1/2” to ensure continuity of the underlayer as shown in UL Design No. S301, as detailed in EJ #1, and from Albi DriClad Installation Guide. The proposed design for the encased beam includes 3/4" Albi DriClad, a 3X Nailer from above and the addition of 2 layer 5/8” Type “X" gypsum wall board. We have analyzed the fire rating of the proposed assembly in accordance with §703.3, §704.3, §707.5.1. and per §713.4 of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum 2-hour fire-resistance rating as detailed above through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type “X" gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501. The proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in this letter with UL No. N501 & S301. Therefore, as detailed within the attached EJ #1, with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam at the lobby will meet the minimum 2-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed. RECONSIDERATION TEXT: We have revised the EJ#1 to include more specific details on the installation of this assembly with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in EJ #1 with UL No. N501 & S301, the proposed design for the beam at the lobby will meet the minimum 2- hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed, thus we request you to approve this appeal.

Appeal item 2

Code Section	703.3, §704.3, §711.2.3
Requires	ORIGINAL TEXT: §703.3 Alternative Methods for Determining Fire Resistance The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required fire resistance of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures; Fire-resistance designs documented in approved sources. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721. Calculations in accordance with Section 722. Engineering analysis based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E119 or UL 263. Alternative protection methods as allowed by Section 104.11. Fire-resistance designs certified by an approved agency. §704.3 Protection of the Primary Structural Frame Other Than Columns Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a fire-resistance rating and support more than two floors or one floor and roof, or support a load-bearing wall or a non-

	load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required fire-resistance rating. Exception: Individual encasement protection on all sides shall be permitted on all exposed sides provided that the extent of protection is in accordance with the required fire-resistance rating, as determined in Section 703. §711.2.3 Supporting Construction of Floor and Roof Assemblies The supporting construction shall be protected to afford the required fire-resistance rating of the horizontal assembly supported. RECONSIDERATION TEXT: NO CHANGE
Code Modification or Alternate Requested	ORIGINAL TEXT: The proposed steel beam assembly is supporting a 2-hour fire-resistance rated floor assembly as shown in attached EJ #2, and is assumed that the beam could be exposed to fire and the assembly will require continuous protection from all exposed sides. RECONSIDERATION TEXT: NO CHANGE
Proposed Design	The proposed assembly consists of a beam supporting a 2-Hour rated floor assembly above. The encasement of the beam includes two layers of Type “X" Gypsum and a minimum of one (1) layer of 3/4" mineral wool board around the three exposed sides; additionally two (2) layers of 5/8 Type “X" are proposed to entirely cover the mineral board and encase the assembly as displayed in Figures 1 in EJ #2. See Figure 2 for the location of the proposed beam assembly. Please see the attached EJ #2. RECONSIDERATION TEXT: The proposed assembly consists of a beam supporting a 2-Hour rated floor assembly above. The encasement of the beam includes one (1) layer of 3/4" mineral wool board around the three exposed sides. Installation of one (1) layer of 3/4" Albi DriClad Mineral Fiber Board through UL design S301. The mineral boards shall be installed with strips a min 4 inches wide, every 2 feet within beam span, friction fit, material is then cut to box in the steel beam assembly with 1 inch overhang, noggins along the bottom flanges friction fit, Albi Screws a min 2.25 inch 6 inch OC fasten the mineral boards to maintain independence of the assembly UL S301. In addition the project proposes to encase UL Design S301 with two (2) layers of 5/8" Types “X” gypsum wallboard, installed per UL Design N501 to exceed the minimum 2-hour fire-resistance rating as detailed in EJ #2. Through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type “X" gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501. The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly. Please see the attached EJ #2.
Reason for alternative	ORIGINAL TEXT: Installation of one (1) layer of 3/4" Albi DriClad Mineral Fiber Board and two (2) layers of 5/8" Types “X" gypsum wallboard will meet the 2-hour requirement as installed for the proposed beam assembly. Where the mineral board requires two layers, the boards shall overlap with a min of 1/2" to ensure continuity of the underlayer as shown in UL Design No. S301, as detailed in EJ #2, and from Albi DriClad Installation Guide. The proposed design for the encased beam includes 3/4" Albi DriClad, a 3X Nailer from above and the addition of 2 layers of 5/8” Type “X" gypsum wall board. We have analyzed the fire rating of the proposed assembly in accordance with §703.3, §704.3, §707.5.1. and per §711.2.3 of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum

2-hour fire-resistance rating as detailed in EJ #2 through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type “X” gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501.
The proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in this letter with UL No. N501 & S301.
Therefore, as detailed in EJ #2 with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam at the exterior wall will meet the minimum 2-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed.
RECONSIDERATION TEXT:
We have revised the EJ#2 to include more specific details on the installation of this assembly with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in EJ #2 with UL No. N501 & S301, the proposed design for the beam at the lobby will meet the minimum 2- hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed, thus we request you to approve this appeal.

Appeal item 3

Code Section	§703.3 & §704.3
Requires	§703.3 Alternative Methods for Determining Fire Resistance The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required fire resistance of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures; Fire-resistance designs documented in approved sources. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721. Calculations in accordance with Section 722. Engineering analysis based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E119 or UL 263. Alternative protection methods as allowed by Section 104.11. Fire-resistance designs certified by an approved agency. §704.3 Protection of the Primary Structural Frame Other Than Columns Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a fire-resistance rating and support more than two floors or one floor and roof, or support a load-bearing wall or a non-load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required fire-resistance rating. Exception: Individual encasement protection on all sides shall be permitted on all exposed sides provided that the extent of protection is in accordance with the required fire-resistance rating, as determined in Section 703. RECONSIDERATION TEXT: NO CHANGE
Code Modification or Alternate Requested	ORIGINAL TEXT: The proposed typical steel beam assembly required to meet a 1-Hour fire-resistance rating per 2019 OSSC and assumed that the beam could be exposed to fire and the assembly will require

	continuous protection from all exposed sides. RECONSIDERATION TEXT: NO CHANGE
Proposed Design	ORIGINAL TEXT: The proposed beam assembly consists of a 3x wood nailer from above, two (2) layers of 5/8 Type “X” to entirely encase the beam from each side, a 3x nailer below (that can be optional as it does not provide required fire protection to the encasement) and two (2)) layers of 5/8 Type “X" from below as displayed in Figure 1 within attached EJ #3. RECONSIDERATION TEXT: The proposed beam assembly consists of a 3x wood nailer from above, a 3x nailer below (that can be optional as it does not provide required fire protection to the encasement) with two (2) layers of 5/8 Type “X” gypsum wallboard to be installed around beam, Base Layer attached with 1-1/4” Type S screws 16” OC. Face layer attached with 1-3/4” Type S screws 8” OC to entirely encase the beam from each side and two (2) layers of 5/8 Type “X" gypsum, Base Layer attached with 1-1/4” Type S screws 16” OC. Face layer attached with 1-3/4” Type S screws 8” OC to from below as displayed in Figure 1 within attached EJ #3.
Reason for alternative	ORIGINAL TEXT: The proposed design for the encased beam includes two (2) layers of 5/8” Type “X" gypsum wall board and a 3X Nailer from above and below. We have analyzed the fire rating of the proposed assembly in accordance with §703.3 and §704.3, of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum 1-hour fire-resistance rating as detailed in EJ #3 through the protection provided by two (2) layers 5/8" Type “X" gypsum wall board UL No. N501. The proposed design for the beam entirely covered on 4 sides will exceed the required 1-hour rating as compared and detailed in EJ #3 with UL No. N501. Therefore, as detailed within EJ #3, with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam will meet the minimum 1-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed. Hence we urge you to approve this appeal. RECONSIDERATION TEXT: We have revised the EJ#3 to include more specific details on the installation of this assembly with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam entirely covered on 4 sides will exceed the required 1-hour rating as compared and detailed in EJ #3 with UL No. N501 and will extend and maintain continuity of the required fire protection of the beam when installed as proposed, thus we request you to approve this appeal.

APPEAL DECISION

1. Alternate 2 hour fire rated beam assembly with engineering analysis: Granted as proposed.

2. Alternate 2 hour fire rated beam assembly with engineering analysis: Granted as proposed.

3. Alternate 1 hour fire rated beam assembly with engineering analysis: Granted as proposed.

The Administrative Appeal Board finds that the information submitted by the appellant demonstrates that the approved modifications or alternate methods are consistent with the intent of the code; do not lessen health, safety, accessibility, life, fire safety or structural requirements; and that special conditions unique to this project make strict application of those code sections impractical.

Pursuant to City Code Chapter 24.10, you may appeal this decision to the Building Code Board of Appeal within 90 calendar days of the date this decision is published. For information on the appeals process, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.

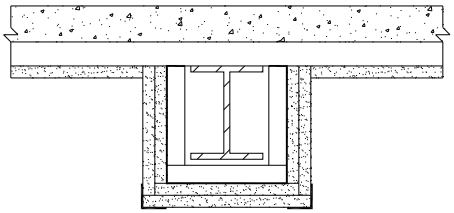
BEAMS, GIRDERS, AND TRUSSES, NONCOMBUSTIBLE

GA FILE NO. BM 2120 | **GENERIC** | **2 HOUR FIRE**

STEEL FRAME, GYPSUM WALLBOARD

Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 1/4" Type S drywall screws 16" o.c. **Face** layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 3/4" Type S drywall screws 8" o.c.

Beam cage fabricated from horizontally installed steel angles (25 gage steel having 1" and 2" legs) located not less than 1/2" from beam flanges. 1" legs of the upper angles secured to steel deck units with 1/2" Type S pan head screws 12" o.c. "U" shaped brackets formed of 25 gage "U" shaped steel channels (1 11/16" wide with 1" legs) 24" o.c. suspended from upper angles with 1/2" Type S pan head screws and supported 1" x 2" angles at lower corners attached to brackets with 1/2" Type S pan head screws. Outside corners of gypsum board protected by 0.020" thick steel corner beads crimped or nailed. Minimum beam size W8x24. **(Two Hour restrained or unrestrained beam.)**



Fire Test: UL R4024-5, 9-14-66;
UL Design N501;
ULC Design O501

ONLINE CERTIFICATIONS DIRECTORY

BXUV.S301
Fire Resistance Ratings - ANSI / UL 263

Page Bottom

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

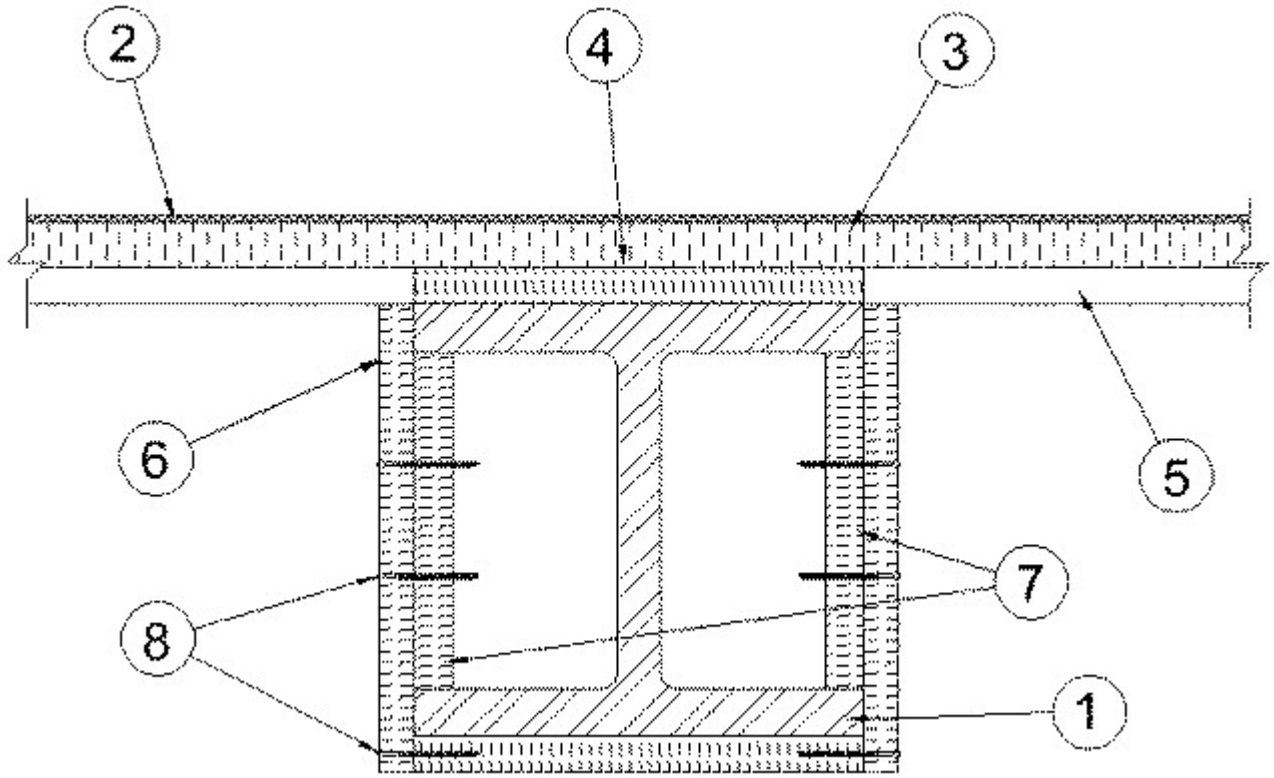
Design No. S301

February 07, 2003

Restrained Beam Ratings — 1, 1-1/2 or 2 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2 & 2 Hr (See Item 6)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam —** W8x28 min size.

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

3. **Mineral And Fiber Boards* —** 24 by 48 in. boards applied in single or multiple layers. Boards secured to steel roof deck units and previous layer of insulation, if multiple layers are used, with adhesive.

JOHNS MANVILLE INTERNATIONAL INC

4. **Adhesive* —** (Optional) Applied to steel roof deck units in 1/2 in. wide ribbons approx 6 in. OC at 0.4 gal per 100 sq ft. See Adhesive (BYWR) category for names of manufacturers.

5. **Steel Roof Deck —** (Unclassified) — Fluted, No. 22 MSG, galv 1-1/2 in. deep with 3-1/2 in. wide flutes spaced 6 in. OC. Ends overlapped at supports a min of 1-1/2 in. and welded to supports, 12 in. OC, max. Adjacent units button punched, welded or screwed together along side joints.

6. **Mineral and Fiber Boards —** Boards cut in various widths to be compatible with the size of beam being protected. Boards placed parallel with the flange of the beams are cut the width of the flange. Boards placed parallel with the web of the beams are cut the width of the beam (web side) plus twice the board thickness. The voids created by the flutes above the beam to be filled with mineral wool batts having a nom density of 4 lb per cu ft.

Restrained and Unrestrained Beam Ratings, Hr	Min Nominal Thkns In.
1	3/4
1-1/2	3/4
2	1-1/2

ALBI MFG, DIV OF STANCHEM INC — Type Dri-Clad

7. **Noggings —** Min 1-1/2 in. thick, pieces of mineral and fiber board (See Item 6). Cut to friction fit between beam flanges; located at horizontal butted joints of adjacent mineral and fiber board sections (Item 6) on the web sides of the beam.

8. **Fasteners —** The boards are fastened to the noggings and to each other by means of spiral type screws, spaced a max of 6 in. OC. The fasteners are installed on both sides of horizontal joints.

*Bearing the UL Classification Mark

Last Updated on 2003-02-07

Questions? Notice of Disclaimer Page Top

Great Scott Trio Engineering Judgment Report

EJ #1 - 2-Hour Fire Rating of Steel Beam At Lobby

Convergence Architecture

7302 N Richmond Ave

Portland, OR 97203

Date: 3/2/2022

Table of Contents

GREAT SCOTT TRIO

NE 7TH AVE & E BURNSIDE ST, PORTLAND, OREGON

1 PROJECT OVERVIEW

The Great Scott Trio is a new project under construction, located at 701 NE Burnside Street in Portland, Oregon. It will be under the jurisdictional review of the City of Portland. The proposed design is a four (4) story mixed use (M, B, an R-2), Type V-A Construction and fully sprinklered throughout and approximately 18,800 gross square feet. The legal lot includes a one story existing brewery building that will remain. The first story is office/retail, lobby, and one Type A residential unit. The upper three floors include twelve (12) residential on either side of an open courtyard.

One or more of the building systems do not meet the prescriptive code requirements or do not meet tested fire resistive assembly requirements. This EJ

The Client is proposing the application of mineral wool board (Albi DriClad, Roxul or equivalent) and additional layers of 5/8” Type “X” gypsum wall board to provide protection of this assembly to meet or exceed a 2-hour fire-resistant rating as required per 2019 OSSC.

This Engineering Judgement (EJ) addresses the condition of the steel beam supporting the wood floor located at the 2-hour lobby beam condition for the purpose of showing equivalent protection of 2-hour fire-resistance protection as required by 2019 OSSC. This EJ is only applicable to the element and location specified above. Other elements and locations were not reviewed for this document.

2 APPLICABLE CODES, STANDARDS, AND GUIDES

The review will be based on the following codes:

- 2019 Oregon Structural Specialty Code
- 2019 Oregon Fire Code

3 DISCUSSION

- The proposed beam assembly has been analyzed in accordance with:
  - **2019 OSSC §703.3 Alternative Methods for Determining Fire Resistance**
  - **2019 OSSC §704.3 Protection of the Primary Structural Frame Other Than Columns**
  - **2019 OSSC §713.4 Fire-Resistance Rating Shaft Enclosures**
  - **2019 OSSC §722.6.2 Calculated Fire Resistance of Walls, Floors and Roofs** for the protection provided by the Albi DriClad Mineral Fiber Board
- The proposed assembly has been analyzed in comparison with the **UL Design No. N501** (for comparision reference), however does not include a 25 guage steel cage around the beam, but has replaced this with mineral board (Albi DriClad, Roxul or equivalent product).
- The proposed assembly has been analyzed in comparison with the **UL Design No. S301** (for comparision reference), and per Albi DriClad Mineral Fiber BoardMineral Board installation Instructions. These have been included as Attachments to this EJ.
- The 2-hour assembly is evaluated with listed/tested ASTM E-119 assemblies and published information from AlbiClad.
- Portions of the tested assembly are modified to suit the unique design condition. The modification is analyzed for equivalency using published fire test data and acceptable fire science principles.

4 PROPOSED DESIGN

The proposed assemblies consist of a beam supporting a 2-Hour rated floor assembly above. The encasement of the beam includes two layers of Type “X” Gypsum and a minimum of one (1) layer of 3/4” mineral wool board around the three exposed sides of the beam; additionally two (2) layers of 5/8” Type “X” gypsum are proposed to entirely cover the mineral board and encase the assembly as displayed in Figure 1. Figure 2 has a special condition approved for the Lobby that requires to have a 2-hour floor-ceiling envelope, also requiring the beam passing thru this space to be 2-hour individually encased and protected as well. See Figure 3 for Architectural Detail #15, the 2-hour rated floor/ceiling assembly.

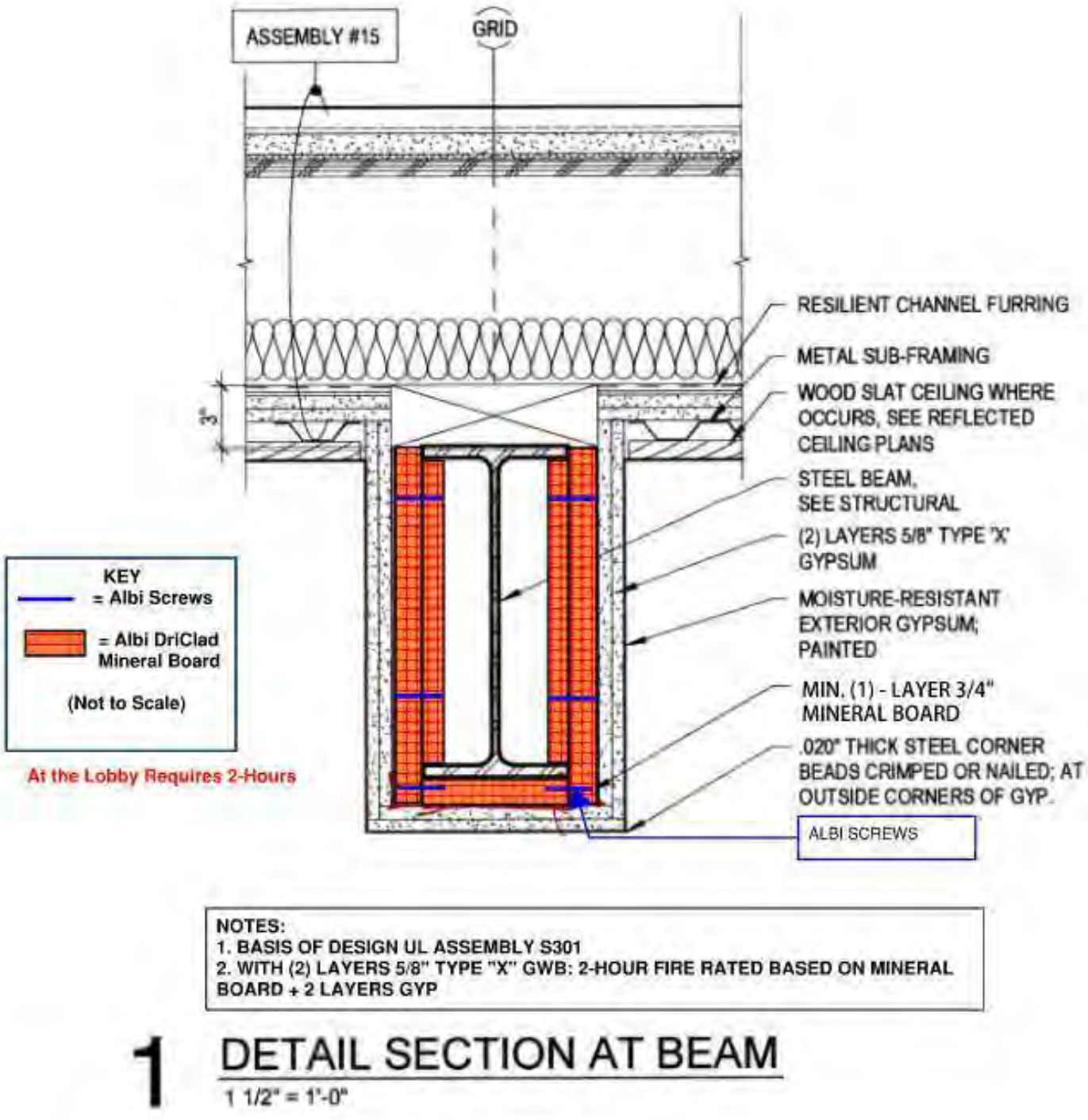


Figure 1: Detail Section at Beam Typical

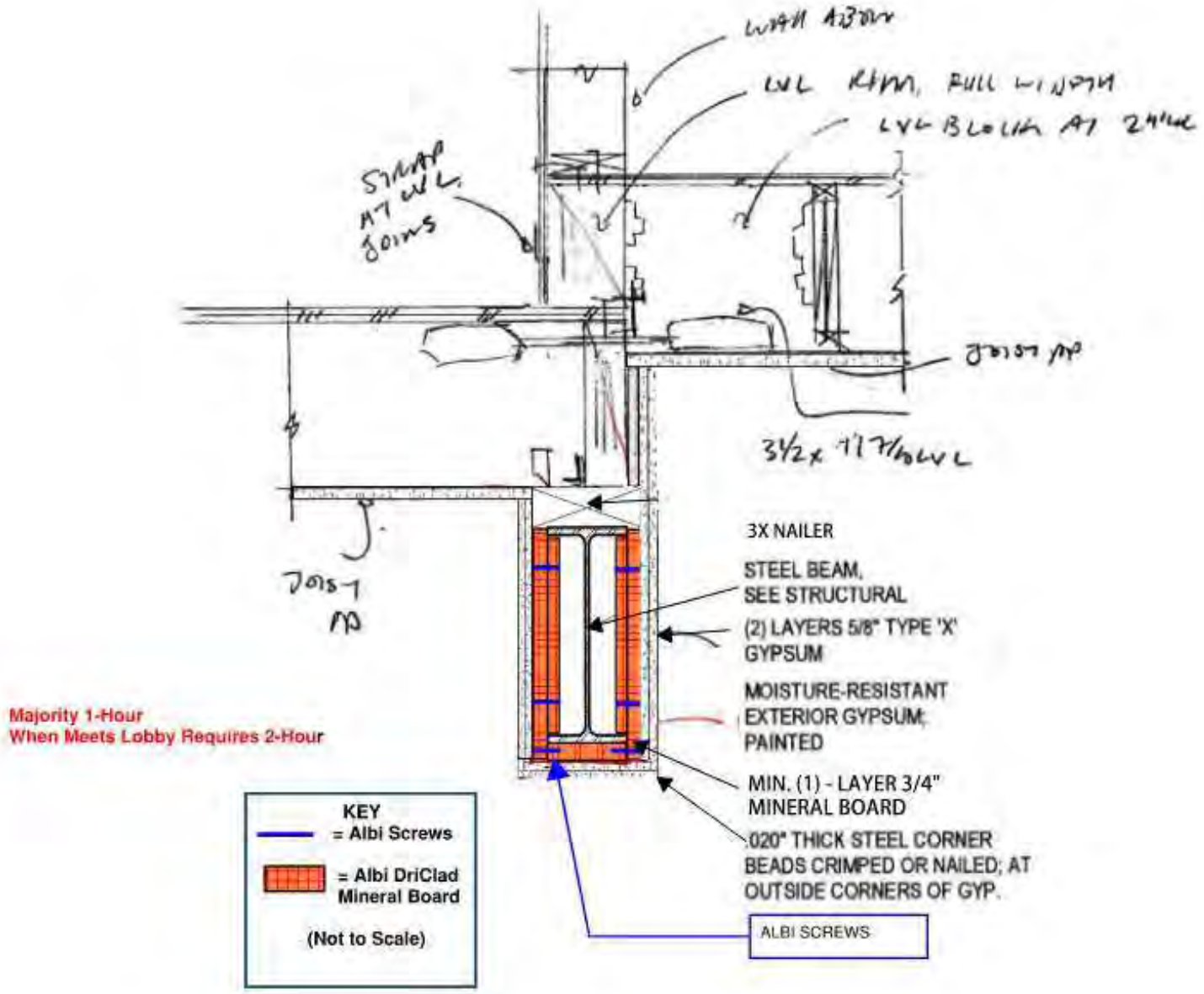


Figure 2: Beam Condition at Grid Line 2, Level 2A, When Meets Lobby

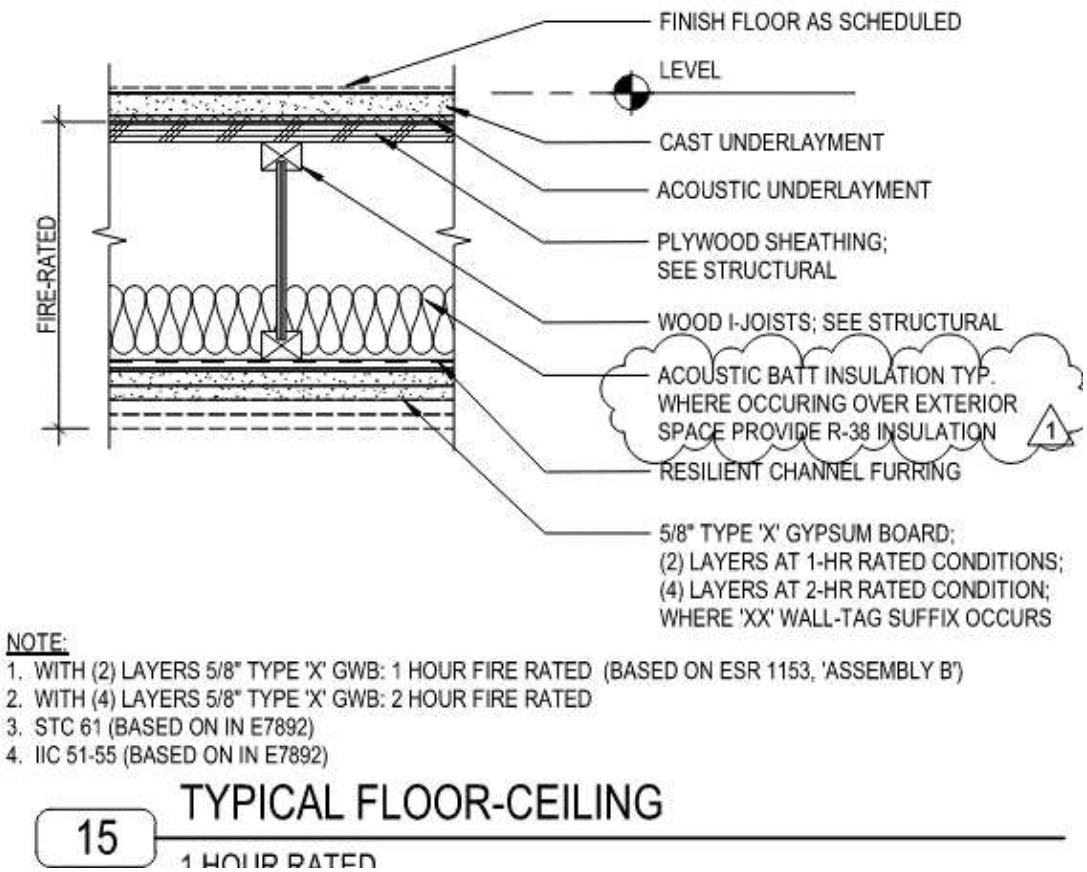


Figure 3: Detail #15 2-Hour Rated Floor Assembly Above Beam Assembly

5 CODE SECTIONS

§703.3 Alternative Methods for Determining Fire Resistance

The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures;

1. *Fire-resistance* designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E119 or UL 263.
5. Alternative protection methods as allowed by Section 104.11.
6. *Fire-resistance* designs certified by an approved agency.

§704.3 Protection of the Primary Structural Frame Other Than Columns

Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a *fire-resistance rating* and support more than two floors or one floor and roof, or support a load-bearing wall or a non-load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required *fire-resistance rating*.

> *Exception*: Individual encasement protection on all sides shall be permitted on all exposed sides provided that the extent of protection is in accordance with the required *fire-resistance rating*, as determined in Section 703.

§707.5.1. Supporting Construction.

The supporting construction for a *fire barrier* shall be protected to afford the required *fire-resistance rating* of the *fire barrier* supported. Hollow vertical spaces within a *fire barrier* shall be fireblocked in accordance with Section 718.2 at every floor level.

Exceptions:

1. The maximum required fire-resistance rating for assemblies supporting fire barriers separating tank storage as provided for in Section 415.9.1.2 shall be 2 hours, but not less than required by Table 601 for the building construction type.
2. Supporting construction for 1-hour fire barriers required by Table 509 in buildings of Types IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code.

§713.4 Fire-resistance Rating Shaft Enclosures

Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

6 ASSEMBLY ANALYSIS

The proposed steel beam assembly is supporting a 2-hour shaft wall, consisting of a vertical exit enclosure (stairwell), which serves all levels of the building. It is assumed that the beam could be exposed to fire and the assembly will require continuous protection from all exposed sides. Per §704.3 requires individual encasement to provide protection for all fire exposed sides of the beam assembly per §707.5.1. the beam needs to be protected with an equivalent rating to the shaft to meet a 2-Hour fire-resistance rating and per §713.4 of the 2019 OSSC, the shaft enclosure is required to be 2-hour fire rated where connecting four or more stories.

The proposed beam assembly was compared to UL N501 & UL S301 and tested for 2 hour fire-resistive construction. Our analysis looks at the four sides of the beam individually with Table 1 providing a summary of the protection from each side, and Table 2 providing the comparison between the tested / listed assemblies and the proposed assembly.

The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly.

Path	Proposed Assembly Beam Size	Notes
1. Protection from above	• 2-Hour Assembly (See Figure 2) Including two (2) layers 5/8" Type "X" GYP • 3xWood Blocking	**160-minute protection (minimum)** **Meets or Exceeds 2-hour FRR**
2. Protection from the Right side	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum	**140-minute minimum protection** **Meets or Exceeds 2-hour FRR**
3. Protection from the underside	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum	**140-minute minimum protection** **Meets or Exceeds 2-hour FRR**
4. Protection from the Left Side	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum	**140-minute minimum protection** **Meets or Exceeds 2-hour FRR**

Table 1:Summary of Fire-Resistance for Proposed Beam at Shaft

7 COMPARISON TO A LISTED ASSEMBLY

Element	UL N501 Minimum Beam Size W8x24	UL S301 Minimum Beam Size W8x28	Proposed Assembly
Protection from above	• Roof / Ceiling assembly	• Roof / Ceiling assembly	• 2-Hour Assembly (See Figure 2) Including two (2) layers 5/8" Type "X" GYP • 3X Wood Blocking
Protection from the Right side	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	1-Layer 3/4" Mineral Board Meets 2-Hour FRR	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum
Protection from the Underside	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	1-Layer 3/4" Mineral Board Meets 2-Hour FRR	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum
Protection from the Left Side	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	1-Layer 3/4" Mineral Board Meets 2-Hour FRR	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum
Fire-Resistance Rating	**2-Hour**	**2-Hour**	**2-Hour (minimum)**

Table 2:Comparison of Tested / Listed Assembly to Proposed Assembly to Meet 2-Hour FRR

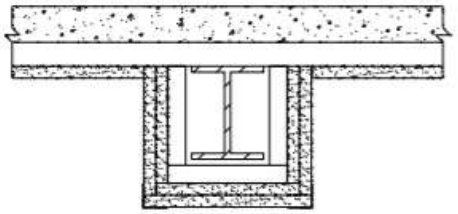
BEAMS, GIRDERS, AND TRUSSES, NONCOMBUSTIBLE

GA FILE NO. BM 2120	GENERIC	2 HOUR FIRE

STEEL FRAME, GYPSUM WALLBOARD

Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 1/4" Type S drywall screws 16" o.c. **Face** layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 3/4" Type S drywall screws 8" o.c.

Beam cage fabricated from horizontally installed steel angles (25 gage steel having 1" and 2" legs) located not less than 1/2" from beam flanges. 1" legs of the upper angles secured to steel deck units with 1/2" Type S pan head screws 12" o.c. "U" shaped brackets formed of 25 gage "U" shaped steel channels (1 11/16" wide with 1" legs) 24" o.c. suspended from upper angles with 1/2" Type S pan head screws and supported 1" x 2" angles at lower corners attached to brackets with 1/2" Type S pan head screws. Outside corners of gypsum board protected by 0.020" thick steel corner beads crimped or nailed. Minimum beam size W8x24. **(Two Hour restrained or unrestrained beam.)**



Fire Test: UL R4024-5, 9-14-66;
UL Design N501;
ULC Design O501

Figure 4: UL Design No. N501

The proposed assembly does not include the 25 gauge steel cage and the protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501. The use of the mineral board provides additional protection above and beyond that anticipated to be provided by the steel cage.

ONLINE CERTIFICATIONS DIRECTORY

BXUV.S301
Fire Resistance Ratings - ANSI/UL 263

Page Bottom

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

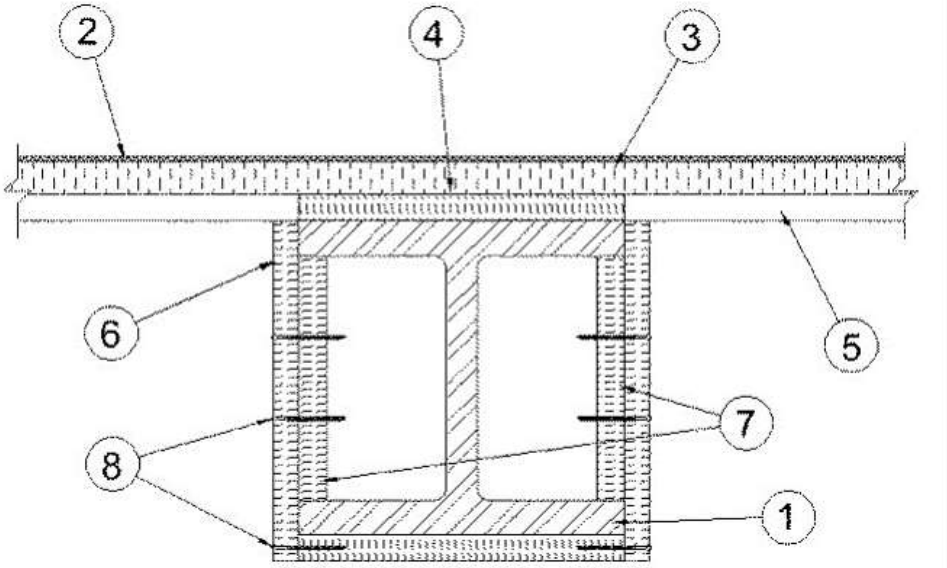
Design No. S301

February 07, 2003

Restrained Beam Ratings — 1, 1-1/2 or 2 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2 & 2 Hr (See Item 6)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam —** W8x28 min size.

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

3. **Mineral And Fiber Boards* —** 24 by 48 in. boards applied in single or multiple layers. Boards secured to steel roof deck units and previous layer of insulation, if multiple layers are used, with adhesive.

JOHNS MANVILLE INTERNATIONAL INC

4. **Adhesive* —** (Optional) Applied to steel roof deck units in 1/2 in. wide ribbons approx 6 in. OC at 0.4 gal per 100 sq ft. See Adhesive (BYWR) category for names of manufacturers.

5. **Steel Roof Deck —** (Unclassified) — Fluted, No. 22 MSG, galv 1-1/2 in. deep with 3-1/2 in. wide flutes spaced 6 in. OC. Ends overlapped at supports a min of 1-1/2 in. and welded to supports, 12 in. OC, max. Adjacent units button punched, welded or screwed together along side joints.

6. **Mineral and Fiber Boards —** Boards cut in various widths to be compatible with the size of beam being protected. Boards placed parallel with the flange of the beams are cut the width of the flange. Boards placed parallel with the web of the beams are cut the width of the beam (web side) plus twice the board thickness. The voids created by the flutes above the beam to be filled with mineral wool batts having a nom density of 4 lb per cu ft.

Restrained and Unrestrained Beam Ratings, Hr	Min Nominal Thkns In.
1	3/4
1-1/2	3/4
2	1-1/2

ALBI MFG, DIV OF STANCHEM INC — Type Dri-Clad

7. **Noggings —** Min 1-1/2 in. thick, pieces of mineral and fiber board (See Item 6). Cut to friction fit between beam flanges; located at horizontal butted joints of adjacent mineral and fiber board sections (Item 6) on the web sides of the beam.

8. **Fasteners —** The boards are fastened to the noggings and to each other by means of spiral type screws, spaced a max of 6 in. OC. The fasteners are installed on both sides of horizontal joints.

ALBI DRICLAD UL FIRE-RESISTANCE LISTINGS — *FIRE TEST ASTM E-119*

Typical System	Size	Hourly Rating	Thickness in. (mm)	UL Design No.
Beams - Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	S301
		1-1/2	3/4 (19.1)	S301
		2	1-1/2 (38)	S301

Figure 5: UL Design No. S301 Assembly for Reference

The proposed assembly will include two (2) layers 5/8" Type "X" gypsum wallboard to encase assembly UL S301 and the protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. S301.

8 MINERAL WOOL BOARD PROPERTIES

PROPERTY	TEST METHOD	VALUE
Dry Applied Density	—	10.5 PCF (average)
Tensile Strength	ASTM C 209	155 PSF
Compressive Strength @ 10%	ASTM C165	936 PSF
Moisture Absorption	ASTM C209	less than 0.50 % (by volume)
Moisture Adsorption	ASTM C553	less than 0.30 % (by volume)
Deflection	ASTM E 759	No Delamination
Corrosion & Fungi Resistance	ASTM C665	Non Corrosive/ No Fungi Growth
Leachable Chlorides	ASTM C871	No Leachable Chlorides
Thermal Conductivity (R Value)	ASTM C158	4.2 per inch
Sound Adsorption	ASTM C423	NRC 0.80
Fire hazard Classification	ASTM E 136	Non Combustible
Flame Spread	ASTM E84	Class A
Smoke Developed	ASTM E84	Class A

Figure 4: Albi DriClad mineral fiberboard properties

1” thickness of Albi DriClad mineral fiberboard undergoes a linear increase in temperature (once thermal stabilization occurs-46 minutes of exposure) under the temperature exposure of the ASTM E119 test (Figure 6). Per the linearity of temperature curve—which is due to the noncombustible composition, high density, and high heat resistant properties of the specimen—the thermal-resistance of the proposed thickness can be estimated. The proposed 1” thickness of the mineral fiberboard is 50% of the tested 2” thick specimen, which provides a 50% decrease in (differential temperature) fire-resistance due to the consistent linear thermal resistance property of the material. The chart below details the temperature of the backside of the DriClad while being heated per an ASTM E119 Time-Temperature Curve. While discoloration of the wood occurs below 550°F, ignition (when exposed to air) does not occur below 400°F and the combustion front develops fully at 550°F per NDS TR10; Section 1.2 (July 2018). It is concluded from the graph below; the proposed thickness of the mineral fiberboard will provide at least 2-hours of fire-resistance (120 Minutes) prior to the ignition of wood materials. This is consistent with ASTM E119 UL Design Assemblies for the DriClad whereby 3/4” thick DriClad provides 2 hours of protection for Steel beams. (UL Designs; D929, N307, J301, D303).

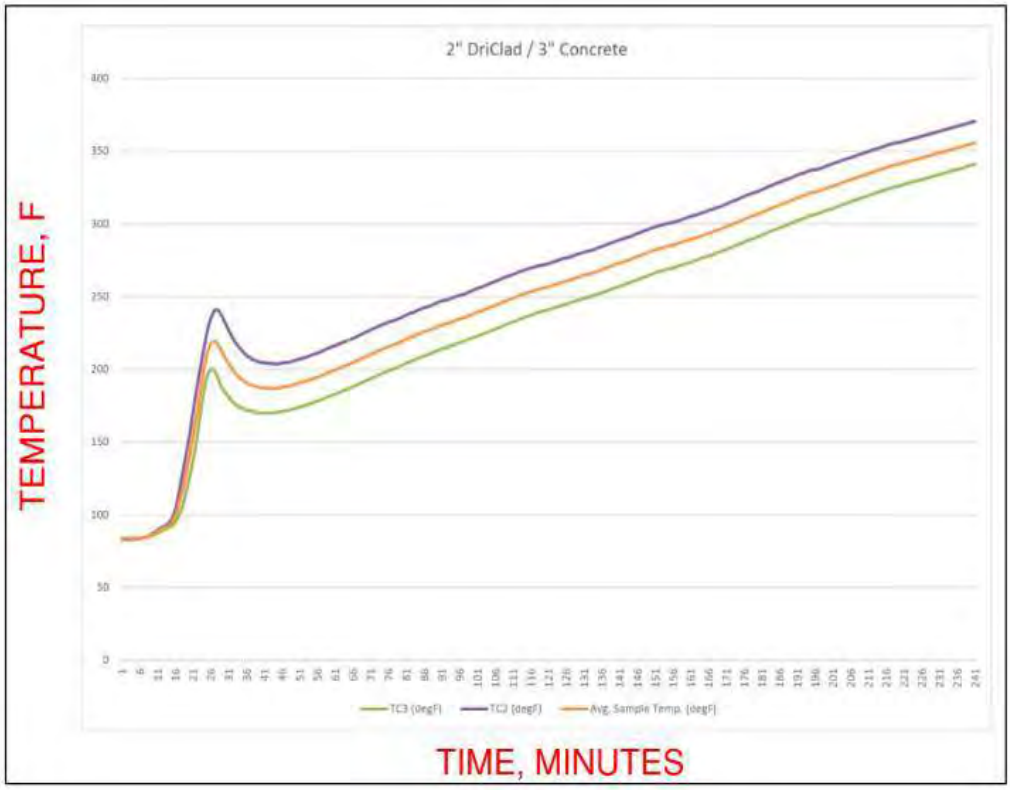


Figure 6: (4-Hr) Time-Temperature curve; ASTM E119 test, provided at the back side of the AlbiClad

One layer of 3/4" Albi DriClad will be installed as outlined above (Figure 1-3 above) and the assembly has been evaluated as allowed per OSSC 703.3. Accepted Fire Protection Engineering principals known as Harmathy's rules (see below) acknowledge that the addition of a rated assemblies will provide, at least, the summation of hourly rating of each assembly. (Rules 1,2).

HARMATHY'S TEN RULES

Rule 1: *The "thermal" fire endurance of a construction consisting of a number of parallel layers is greater than the sum of the "thermal" fire endurances characteristic of the individual layers when exposed separately to fire.*

Rule 2: *The fire endurance of a construction does not decrease with the addition of further layers.*

9 INSTALLATION OF MINERAL BOARD

Installation of 3/4" Albi DriClad fiber board is intended to entirely encase the steel beams to maintain continuity of penetrations without requiring SFRM or intumescent fire caulking. Any penetrations shall be protected through shims of mineral board cut and pressed to fit into and around all penetrations, the gap is not to exceed 1/8".

In order to ensure a 2-hour fire-resistance rating is provided, Albi DriClad Mineral Board will be installed over the entirety of the beam. Albi DriClad mineral fiberboard is a UL-listed material. It is a semi-rigid board manufactured from molten volcanic rock, spun into fine threads, and impregnated with bonding resin. It is compressed to form a durable noncombustible material with superior fire-resistance.

Installation shall be performed Per Albi DriClad Mineral Fiber Board product guide. One layer of 3/4" Albi DriClad Mineral Fiber Board will meet the 2-hour fire resistance rating when installed and detailed above with the addition of two (2) Layers of 5/8" Type "X" gypsum wall board.

Noggins will be installed at bottom of beam. Noggins shall be cut 4" wide or more and push fit into web at 2'-0" centers as shown in installation guide from AlbiClad. Ideally, noggins should extend slightly beyond flange tip 1/16". Gaps to not exceed 1/8 " to maintain continuity.

Cut side boards to suit depth of steel section plus thickness of fireproofing board. Install DriClad boards using two AlbiScrews at each end and at each intermediary noggin. (See figures 6 & 7 below and in installation guide) and shown in figure 5 & 6 below. We have included the Albi DriClad Mineral Fiber Board brochure and installation instructions as an attachment to this EJ.

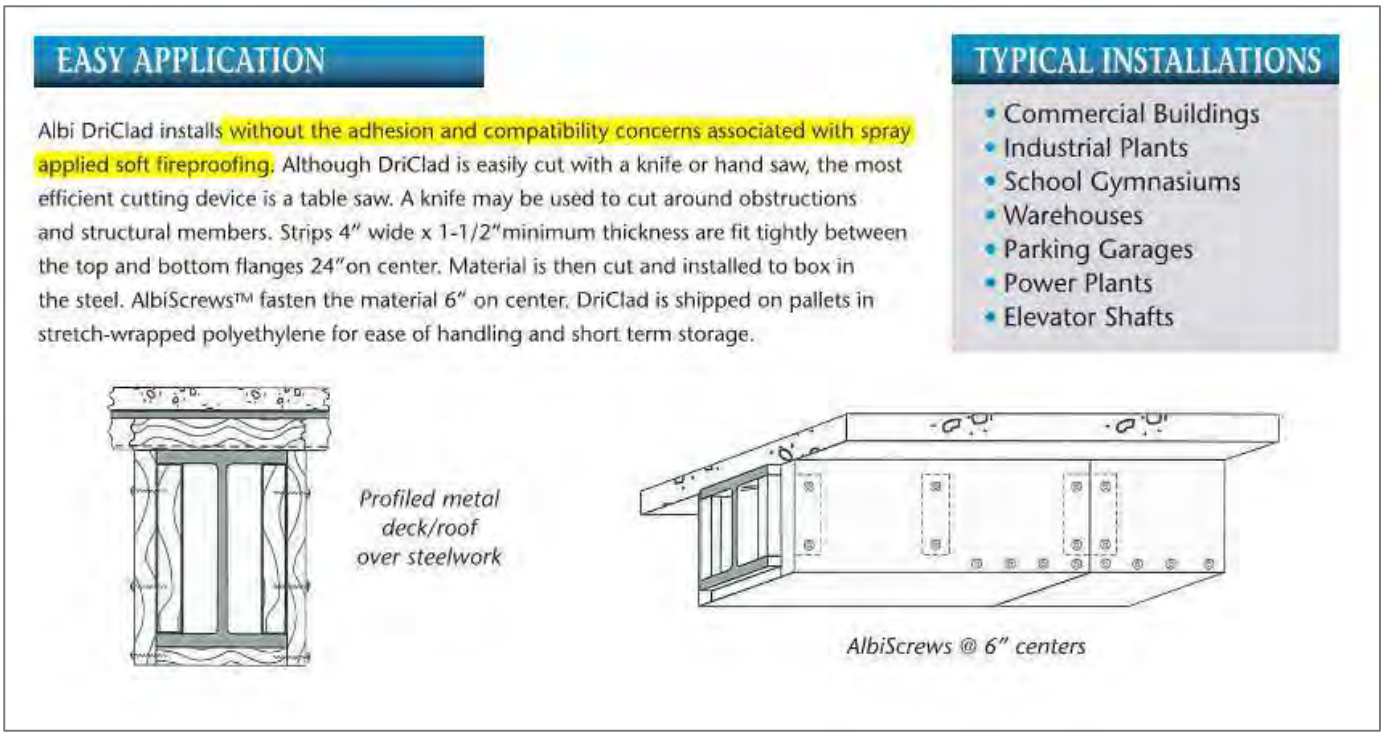


Figure 6: Albi DriClad Installation Diagram

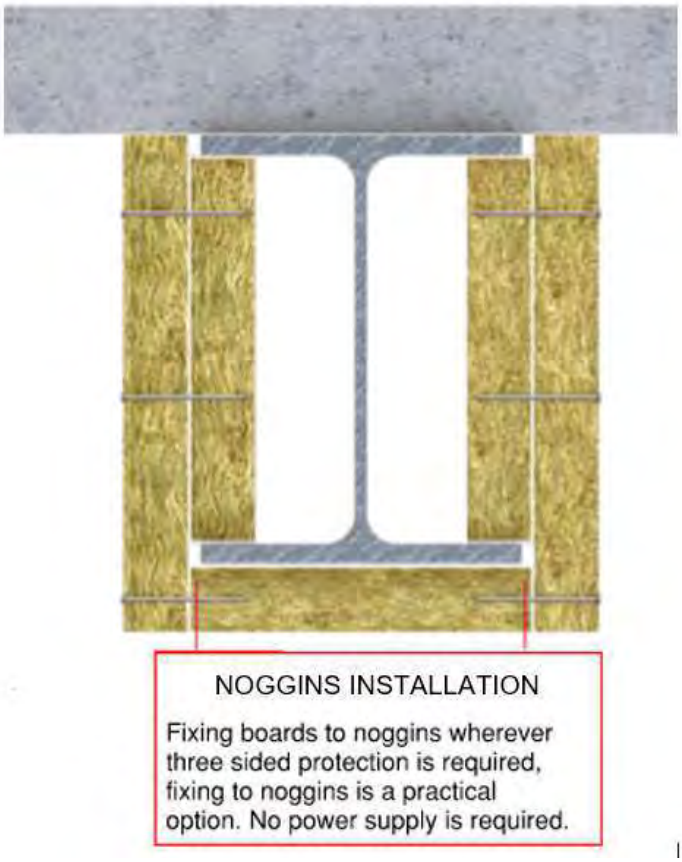


Figure 7: Installation Diagram with Noggins & AlbiScrews

10 SUMMARY

The overall rating of the assemblies were determined by the sum of the fire resistance rating of each component. The proposed assembly was found to meet the 2-hour requirements. The individual ratings were determined from §703.3, the code allows alternative methods for determining fire resistance. §722.6.2 for the protection provided by the Albi DriClad Mineral Fiber Board. §722 provides methods for calculating the fire resistance of membranes.

The protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501 and S301.

The difference between the proposed and the listed assembly design N501 is the 25 gauge steel beam cage element is not included in the proposed assembly as this does not provide any fire-resistance rating and is not part of the design.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam will meet the minimum 2-hour fire-resistance rating requirement by the OSSC and will extend and maintain continuity of the proposed beam and any penetrations.

Installation of one (1) layer of 3/4” Albi DriClad Mineral Fiber Board and two (2) layers of 5/8” Types “X” gypsum wallboard will meet the 2-hour requirement as installed for the proposed beam assembly. Where the mineral board requires two layers, the boards shall overlap with a min of 1/2” to ensure continuity of the underlayer as shown in UL Design No. S301, as detailed above, and from Albi DriClad Installation Guide.

11 CONCLUSION

The proposed design for the encased beam includes 3/4" Albi DriClad, a 3X Nailer from above and the addition of 2 layer 5/8" Type "X" gypsum wall board.

We have analyzed the fire rating of the proposed assembly in accordance with §703.3, §704.3, §707.5.1. and per §713.4 of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum 2-hour fire-resistance rating as detailed above through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type "X" gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501.

The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly.

The proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in this letter with UL No. N501 & S301.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam at the lobby will meet the minimum 2-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed.

Approved By:

exp 12/31/2022

Nicholas A Moriarty

Digitally signed by Nicholas A Moriarty
DN: C=US, E=nick.moriarty@codeul.com, O=Code Unlimited, OU=Las Vegas, CN=Nicholas A Moriarty
Date: 2022.03.02 20:36:11-08'00'

Nicholas A Moriarty, PE
Principal, Senior Fire Protection Engineer
Code Unlimited

Prepared By:

Meghan Stormont
Fire Analyst II
Code Unlimited LLC

Attachments

Albi DriClad Mineral Fiber BoardDri1clad Brochure

Albi DriClad Installation Instructions

DriClad
Parking Garage
Methuen, MA
Photo: Jim Lundell

Albi
Protective Coatings

DriClad

DESCRIPTION

Albi DriClad is based on naturally occuring basalt volcanic rock. The patented manufacturing process transforms crushed volcanic rock into a lightweight, durable board from finely sewn threads bound with a proprietary resin. For use on structural steel in lieu of conventional, soft fireproofing, this material offers excellent fire safety properties. It is supplied as 4' x 6' boards.

DriClad
Maine College of Arts
Portland, ME
Photo: Jeffrey Stevensen

ALBI DRICLAD ADVANTAGES

- Noncombustible
- High insulating Value
- No steel surface preparation required
- High sound absorption
- No leachable chloride content
- Non-capillary and non-hygroscopic
- Completely free of asbestos. CFCs and HFCs
- Chemically inert
- Installs dry without disruption to other trades
- Applies year-round in all weather conditions
- Factory-controlled density and thickness

WHERE TO SPECIFY

Specify Albi DriClad to provide fire resistance for structural steel on both new and retrofit construction. DriClad is compatible with all materials with which it is likely to be used in normal inductrial and commercial applications. It can also be applied to a wide range of nonferrous metals as well as elements such as walls, ventilation ducts, doors, and conduit. DriClad is available in a range of thicknesses beginning at 1".

PROVEN PERFORMANCE

The superior performance of Albi DriClad fireproofing materials has been verified under a wide range of applications throughout the world. DriClad is manufactured to the most stringent quality criteria and conforms to, or exceeds, all relevant American and worldwide standards. DriClad is classified as noncombustible in accordance with ASTM E136. Since DriClad has a low binder content, it shows zero flame spread and smoke development, per ASTM E84.

ALBI DRICLAD UL FIRE-RESISTANCE LISTINGS

FIRE TEST ASTM E-119

Typical System	Size	Hourly Rating	Thickness in. (mm)	UL Design No.
Columns - Wide Flange	W10 x 49 (254 x 254 mm)	1	3/4 (19.1)	X313
		1-1/2	1-1/4 (32)	X313
		2	1-1/2 (38)	X313
		3	2-1/2 (64)	X313
	W12 x 120 (312.9 x 332.7 mm)	4	1-1/2 (38)	X313
Beams - Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	S301
		1-1/2	3/4 (19.1)	S301
		2	1-1/2 (38)	S301
Beams - Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	N307
		1-1/2	3/4 (19.1)	N307
		2 (restrained)	3/4 (38)	N307
		2 (unrestrained)	1-5/8 (41)	N307
		3 (restrained)	1-5/8 (41)	N307
Beams - Unprotected Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	P930
		1-1/2	3/4 (19.1)	P930
		2 (restrained)	3/4 (19.1)	P930
		2 (unrestrained)	1-5/8 (41)	P930
Beams - Protected Roof / Ceiling (Restrained & Unrestrained)	Type 10k1 Joists	1	1 (25.4)	P302
Assembly - Floor / Ceiling (Restrained)[1]	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D929
		1-1/2	3/4 (19.1)	D929
		2	3/4 (19.1)	D929
		3	1-5/8 (41)	D929
Assembly - Floor / Ceiling (Unrestrained)[1]	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D929
		1-1/2	3/4 (19.1)	D929
		2	1-5/8 (41)	D929
Assembly - Protected Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D303
		1-1/2	3/4 (19.1)	D303
		2 (restrained)	3/4 (19.1)	D303
		2 (unrestrained)	1-5/8 (41)	D303
		3 (restrained)	1-5/8 (41)	D303
Assembly - Floor / Ceiling (Restrained & Unrestrained)	W8 x 24 (203 x 203 mm)	2	1 (25.4)	G301
Assembly - Protected Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	J301
		1-1/2	3/4 (19.1)	J301
		2 (restrained)	3/4 (19.1)	J301
		2 (unrestrained)	1-5/8 (41)	J301
		3 (restrained)	1-5/8 (41)	J301

[1] Requiere montaje con proteccion.

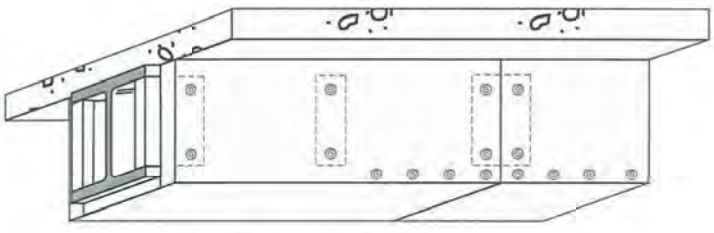
EASY APPLICATION

Albi DriClad installs without the adhesion and compatibility concerns associated with spray applied soft fireproofing. Although DriClad is easily cut with a knife or hand saw, the most efficient cutting device is a table saw. A knife may be used to cut around obstructions and structural members. Strips 4" wide x 1-1/2"minimum thickness are fit tightly between the top and bottom flanges 24"on center. Material is then cut and installed to box in the steel. AlbiScrews™ fasten the material 6" on center. DriClad is shipped on pallets in stretch-wrapped polyethylene for ease of handling and short term storage.

TYPICAL INSTALLATIONS

- Commercial Buildings
- Industrial Plants
- School Gymnasiums
- Warehouses
- Parking Garages
- Power Plants
- Elevator Shafts

Profiled metal deck/roof over steelwork



AlbiScrews @ 6" centers

Other Albi DriClad Literature

- Albi DriClad Long Form Guide Specification
- Albi DriClad Field Application Manual

PHYSICAL PROPERTIES

Property	ASTM Test Method	Value
Dry Applied Density (Average)	- 10.5	PCF
Compressive Strength @ 10%	ASTM C165	936 PSF
Tensile Strength	ASTM C209	155 PSF
Moisture Absorption	ASTM C209	0.50% By Volume
Moisture Adsorption	ASTM C553	0.03% By Volume
Sound Absorption	ASTM C423	NRC - 0.80
Deflection	ASTM E759	No Delamination
Thermal Performance (R Value)	ASTM C158	4.2 (per inch)
Corrosion & Fungi Resistance	ASTM C665	Non Corrosive/No Fung Growth
Leachable Chlorides	ASTM C871	No Leachable Chlorides
Air Erosion	ASTM C1071	0 @ 5800 ft/min
Fire Hazard Classification	ASTM E136	Non Combustible
Flame Spread	ASTM E84	0 (Class A)
Smoke Developed	ASTM E84	0 (Class A)

CLASSIFIED UL
* See complete marking on package

ALBI DRICLAD UL Classified Mineral Board*	Material Thickness	Material Thickness	Material Thickness	Material Thickness
	1.0 inch	1-5/8 inch	2.0 inch	2-1/2 inch
Sheets per Pallet	45 sheets	28 sheets	21 sheets	18 sheets
Total Square Feet per Pallet	1080 sq. ft.	672 sq. ft.	504 sq. ft	432 sq. ft.
Gross Weight per Pallet	1000 lbs	1000 lbs.	1000 lbs.	1000 lbs.

Also inquire about these fireproofing products from Albi:

Albi Clad 800
Intumescent fireproofing, withstands severe weathering and abuse

Albi Clad TF
Water-based, thin-film intumescent fireproofing for exposed interior structural steel

Albi Clad FP
Water-based, thin-film intumescent fireproofinh for exposed wood, wallboard, and other combustible assemblies

ALBI PROTECTIVE COATING

For more than five decades, Albi fireproofing materials have demonstrated superior performance and reliability under a range of extreme environments worldwide. These proprietary formualtions also meet global building codes and insurance requirements. Lightweight Albi materials provide long-term protection, outstanding durability, aesthetic properties and are completely free from asbestos.

Albi
Protective Coatings

Albi Protective Coatings, Division of StanChem, Inc.
401 Berlin Street, East Berlin, Connecticut 06023 U.S.A.
Tel: (860) 828-0571 Fax: (860) 828-3297
www.albi.com info@albi.com

Albi DriClad

FIREPROOFING APPLICATION MANUAL & FIELD GUIDE

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Division of StanChem, Inc.
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INTRODUCTION

Throughout the years, Albi has earned an enviable reputation for its dependable, high quality fireproofing systems. Providing maximum protection with minimum thickness, our line of Albi Clad

intumescent fireproofing materials have demonstrated their unique ability to withstand abuse, impact, vibration and adverse environmental conditions, while still continuing their outstanding performance record and aesthetic properties.

This manual has been prepared to provide you with basic information pertinent to the properties and application methods of Albi DriClad. Further, equipment recommendations and application suggestions are included to assist you and your job superintendent in proper job preparation and professional execution of work. The objective of this manual is to explain the necessary components and methods to provide the required fire protection as specified by the owner or architect.

It is your responsibility, as a competent and reputable applicator, to apply the product in accordance with ULI tests and in compliance with our recommendations. It is important that you have full knowledge of our product and its application methods in order to maintain our record of proven performance and consistent customer satisfaction. We urge your studied review of the information contained in this manual and the transmission of this same information to all personnel who will be involved in the application of Albi DriClad.

As additional information is developed, it will be forwarded to you for insertion in this manual. Should you desire additional copies, or should there be questions requiring clarification, please contact our home office, your regional manager, or Mr. Ken Walker the Product Manager for Albi DriClad.

ALBI PRODUCT DESCRIPTION

Albi DriClad is a semi rigid board manufactured from molten volcanic rock which is spun into fine threads, impregnated with a special resin and compressed to form a durable, yet easy to use material which has superior fire resistance properties. Albi DriClad is used to fireproof structural steel and is installed using Albi DriClad screws. Albi DriClad meets the fire test criteria of ASTM E84, ASTM E119, and UL263.

Albi DriClad is listed by Underwriter's Laboratories, Inc. and is designed for rapid installation to columns, beams, floor/ceiling, and roof/ceiling assemblies for fire ratings up to 4 hours. Due to its high moisture resistance Albi DriClad is suitable for application to both interior and exterior surfaces which are **initially** exposed to the weather during construction. Albi DriClad can also be used in semi exposed conditions such as parking garages.

EQUIPMENT RECOMMENDATIONS

Cutting

As a board material, the most efficient method for cutting is with a standard table saw. It is recommended that the saw have a dust collection system to help control any air born mineral fibers. For small jobs it may be more efficient to use a circular saw (with a dust collection unit) or even a broad knife.

Installation

The installation of the Albi DriClad requires the use of our Albi Screw system. These pig tail type screws are most efficiently installed using a cordless drill, fitted with either a #10 countersink bit or philips head bit.

Miscellaneous

For small cuts around clips, hangers, etc a thin bladed, rigid, steak knife is the most efficient.

TYPICAL APPLICATION DETAILS

PREPARATION
Albi DriClad requires no special treatment to the steel substrate. Cut boards to size with due allowance for steel tolerances and board thicknesses.

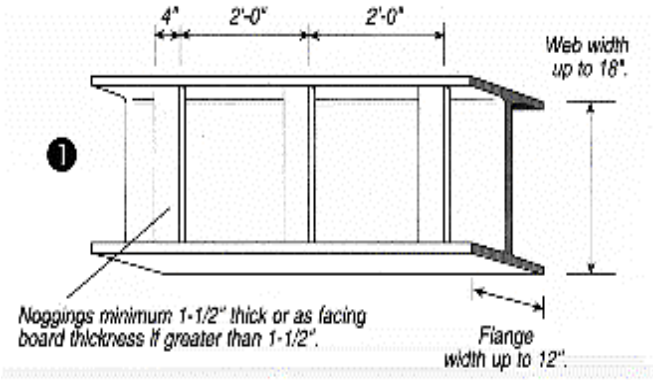
INSTALLATION SEOUENCE
(A) Cut noggings 4" wide or more and push fit into web at 2'-0" centers as shown in figure 1. Ideally, nogging should extend slightly beyond flange tip 1/16". For beams with webs deeper than 18" use tee-shaped noggings as shown in figure 5.

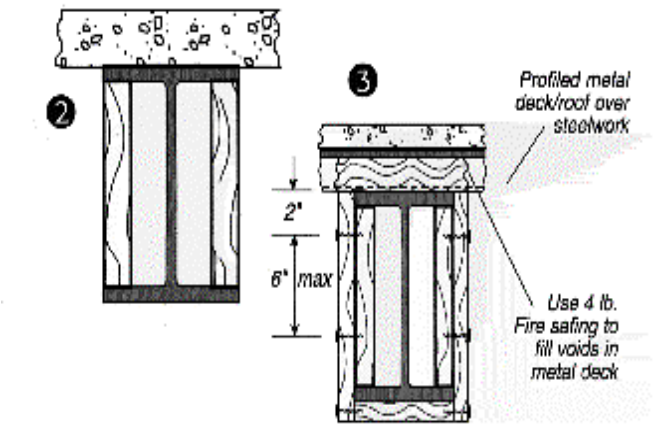
(B) Cut side boards to suit depth of steel section plus thickness of fireproofing board. Install DriClad boards using two AlbiScrews at each end and at each intermediary nogging. (See figures 3 and 4)

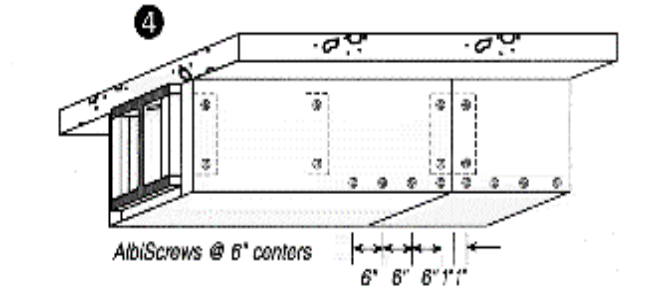
(C) Cut width of soffit boards to fit between side panels (nominal width of flange). Install panel tight up to flange with AlbiScrews at 6" centers along each side as shown in figures 3 and 4. For beams with flanges wider than 12" soffit boards require additional support. Use either DriClad Adhesive or steel pins as shown in figure 6.

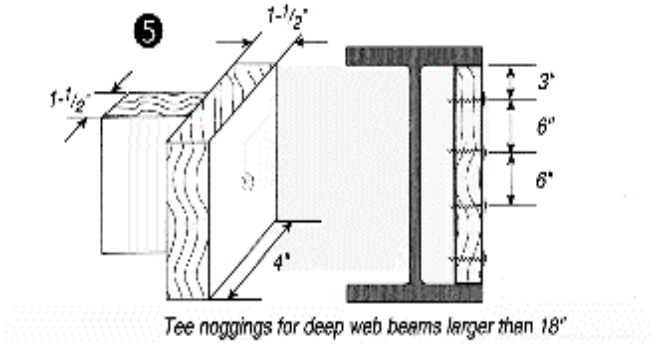
Note: The nominal minimum length of AlbiScrews is the total thickness of the DriClad boards being fixed together. e.g. 3/4" fireproofing plus 1-1/2" minimum nogging requires size 1 (2-1/4") AlbiScrews.

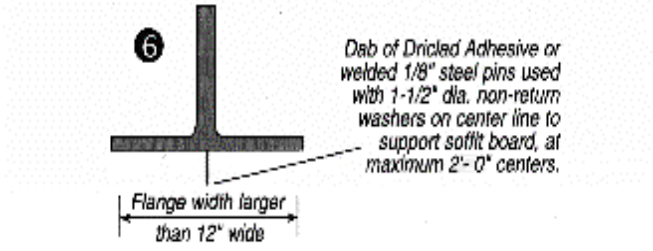
*Steel should be free from dust and loose particles where noggings are to be installed.











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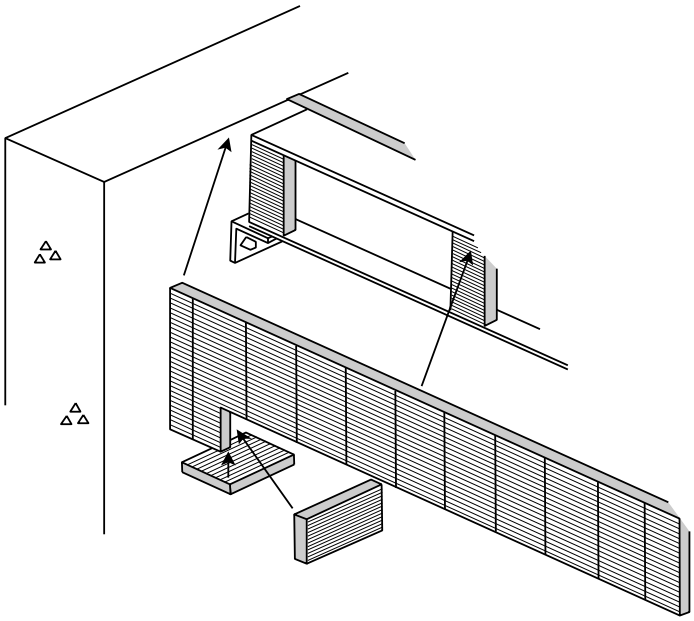

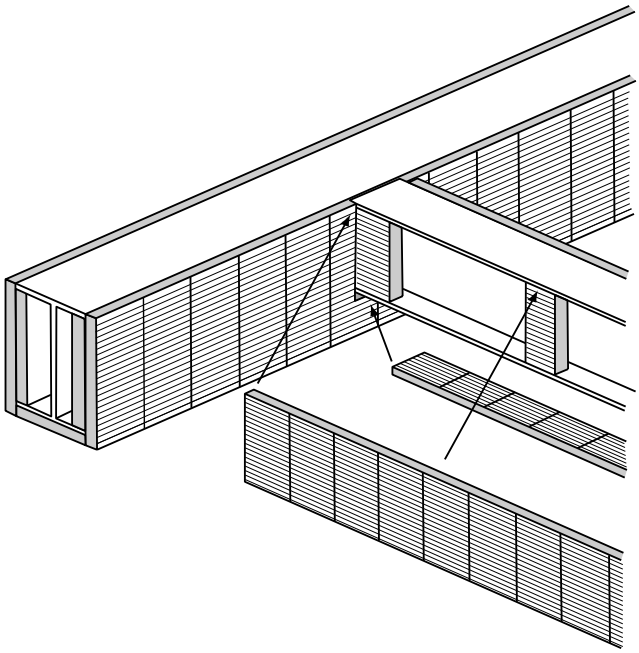

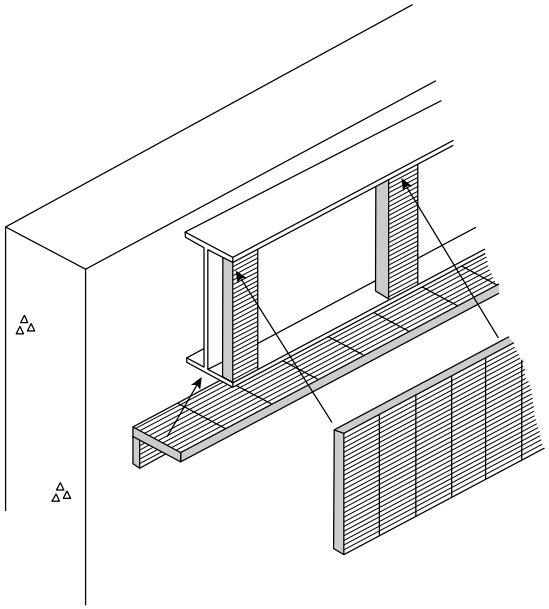

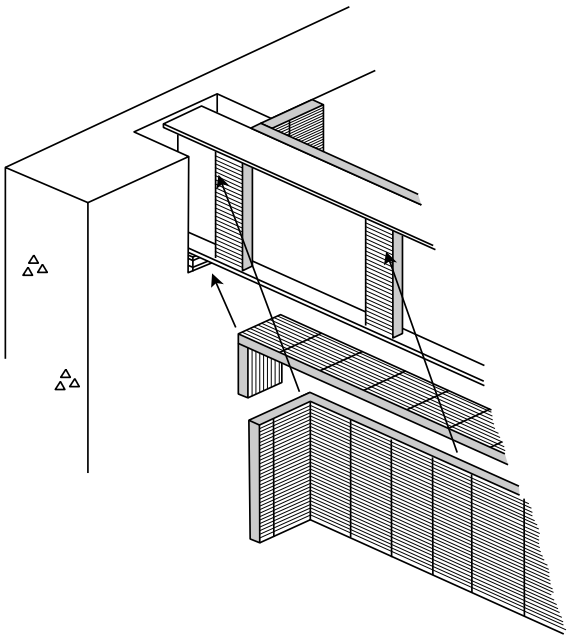

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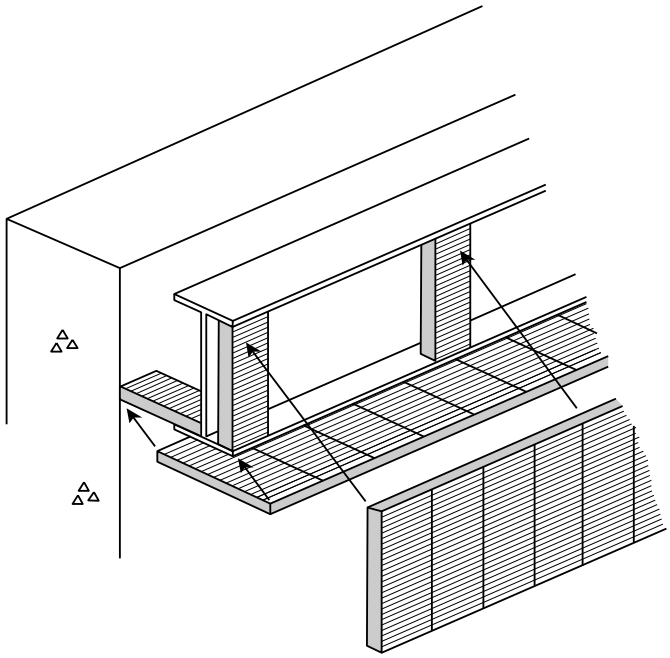

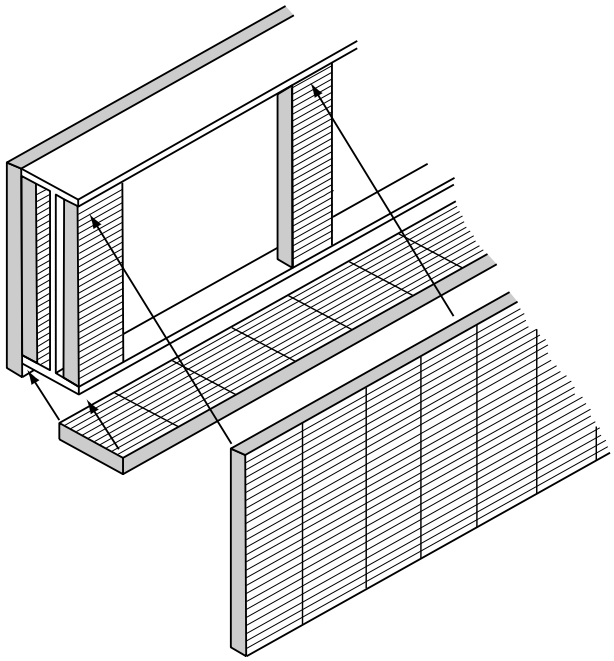

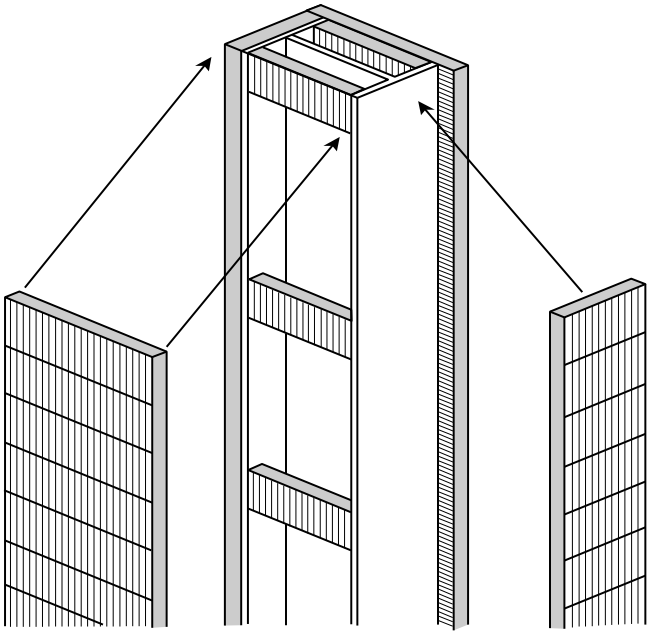

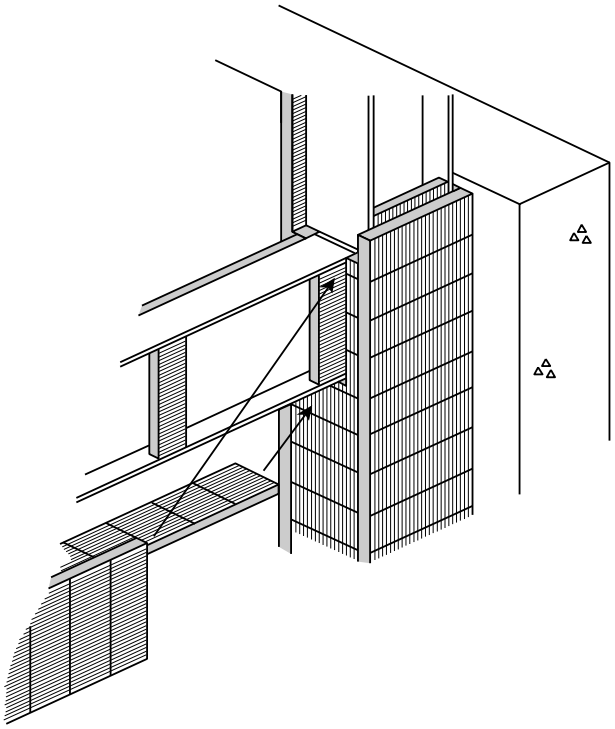

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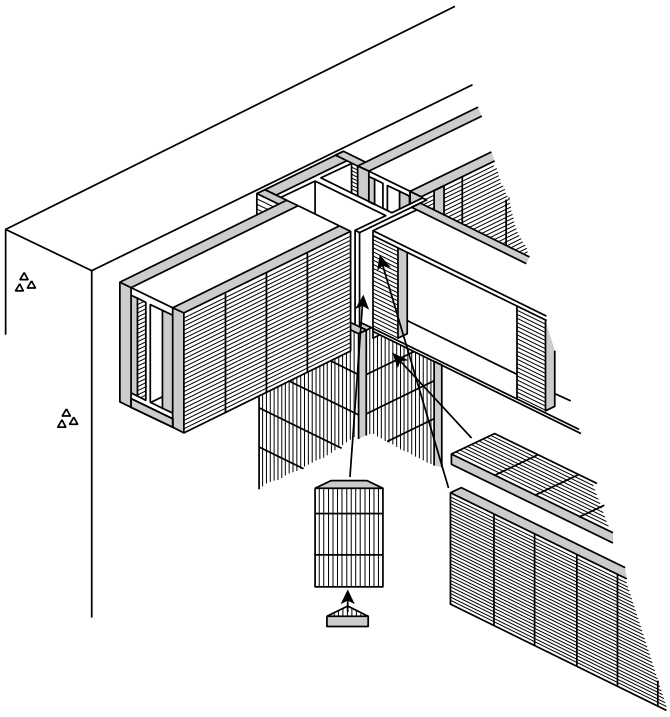

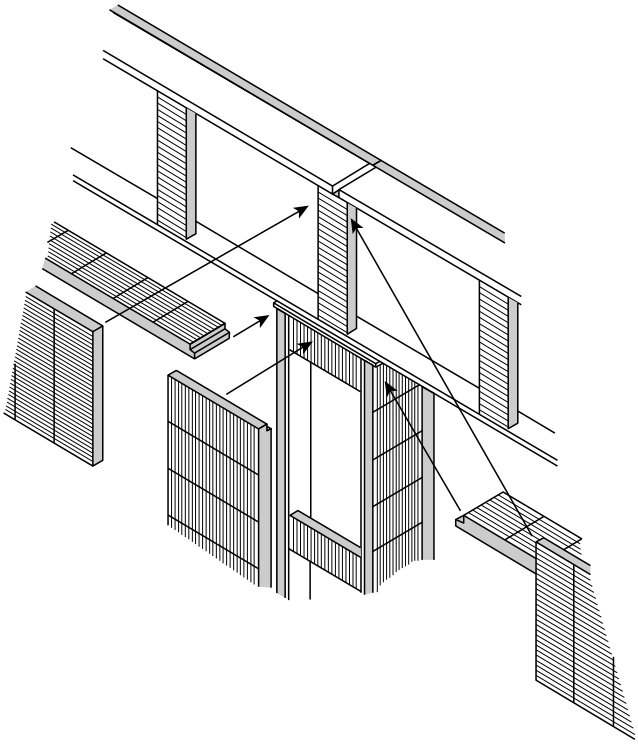

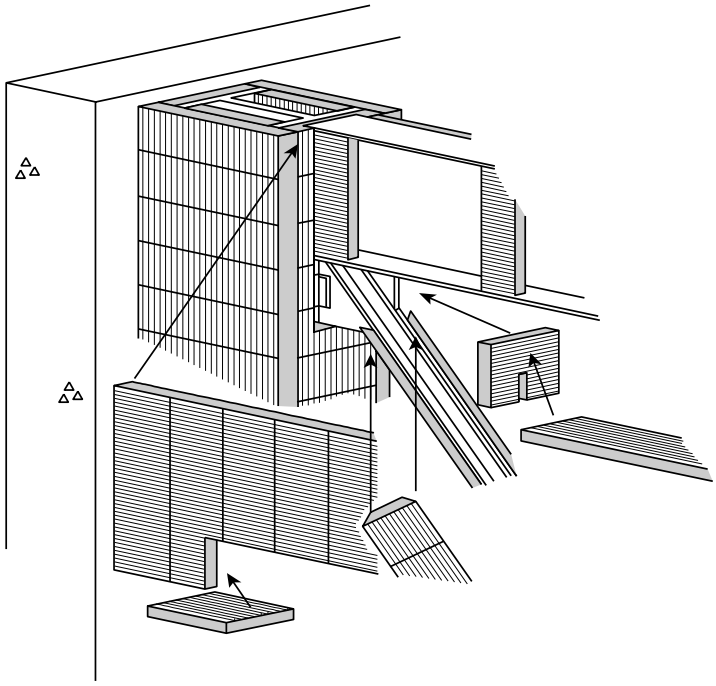

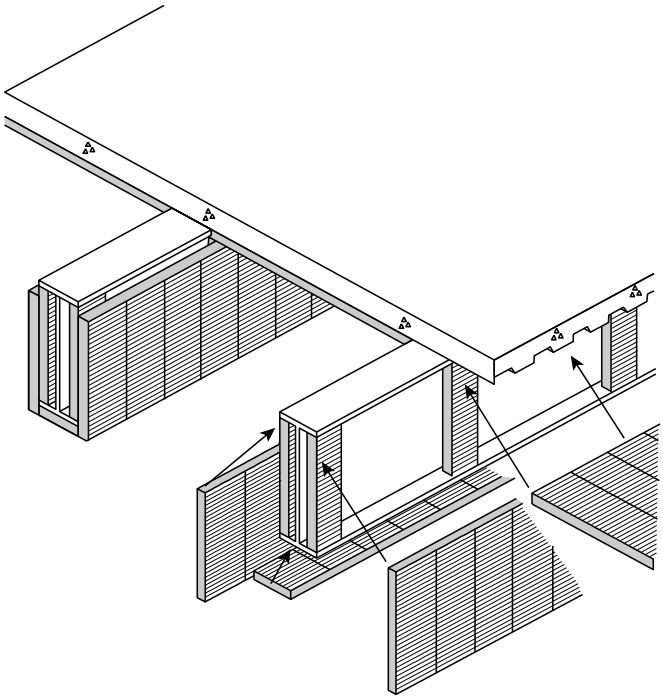

UNDERWRITERS' LABORATORIES, INC. - LISTINGS

COLUMNS: **Wide Flange** FIRE TEST: **ASTM E-119**

COLUMN SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W10 x 49	X-313	1 hr.	3/4 inches
	X-313	1-1/2 hrs.	1-1/4 inches
	X-313	2 hrs.	1-1/2 inches
	X-313	3 hrs.	2-1/2 inches
W12 x 120	X-313	4 hrs.	1-1/2 inches

BEAMS: **Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	S-301	1 hr.	3/4 inches
	S-301	1-1/2 hrs.	3/4 inches
	S-301	2 hrs.	1-1/2 inches

BEAMS: **Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	N-307	1 hr.	3/4 inches
	N-307	1-1/2 hrs.	3/4 inches
	N-307	2 hrs.(restrained)	3/4 inches
	N-307	2 hrs. (unrestrained)	1 1/2 inches
	N-307	3 hrs. (restrained)	1 1/2 inches

BEAMS: **Unprotected Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	P-930	1 hr.	3/4 inches
	P-930	1-1/2 hrs.	3/4 inches
	P-930	2 hrs.	1-1/2 inches

BEAMS: **Protected Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	P-302	1 hr.	1 inch

ASSEMBLY: **Floor / Ceiling** (restrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-929	1 hr.	3/4 inches
	D-929	1-1/2 hrs.	3/4 inches
	D-929	2 hrs.	3/4 inches
	D-929	3 hrs.	1-1/2 inches

ASSEMBLY: **Floor / Ceiling** (unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-929	1 hr.	3/4 inches
	D-929	1-1/2 hrs.	3/4 inches
	D-929	2 hrs.	1-1/2 inches

ASSEMBLY: **Protected Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-303	2 hrs.	1 inch

ASSEMBLY: **Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	G-301	3 hrs.	1 inch

WARRANTY/GUARANTEE INFORMATION

Limited warranty/limitation of liability: Information and recommendations provided by Albi are based upon extensive test data, laboratory experiments and years of field experience believed to be reliable. Statements made herein as to application and other properties will vary according to the nature and conditions of the surfaces to which the product is applied.

Albi warrants that its products will meet the specifications that it sets for them. Albi's responsibility under this warranty will be limited solely to replacing the products which prove defective, provided that Buyer gives Albi prompt notice in writing of said defect and satisfactory proof thereof. Products may be returned to Albi only after written authorization has been obtained from Albi. The foregoing warranty is in lieu of all other warranties, whether oral, written, express, implied or statutory. **IMPLIED WARRANTIES OF MERCHANTIBILITY AND FITNESS FOR A PARTICULAR PURPOSE WILL NOT APPLY.** Technical or other advice is furnished by us solely as an accommodation and shall not increase the scope of our responsibilities or liability. Albi's warranty obligations and Buyer's remedies hereunder are solely as stated herein. In no event will Albi be liable either for the labor and other associated costs incurred in replacing the product, including, but not limited to, its removal and application, or for other incidental or consequential damages.

Applicator shall guarantee that its installation of material conforms to manufacturer's recommendations, and shall further guarantee his workmanship connected with the installation for a period of one year from the date of installation.

ONLINE CERTIFICATIONS DIRECTORY

BXUV.S301
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

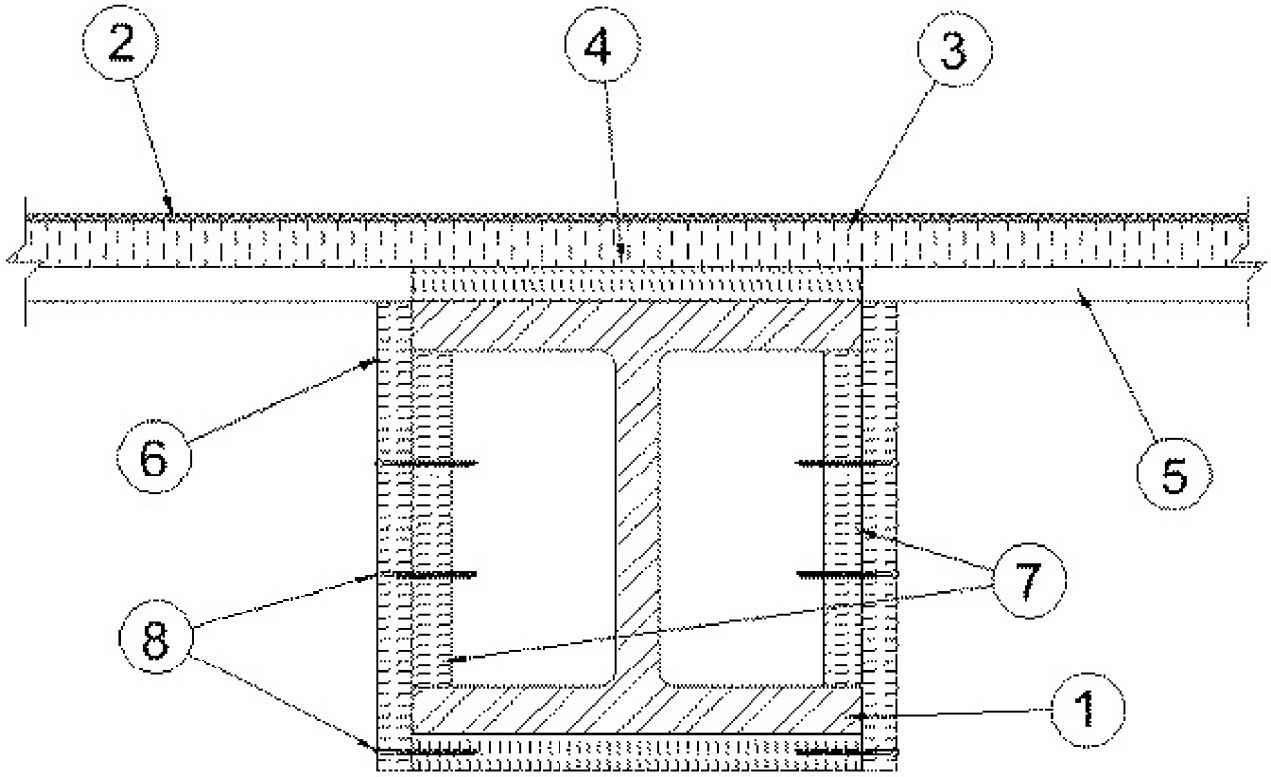
Design No. S301

February 07, 2003

Restrained Beam Ratings — 1, 1-1/2 or 2 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2 & 2 Hr (See Item 6)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam —** W8x28 min size.

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

3. **Mineral And Fiber Boards* —** 24 by 48 in. boards applied in single or multiple layers. Boards secured to steel roof deck units and previous layer of insulation, if multiple layers are used, with adhesive.

JOHNS MANVILLE INTERNATIONAL INC

4. **Adhesive* —** (Optional) Applied to steel roof deck units in 1/2 in. wide ribbons approx 6 in. OC at 0.4 gal per 100 sq ft. See Adhesive (BYWR) category for names of manufacturers.

5. **Steel Roof Deck —** (Unclassified) — Fluted, No. 22 MSG, galv 1-1/2 in. deep with 3-1/2 in. wide flutes spaced 6 in. OC. Ends overlapped at supports a min of 1-1/2 in. and welded to supports, 12 in. OC, max. Adjacent units button punched, welded or screwed together along side joints.

6. **Mineral and Fiber Boards —** Boards cut in various widths to be compatible with the size of beam being protected. Boards placed parallel with the flange of the beams are cut the width of the flange. Boards placed parallel with the web of the beams are cut the width of the beam (web side) plus twice the board thickness. The voids created by the flutes above the beam to be filled with mineral wool batts having a nom density of 4 lb per cu ft.

Restrained and Unrestrained Beam Ratings, Hr	Min Nominal Thkns In.
1	3/4
1-1/2	3/4
2	1-1/2

ALBI MFG, DIV OF STANCHEM INC — Type Dri-Clad

7. **Noggings —** Min 1-1/2 in. thick, pieces of mineral and fiber board (See Item 6). Cut to friction fit between beam flanges; located at horizontal butted joints of adjacent mineral and fiber board sections (Item 6) on the web sides of the beam.

8. **Fasteners —** The boards are fastened to the noggings and to each other by means of spiral type screws, spaced a max of 6 in. OC. The fasteners are installed on both sides of horizontal joints.

*Bearing the UL Classification Mark

Last Updated on 2003-02-07

Questions? Notice of Disclaimer Page Top

Great Scott Trio Engineering Judgment Report

EJ #2 - 2-Hour Fire Rating of Steel Beam at Exterior Wall

Convergence Architecture

7302 N Richmond Ave

Portland, OR 97203

Date: 3/2/2022

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GREAT SCOTT TRIO

NE 7TH AVE & E BURNSIDE ST, PORTLAND, OREGON

1 PROJECT OVERVIEW

The Great Scott Trio is a new project under construction, located at 701 NE Burnside Street in Portland, Oregon. It will be under the jurisdictional review of the City of Portland. The proposed design is a four (4) story mixed use (M, B, an R-2), Type V-A Construction and fully sprinklered throughout and approximately 18,800 gross square feet. The legal lot includes a one story existing brewery building that will remain. The first story is office/retail, lobby, and one Type A residential unit. The upper three floors include twelve (12) residential on either side of an open courtyard.

One or more of the building systems do not meet the prescriptive code requirements or do not meet tested fire resistive assembly requirements.

The Client is proposing the application of mineral wool board (Albi DriClad, Roxul or equivalent) and additional layers of 5/8” Type “X” gypsum wall board to provide protection of this assembly to meet or exceed a 2-hour fire-resistant rating as required per 2019 OSSC.

This Engineering Judgement (EJ) addresses the condition of the steel beam supporting the wood floor located at the exterior wall for the purpose of showing equivalent protection of 2-hour fire-resistance protection as required by 2019 OSSC. This EJ is only applicable to the element and location specified above and as detailed herein. Other elements and locations were not reviewed for this document.

2 APPLICABLE CODES, STANDARDS, AND GUIDES

The review will be based on the following codes:

- 2019 Oregon Structural Specialty Code
- 2019 Oregon Fire Code

3 DISCUSSION

3.1 Approach

- The proposed beam assembly has been analyzed in accordance with:
  - **2019 OSSC §703.3 Alternative Methods for Determining Fire Resistance**
  - **2019 OSSC §704.3 Protection of the Primary Structural Frame Other Than Columns**
  - **2019 OSSC §711.2.3 Supporting Construction of Floor and Roof Assemblies**
  - **2019 OSSC §722.6.2 Calculated Fire Resistance of Walls, Floors and Roofs** for the protection provided by the Albi DriClad Mineral Fiber Board
- The proposed assembly has been analyzed in comparison with the **UL Design No. N501** (for comparision reference), however does not include a 25 guage steel cage around the beam, but has replaced this with mineral board (Albi DriClad, Roxul or equivalent product).
- The proposed assembly has been analyzed in comparison with the **UL Design No. S301** (for comparision reference), and per Albi DriClad Mineral Fiber BoardMineral Board installation Instructions. These have been included as Attachments to this EJ.
- The 2-hour assembly is evaluated with listed/tested ASTM E-119 assemblies and published information from AlbiClad.
- Portions of the tested assembly are modified to suit the unique design condition. The modification is analyzed for equivalency using published fire test data and acceptable fire science principles.

4 PROPOSED DESIGN

The proposed assembly consists of a beam supporting a 2-Hour rated floor assembly above. The encasement of the beam includes two layers of Type “X” Gypsum and a minimum of one (1) layer of 3/4” mineral wool board around the three exposed sides; additionally two (2) layers of 5/8”” Type “X” are proposed to entirely cover the mineral board and encase the assembly as displayed in Figures 1. See Figure 2 for the location of the proposed beam assembly.

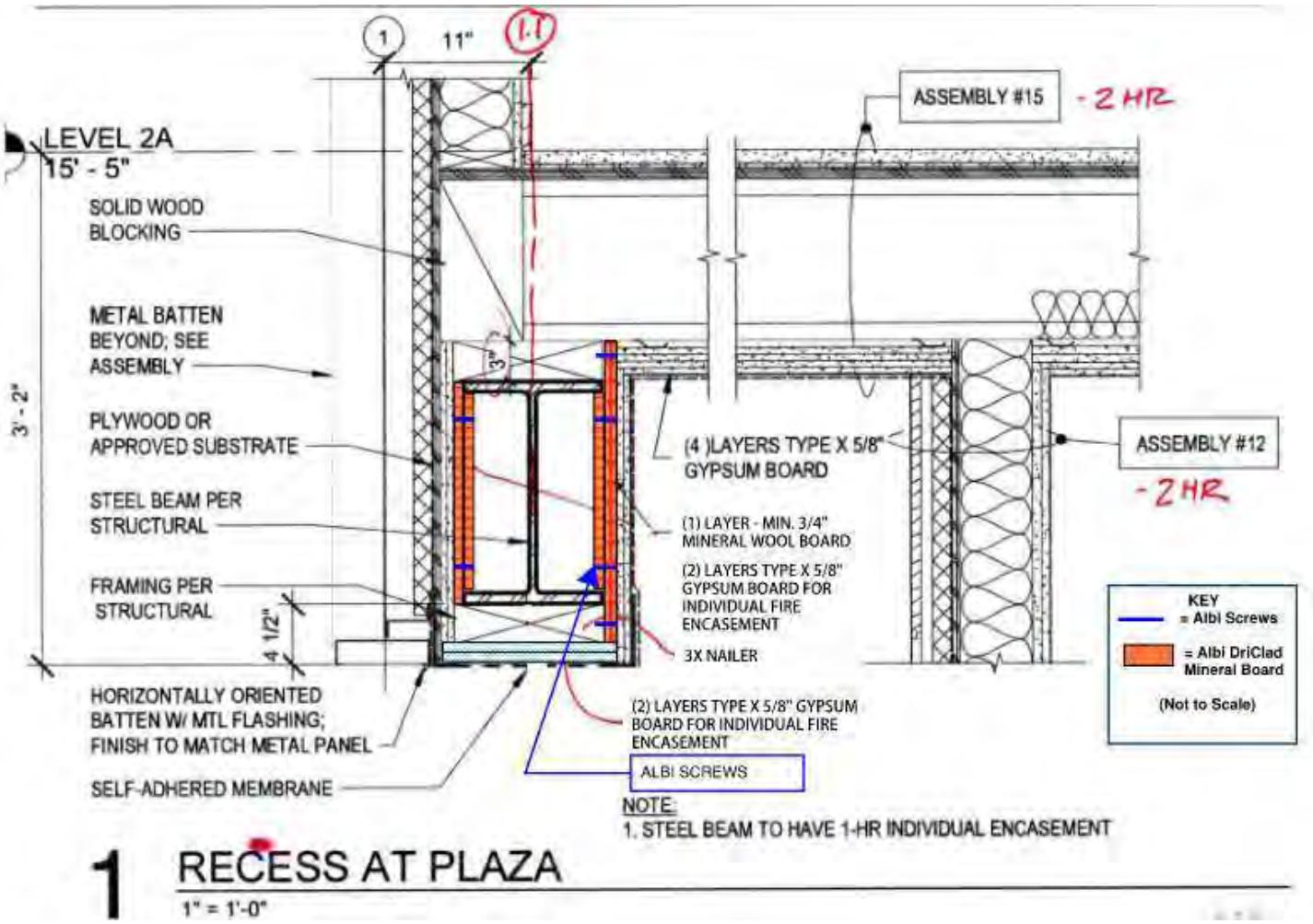


Figure 1: Proposed Assembly Recess At Plaza Exterior Wall

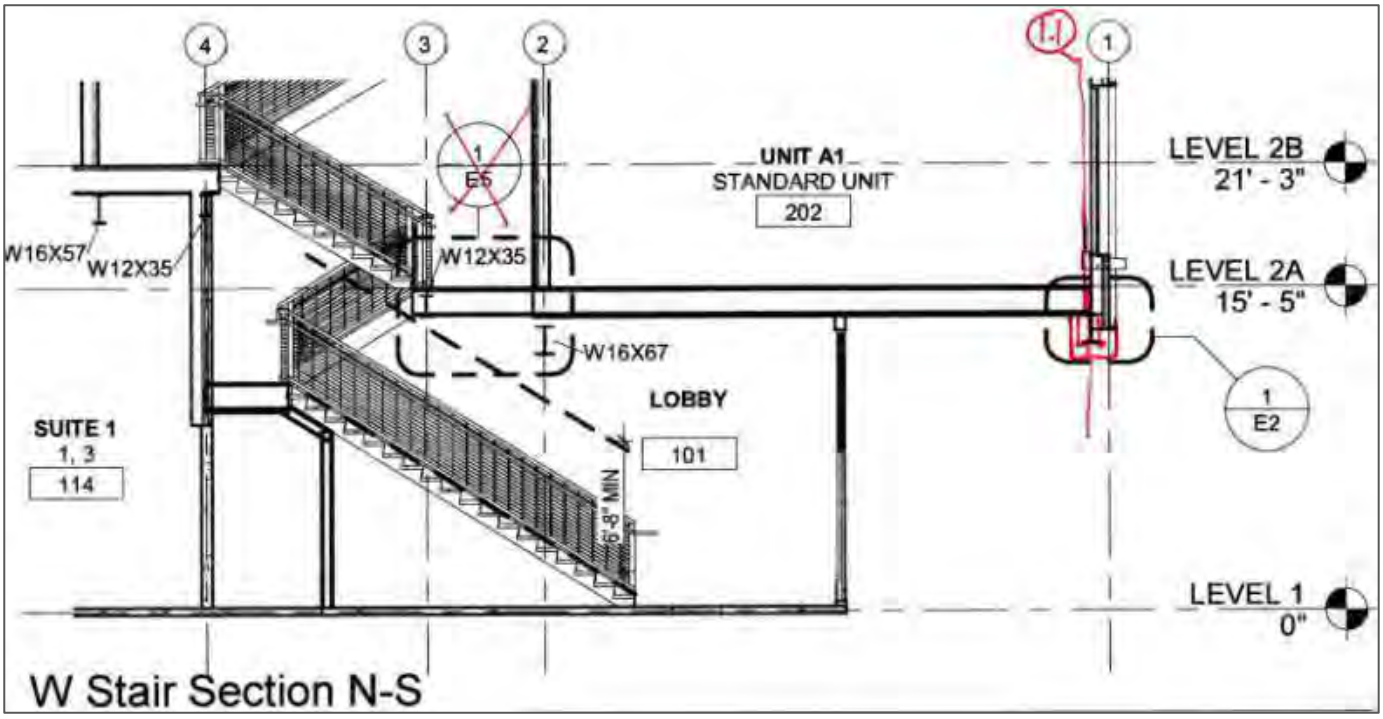


Figure 2: Location of proposed beam assembly

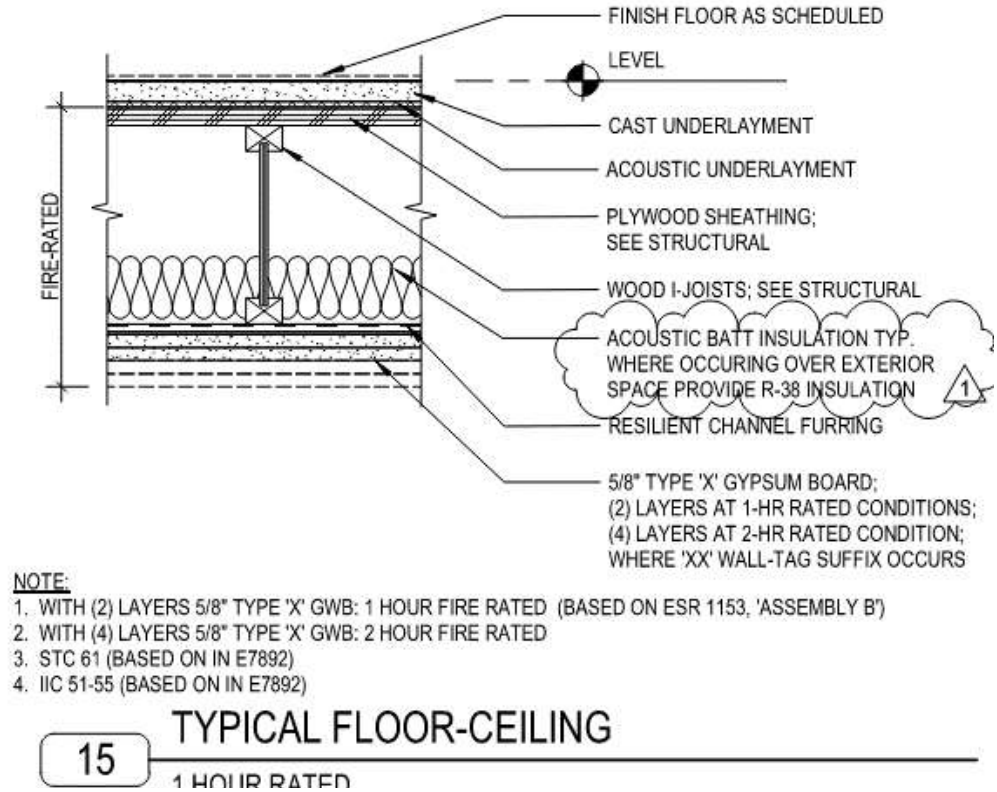


Figure 3: Detail #15 2-Hour Rated Floor Assembly Above Beam Assembly

5 CODE SECTIONS

§703.3 Alternative Methods for Determining Fire Resistance

The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures;

1. *Fire-resistance* designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance* ratings as determined by the test procedures set forth in ASTM E119 or UL 263.
5. Alternative protection methods as allowed by Section 104.11.
6. Fire-resistance designs certified by an approved agency.

§704.3 Protection of the Primary Structural Frame Other Than Columns

Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a *fire-resistance rating* and support more than two floors or one floor and roof, or support a load-bearing wall or a non-load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required *fire-resistance rating*.

> *Exception*: Individual encasement protection on all sides shall be permitted on all exposed sides provided that the extent of protection is in accordance with the required *fire-resistance rating*, as determined in Section 703.

§711.2.3 Supporting Construction of Floor and Roof Assemblies

The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

6 ASSEMBLY ANALYSIS

The proposed steel beam assembly is supporting a 2-hour fire-resistance rated floor assembly as shown in Figures 1 and 3 above (Architectural Detail #15). It is assumed that the beam could be exposed to fire and the assembly will require continuous protection from all exposed sides. Per §704.3 requires individual encasement to provide protection for all fire exposed sides of the beam assembly per §707.5.1. the beam needs to be protected with an equivalent rating to the floor to meet a 2-Hour fire-resistance rating and per §711.2.3 of the 2019 OSSC, the supporting construction needs to be the same as the assembly being supported.

The proposed beam assembly was compared to UL S301 and N501, and tested for 2 hour fire-resistive construction. Our analysis looks at the four sides of the beam individually with Table 1 providing a

summary of the protection from each side, and Table 2 providing the comparison between the tested / listed assembly and the proposed assembly.

The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly.

Path	Proposed Assembly Beam Size	Notes
1. Protection from above	• 2-Hour Assembly (See Figure 2) Including two (2) layers 5/8" Type "X" GYP • 3xWood Blocking	**160-minute protection (minimum)** **Exceeds 2-hour FRR**
2. Protection from the Right side	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum	**140-minute minimum protection** **Exceeds 2-hour FRR**
3. Protection from the underside	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum	**140-minute minimum protection** **Exceeds 2-hour FRR**
4. Protection from the Left Side	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum • Plywood Sheathing • Exterior Wall Finish	**140-minute minimum protection** **Exceeds 2-hour FRR**

Table 1: Summary of Fire-Resistance for Proposed Beam at Shaft

7 COMPARISON TO A LISTED SYSTEM

Element	UL S301 Minimum Beam Size W8x28	Proposed Assembly
Protection from above	Roof / Ceiling assembly	• 2-Hour Assembly (See Figure 2) Including two (2) layers 5/8" Type "X" GYP • 3X Wood Blocking
Protection from the Right side	1-Layer 3/4" Albi DriClad Mineral Board Meets 1-Hour FRR (2-Hour requires 2 layers)	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum
Protection from the Underside	1-Layer 3/4" Mineral Board Meets 1-Hour FRR (2-Hour requires 2 layers)	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum
Protection from the Left Side	1-Layer 3/4" Mineral Board Meets 1-Hour FRR (2-Hour requires 2 layers of Mineral Board)	• 1 Layer, Minimum 3/4" Mineral Wool Board • 2 Layers – 5/8" Type "X" Gypsum • Plywood Sheathing • Exterior Wall Finish
Fire-Resistance Rating	**2-Hour**	**2-Hour (minimum)**

Table 2: Comparison of Tested / Listed Assembly to Proposed Assembly to Meet 2-Hour FRR

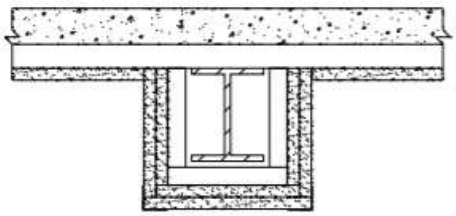
BEAMS, GIRDERS, AND TRUSSES, NONCOMBUSTIBLE

GA FILE NO. BM 2120	GENERIC	2 HOUR FIRE

STEEL FRAME, GYPSUM WALLBOARD

Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 1/4" Type S drywall screws 16" o.c. **Face** layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 3/4" Type S drywall screws 8" o.c.

Beam cage fabricated from horizontally installed steel angles (25 gage steel having 1" and 2" legs) located not less than 1/2" from beam flanges. 1" legs of the upper angles secured to steel deck units with 1/2" Type S pan head screws 12" o.c. "U" shaped brackets formed of 25 gage "U" shaped steel channels (1 11/16" wide with 1" legs) 24" o.c. suspended from upper angles with 1/2" Type S pan head screws and supported 1" x 2" angles at lower corners attached to brackets with 1/2" Type S pan head screws. Outside corners of gypsum board protected by 0.020" thick steel corner beads crimped or nailed. Minimum beam size W8x24. **(Two Hour restrained or unrestrained beam.)**



Fire Test: UL R4024-5, 9-14-66;
UL Design N501;
ULC Design O501

Figure 4: UL Design No. N501

The proposed assembly will substitute mineral board In lieu of the 25 gauge steel beam cage and the protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501

ONLINE CERTIFICATIONS DIRECTORY

BXUV.S301
Fire Resistance Ratings - ANSI/UL 263

Page Bottom

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

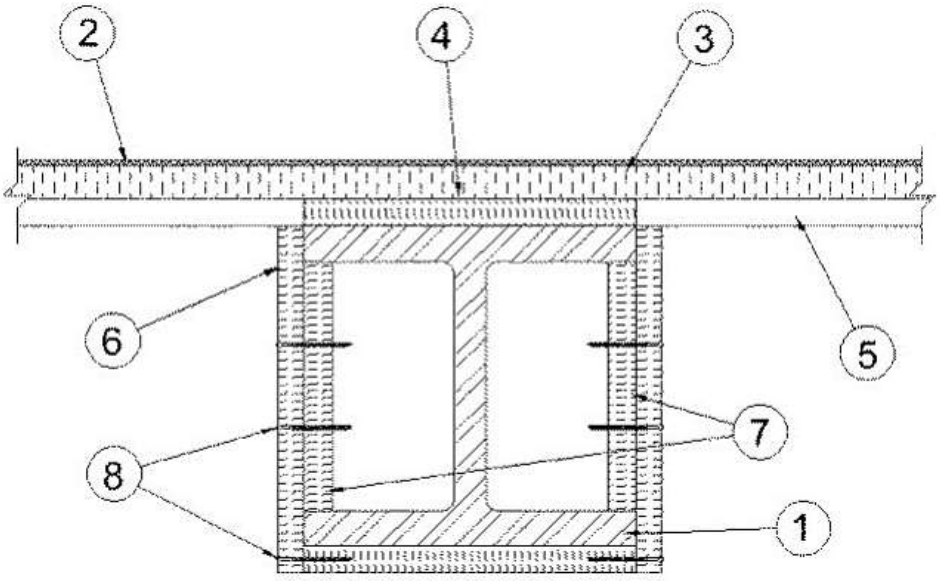
Design No. S301

February 07, 2003

Restrained Beam Ratings — 1, 1-1/2 or 2 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2 & 2 Hr (See Item 6)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam —** W8x28 min size.

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

3. **Mineral And Fiber Boards* —** 24 by 48 in. boards applied in single or multiple layers. Boards secured to steel roof deck units and previous layer of insulation, if multiple layers are used, with adhesive.

JOHNS MANVILLE INTERNATIONAL INC

4. **Adhesive* —** (Optional) Applied to steel roof deck units in 1/2 in. wide ribbons approx 6 in. OC at 0.4 gal per 100 sq ft. See Adhesive (BYWR) category for names of manufacturers.

5. **Steel Roof Deck —** (Unclassified) — Fluted, No. 22 MSG, galv 1-1/2 in. deep with 3-1/2 in. wide flutes spaced 6 in. OC. Ends overlapped at supports a min of 1-1/2 in. and welded to supports, 12 in. OC, max. Adjacent units button punched, welded or screwed together along side joints.

6. **Mineral and Fiber Boards —** Boards cut in various widths to be compatible with the size of beam being protected. Boards placed parallel with the flange of the beams are cut the width of the flange. Boards placed parallel with the web of the beams are cut the width of the beam (web side) plus twice the board thickness. The voids created by the flutes above the beam to be filled with mineral wool batts having a nom density of 4 lb per cu ft.

Restrained and Unrestrained Beam Ratings, Hr	Min Nominal Thkns In.
1	3/4
1-1/2	3/4
2	1-1/2

ALBI MFG, DIV OF STANCHEM INC — Type Dri-Clad

7. **Noggings —** Min 1-1/2 in. thick, pieces of mineral and fiber board (See Item 6). Cut to friction fit between beam flanges; located at horizontal butted joints of adjacent mineral and fiber board sections (Item 6) on the web sides of the beam.

8. **Fasteners —** The boards are fastened to the noggings and to each other by means of spiral type screws, spaced a max of 6 in. OC. The fasteners are installed on both sides of horizontal joints.

ALBI DRICLAD UL FIRE-RESISTANCE LISTINGS — *FIRE TEST ASTM E-119*

Typical System	Size	Hourly Rating	Thickness in. (mm)	UL Design No.
Beams - Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	S301
		1-1/2	3/4 (19.1)	S301
		2	1-1/2 (38)	S301

Figure 5: UL Design No. S301 Assembly for Reference

The proposed assembly will include two (2) layers 5/8" Type "X" gypsum wallboard to encase assembly UL S301 and the protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. S301

8 MINERAL WOOL BOARD PROPERTIES

PROPERTY	TEST METHOD	VALUE
Dry Applied Density	—	10.5 PCF (average)
Tensile Strength	ASTM C 209	155 PSF
Compressive Strength @ 10%	ASTM C165	936 PSF
Moisture Absorption	ASTM C209	less than 0.50 % (by volume)
Moisture Adsorption	ASTM C553	less than 0.30 % (by volume)
Deflection	ASTM E 759	No Delamination
Corrosion & Fungi Resistance	ASTM C665	Non Corrosive/ No Fungi Growth
Leachable Chlorides	ASTM C871	No Leachable Chlorides
Thermal Conductivity (R Value)	ASTM C158	4.2 per inch
Sound Adsorption	ASTM C423	NRC 0.80
Fire hazard Classification	ASTM E 136	Non Combustible
Flame Spread	ASTM E84	Class A
Smoke Developed	ASTM E84	Class A

Figure 6: Albi DriClad mineral fiberboard properties

1” thickness of Albi DriClad mineral fiberboard undergoes a linear increase in temperature (once thermal stabilization occurs-46 minutes of exposure) under the temperature exposure of the ASTM E119 test (Figure 6). Per the linearity of temperature curve—which is due to the noncombustible composition, high density, and high heat resistant properties of the specimen—the thermal-resistance of the proposed thickness can be estimated. The proposed 1” thickness of the mineral fiberboard is 50% of the tested 2” thick specimen, which provides a 50% decrease in (differential temperature) fire-resistance due to the consistent linear thermal resistance property of the material. The chart below details the temperature of the backside of the DriClad while being heated per an ASTM E119 Time-Temperature Curve. While discoloration of the wood occurs below 550°F, ignition (when exposed to air) does not occur below 400°F and the combustion front develops fully at 550°F per NDS TR10; Section 1.2 (July 2018). It is concluded from the graph below; the proposed thickness of the mineral fiberboard will provide at least 2-hours of fire-resistance (120 Minutes) prior to the ignition of wood materials. This is consistent with ASTM E119 UL Design Assemblies for the DriClad whereby ¾” thick DriClad provides 2 hours of protection for Steel beams. (UL Designs; D929, N307, J301, D303).

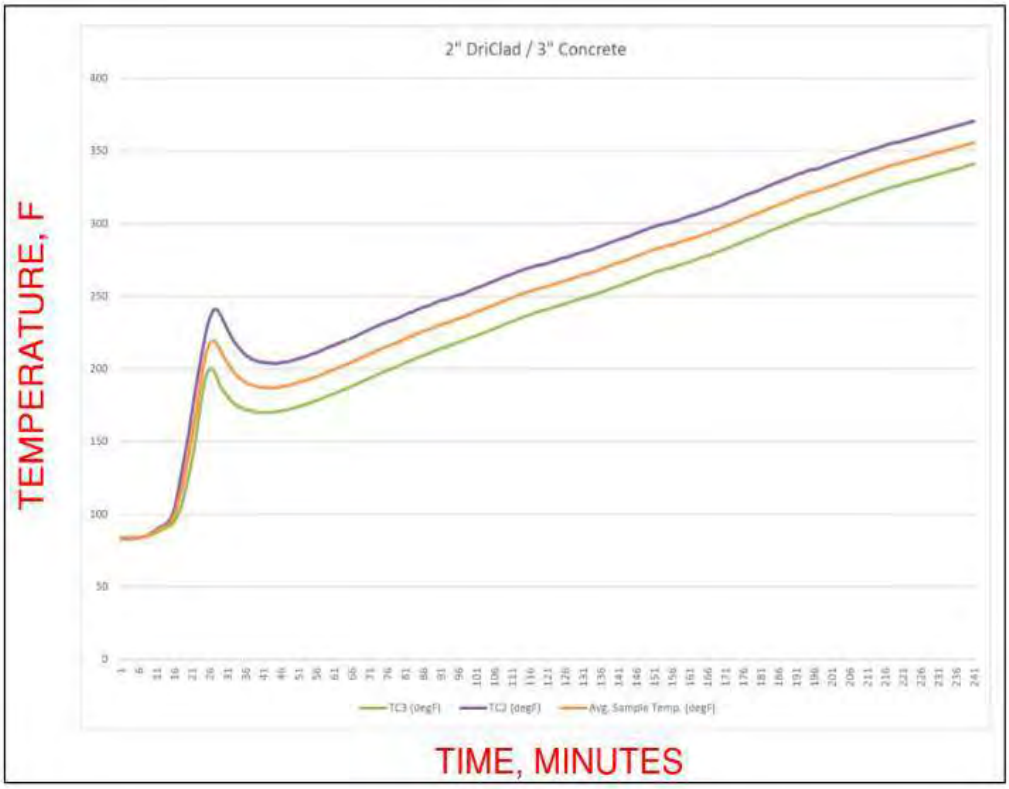


Figure 7: (4-Hr) Time-Temperature curve; ASTM E119 test, provided at the back side of the AlbiClad

One layer of 3/4" Albi DriClad will be installed as outlined above (Figure 1-3 above) and the assembly has been evaluated as allowed per OSSC 703.3. By upgrading the existing shaftwall assembly between occupancies to a 2-hour fire rating, the shaftwall assembly would meet the requirements of Table 508.4 from the OSSC for an unsprinklered building. Accepted Fire Protection Engineering principals known as Harmathy's rules (see below) acknowledge that the addition of a rated assemblies will provide, at least, the summation of hourly rating of each assembly. (Rules 1,2).

HARMATHY'S TEN RULES

Rule 1: *The "thermal" fire endurance of a construction consisting of a number of parallel layers is greater than the sum of the "thermal" fire endurances characteristic of the individual layers when exposed separately to fire.*

Rule 2: *The fire endurance of a construction does not decrease with the addition of further layers.*

9 INSTALLATION OF MINERAL BOARD

Installation of Albi DriClad fiber board is intended to entirely encase the steel beams to maintain continuity without requiring SFRM or intumescent fire caulking. Any penetrations shall be protected through shims of mineral board cut and pressed to fit into and around all penetrations, the gap is not to exceed 1/8".

In order to ensure a 2-hour fire-resistance rating is provided, Albi DriClad Mineral Board will be installed over the existing beam. Albi DriClad mineral fiberboard is a UL-listed material. It is a semi-rigid board

manufactured from molten volcanic rock, spun into fine threads, and impregnated with bonding resin. It is compressed to form a durable noncombustible material with superior fire-resistance.

Installation shall be performed Per Albi DriClad Mineral Fiber Board product guide. One layer of 3/4" Albi DriClad Mineral Fiber Board will meet the 2-hour fire resistance rating when installed as installed and detailed above with the addition of two (2) Layers of 5/8" Type "X" gypsum wall board.

Noggins will be installed at bottom of beam. Noggins shall be cut 4" wide or more and push fit into web at 2'-0" centers as shown in installation guide from AlbiClad. Ideally, noggins should extend slightly beyond flange tip 1/16". Gaps to not exceed 1/8 " to maintain continuity.

Cut side boards to suit depth of steel section plus thickness of fireproofing board. Install DriClad boards using two AlbiScrews at each end and at each intermediary noggin. (See figures 6 & 7 below and in installation guide) and shown in figure 4 & 5 below. We have included the Albi DriClad Mineral Fiber Board brochure and installation instructions as an attachment to this EJ.

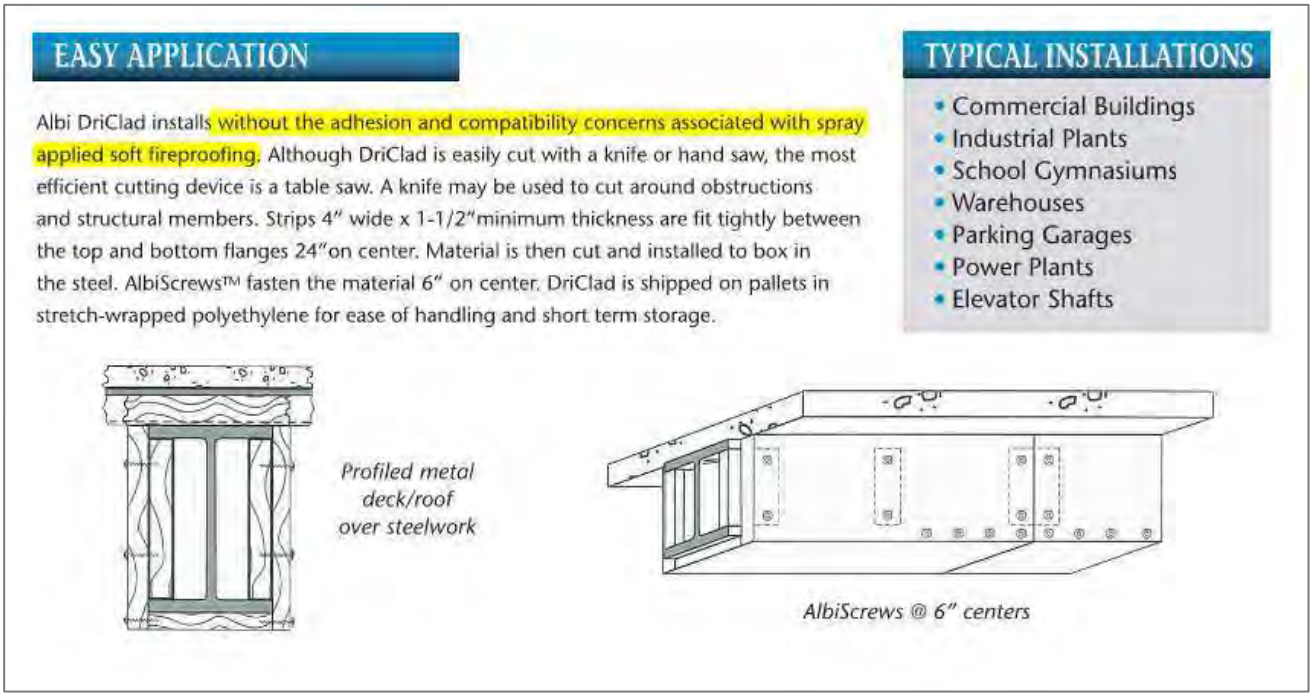


Figure 8: Albi DriClad Installation Diagram

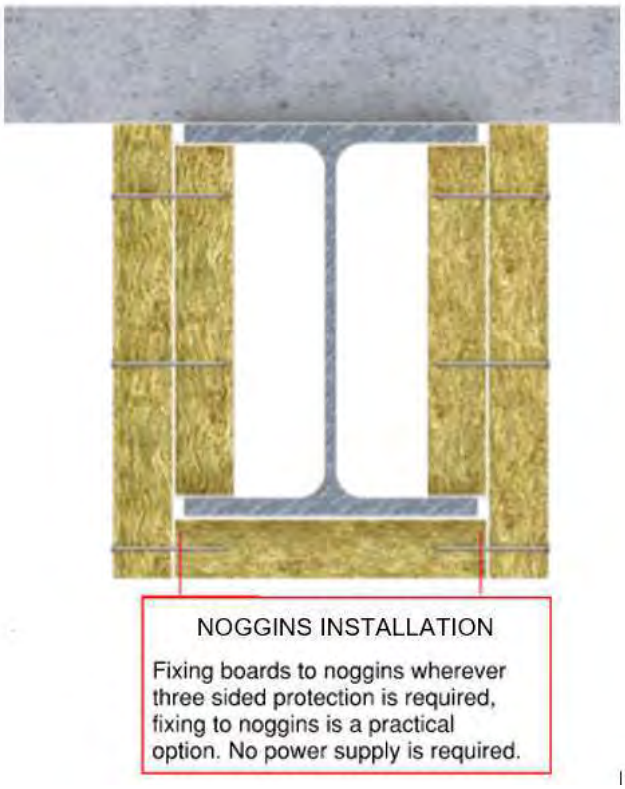


Figure 9: Installation Diagram with Noggins & AlbiScrews

10 SUMMARY

The overall rating of the assemblies were determined by the sum of the fire resistance rating of each component. The proposed assembly was found to meet the 2-hour requirements. The individual ratings were determined from §703.3, the code allows alternative methods for determining fire resistance. §722.6.2 for the protection provided by the Albi DriClad Mineral Fiber Board. §722 provides methods for calculating the fire resistance of membranes.

The protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501 and S301.

The difference between the proposed and the listed assembly design N501 is the 25 gauge steel beam cage element is not included in the proposed assembly as this does not provide any fire-resistance rating and is not part of the design.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam will meet the minimum 2-hour fire-resistance rating requirement by the OSSC and will extend and maintain continuity of the proposed beam and any penetrations.

Installation of one (1) layer of 3/4” Albi DriClad Mineral Fiber Board and two (2) layers of 5/8” Types “X” gypsum wallboard will meet the 2-hour requirement as installed for the proposed beam assembly. Where the mineral board requires two layers, the boards shall overlap with a min of 1/2” to ensure continuity of the underlayer as shown in UL Design No. S301, as detailed above, and from Albi DriClad Installation Guide

11 CONCLUSION

The proposed design for the encased beam includes 3/4" Albi DriClad, a 3X Nailer from above and the addition of 2 layers of 5/8" Type "X" gypsum wall board.

We have analyzed the fire rating of the proposed assembly in accordance with §703.3, §704.3, §707.5.1. and per §711.2.3 of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum 2-hour fire-resistance rating as detailed above through the protection provided by Albi DriClad Mineral Fiber Board in addition to 2 layers 5/8" Type "X" gypsum wall board UL No. S301. The Mineral Board will be used in lieu of the steel beam cage in UL No. N501.

The Albi DriClad will be self-supporting and structurally independent per UL Design S301 such that the loss of gypsum wall board during a fire incident should not impact the Albi DriClad and therefore the fire-resistance rating of the beam assembly.

The proposed design for the beam entirely covered on 4 sides will exceed the required 2-hour rating as compared and detailed in this letter with UL No. N501 & S301.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam at the exterior wall will meet the minimum 2-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed.

Approved By:

Nicholas A Moriarty

Digitally signed by Nicholas A Moriarty
DN: C=US, E=nick.moriarty@codeul.com, O=Code Unlimited, OU=Las Vegas, CN=Nicholas A Moriarty
Date: 2022.03.02 20:37:16-08'00'

exp 12/31/2022

Nicholas A Moriarty, PE
Principal, Senior Fire Protection Engineer
Code Unlimited

Prepared By:

Meghan Stormont
Fire Analyst II
Code Unlimited LLC

Attachments

Albi DriClad Mineral Fiber BoardDri1clad Brochure

Albi DriClad Installation Instructions

DriClad
Parking Garage
Methuen, MA
Photo: Jim Lundell

Albi
Protective Coatings

DriClad

DESCRIPTION

Albi DriClad is based on naturally occuring basalt volcanic rock. The patented manufacturing process transforms crushed volcanic rock into a lightweight, durable board from finely sewn threads bound with a proprietary resin. For use on structural steel in lieu of conventional, soft fireproofing, this material offers excellent fire safety properties. It is supplied as 4' x 6' boards.

DriClad
Maine College of Arts
Portland, ME
Photo: Jeffrey Stevensen

ALBI DRICLAD ADVANTAGES

- Noncombustible
- High insulating Value
- No steel surface preparation required
- High sound absorption
- No leachable chloride content
- Non-capillary and non-hygroscopic
- Completely free of asbestos. CFCs and HFCs
- Chemically inert
- Installs dry without disruption to other trades
- Applies year-round in all weather conditions
- Factory-controlled density and thickness

WHERE TO SPECIFY

Specify Albi DriClad to provide fire resistance for structural steel on both new and retrofit construction. DriClad is compatible with all materials with which it is likely to be used in normal inductrial and commercial applications. It can also be applied to a wide range of nonferrous metals as well as elements such as walls, ventilation ducts, doors, and conduit. DriClad is available in a range of thicknesses beginning at 1".

PROVEN PERFORMANCE

The superior performance of Albi DriClad fireproofing materials has been verified under a wide range of applications throughout the world. DriClad is manufactured to the most stringent quality criteria and conforms to, or exceeds, all relevant American and worldwide standards. DriClad is classified as noncombustible in accordance with ASTM E136. Since DriClad has a low binder content, it shows zero flame spread and smoke development, per ASTM E84.

ALBI DRICLAD UL FIRE-RESISTANCE LISTINGS

FIRE TEST ASTM E-119

Typical System	Size	Hourly Rating	Thickness in. (mm)	UL Design No.
Columns - Wide Flange	W10 x 49 (254 x 254 mm)	1	3/4 (19.1)	X313
		1-1/2	1-1/4 (32)	X313
		2	1-1/2 (38)	X313
		3	2-1/2 (64)	X313
	W12 x 120 (312.9 x 332.7 mm)	4	1-1/2 (38)	X313
Beams - Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	S301
		1-1/2	3/4 (19.1)	S301
		2	1-1/2 (38)	S301
Beams - Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	N307
		1-1/2	3/4 (19.1)	N307
		2 (restrained)	3/4 (38)	N307
		2 (unrestrained)	1-5/8 (41)	N307
		3 (restrained)	1-5/8 (41)	N307
Beams - Unprotected Roof / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	P930
		1-1/2	3/4 (19.1)	P930
		2 (restrained)	3/4 (19.1)	P930
		2 (unrestrained)	1-5/8 (41)	P930
Beams - Protected Roof / Ceiling (Restrained & Unrestrained)	Type 10k1 Joists	1	1 (25.4)	P302
Assembly - Floor / Ceiling (Restrained)[1]	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D929
		1-1/2	3/4 (19.1)	D929
		2	3/4 (19.1)	D929
		3	1-5/8 (41)	D929
Assembly - Floor / Ceiling (Unrestrained)[1]	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D929
		1-1/2	3/4 (19.1)	D929
		2	1-5/8 (41)	D929
Assembly - Protected Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	D303
		1-1/2	3/4 (19.1)	D303
		2 (restrained)	3/4 (19.1)	D303
		2 (unrestrained)	1-5/8 (41)	D303
		3 (restrained)	1-5/8 (41)	D303
Assembly - Floor / Ceiling (Restrained & Unrestrained)	W8 x 24 (203 x 203 mm)	2	1 (25.4)	G301
Assembly - Protected Floor / Ceiling (Restrained & Unrestrained)	W8 x 28 (203 x 203 mm)	1	3/4 (19.1)	J301
		1-1/2	3/4 (19.1)	J301
		2 (restrained)	3/4 (19.1)	J301
		2 (unrestrained)	1-5/8 (41)	J301
		3 (restrained)	1-5/8 (41)	J301

[1] Requiere montaje con proteccion

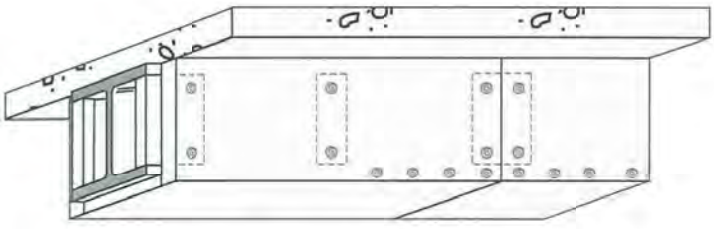
EASY APPLICATION

Albi DriClad installs without the adhesion and compatibility concerns associated with spray applied soft fireproofing. Although DriClad is easily cut with a knife or hand saw, the most efficient cutting device is a table saw. A knife may be used to cut around obstructions and structural members. Strips 4" wide x 1-1/2"minimum thickness are fit tightly between the top and bottom flanges 24"on center. Material is then cut and installed to box in the steel. AlbiScrews™ fasten the material 6" on center. DriClad is shipped on pallets in stretch-wrapped polyethylene for ease of handling and short term storage.

TYPICAL INSTALLATIONS

- Commercial Buildings
- Industrial Plants
- School Gymnasiums
- Warehouses
- Parking Garages
- Power Plants
- Elevator Shafts

Profiled metal deck/roof over steelwork



AlbiScrews @ 6" centers

Other Albi DriClad Literature

- Albi DriClad Long Form Guide Specification
- Albi DriClad Field Application Manual

PHYSICAL PROPERTIES

Property	ASTM Test Method	Value
Dry Applied Density (Average)	- 10.5	PCF
Compressive Strength @ 10%	ASTM C165	936 PSF
Tensile Strength	ASTM C209	155 PSF
Moisture Absorption	ASTM C209	0.50% By Volume
Moisture Adsorption	ASTM C553	0.03% By Volume
Sound Absorption	ASTM C423	NRC - 0.80
Deflection	ASTM E759	No Delamination
Thermal Performance (R Value)	ASTM C158	4.2 (per inch)
Corrosion & Fungi Resistance	ASTM C665	Non Corrosive/No Fung Growth
Leachable Chlorides	ASTM C871	No Leachable Chlorides
Air Erosion	ASTM C1071	0 @ 5800 ft/min
Fire Hazard Classification	ASTM E136	Non Combustible
Flame Spread	ASTM E84	0 (Class A)
Smoke Developed	ASTM E84	0 (Class A)

CLASSIFIED UL
* See complete marking on package

ALBI DRICLAD UL Classified Mineral Board*	Material Thickness	Material Thickness	Material Thickness	Material Thickness
	1.0 inch	1-5/8 inch	2.0 inch	2-1/2 inch
Sheets per Pallet	45 sheets	28 sheets	21 sheets	18 sheets
Total Square Feet per Pallet	1080 sq. ft.	672 sq. ft.	504 sq. ft	432 sq. ft.
Gross Weight per Pallet	1000 lbs	1000 lbs.	1000 lbs.	1000 lbs.

Also inquire about these fireproofing products from Albi:

Albi Clad 800
Intumescent fireproofing, withstands severe weathering and abuse

Albi Clad TF
Water-based, thin-film intumescent fireproofing for exposed interior structural steel

Albi Clad FP
Water-based, thin-film intumescent fireproofinh for exposed wood, wallboard, and other combustible assemblies

ALBI PROTECTIVE COATING

For more than five decades, Albi fireproofing materials have demonstrated superior performance and reliability under a range of extreme environments worldwide. These proprietary formualtions also meet global building codes and insurance requirements. Lightweight Albi materials provide long-term protection, outstanding durability, aesthetic properties and are completely free from asbestos.

Albi
Protective Coatings

Albi Protective Coatings, Division of StanChem, Inc.
401 Berlin Street, East Berlin, Connecticut 06023 U.S.A.
Tel: (860) 828-0571 Fax: (860) 828-3297
www.albi.com info@albi.com

Albi DriClad

FIREPROOFING APPLICATION MANUAL & FIELD GUIDE

Albi Protective Coatings
Division of StanChem, Inc.
401 Berlin Street
East Berlin, CT 06023 USA
Tel: (860) 828-0571
Fax: (860) 828-3297
www.albi.com

TABLE OF CONTENTS

INTRODUCTION

Throughout the years, Albi has earned an enviable reputation for its dependable, high quality fireproofing systems. Providing maximum protection with minimum thickness, our line of Albi Clad

intumescent fireproofing materials have demonstrated their unique ability to withstand abuse, impact, vibration and adverse environmental conditions, while still continuing their outstanding performance record and aesthetic properties.

This manual has been prepared to provide you with basic information pertinent to the properties and application methods of Albi DriClad. Further, equipment recommendations and application suggestions are included to assist you and your job superintendent in proper job preparation and professional execution of work. The objective of this manual is to explain the necessary components and methods to provide the required fire protection as specified by the owner or architect.

It is your responsibility, as a competent and reputable applicator, to apply the product in accordance with ULI tests and in compliance with our recommendations. It is important that you have full knowledge of our product and its application methods in order to maintain our record of proven performance and consistent customer satisfaction. We urge your studied review of the information contained in this manual and the transmission of this same information to all personnel who will be involved in the application of Albi DriClad.

As additional information is developed, it will be forwarded to you for insertion in this manual. Should you desire additional copies, or should there be questions requiring clarification, please contact our home office, your regional manager, or Mr. Ken Walker the Product Manager for Albi DriClad.

ALBI PRODUCT DESCRIPTION

Albi DriClad is a semi rigid board manufactured from molten volcanic rock which is spun into fine threads, impregnated with a special resin and compressed to form a durable, yet easy to use material which has superior fire resistance properties. Albi DriClad is used to fireproof structural steel and is installed using Albi DriClad screws. Albi DriClad meets the fire test criteria of ASTM E84, ASTM E119, and UL263.

Albi DriClad is listed by Underwriter's Laboratories, Inc. and is designed for rapid installation to columns, beams, floor/ceiling, and roof/ceiling assemblies for fire ratings up to 4 hours. Due to its high moisture resistance Albi DriClad is suitable for application to both interior and exterior surfaces which are **initially** exposed to the weather during construction. Albi DriClad can also be used in semi exposed conditions such as parking garages.

EQUIPMENT RECOMMENDATIONS

Cutting

As a board material, the most efficient method for cutting is with a standard table saw. It is recommended that the saw have a dust collection system to help control any air born mineral fibers. For small jobs it may be more efficient to use a circular saw (with a dust collection unit) or even a broad knife.

Installation

The installation of the Albi DriClad requires the use of our Albi Screw system. These pig tail type screws are most efficiently installed using a cordless drill, fitted with either a #10 countersink bit or philips head bit.

Miscellaneous

For small cuts around clips, hangers, etc a thin bladed, rigid, steak knife is the most efficient.

TYPICAL APPLICATION DETAILS

PREPARATION
Albi DriClad requires no special treatment to the steel substrate. Cut boards to size with due allowance for steel tolerances and board thicknesses.

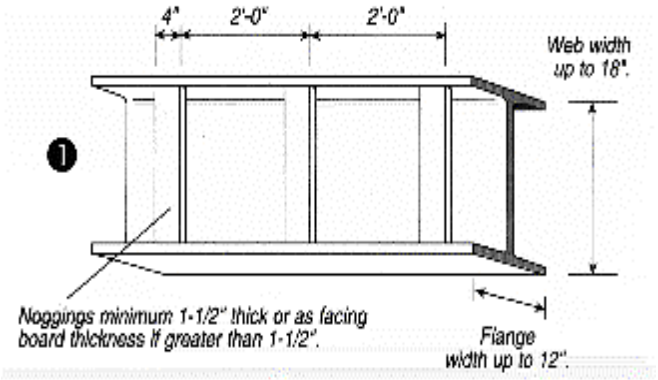
INSTALLATION SEOUENCE
(A) Cut noggings 4" wide or more and push fit into web at 2'-0" centers as shown in figure 1. Ideally, nogging should extend slightly beyond flange tip 1/16". For beams with webs deeper than 18" use tee-shaped noggings as shown in figure 5.

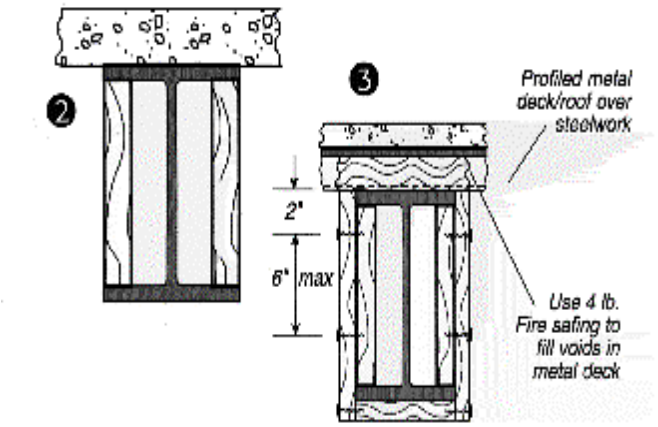
(B) Cut side boards to suit depth of steel section plus thickness of fireproofing board. Install DriClad boards using two AlbiScrews at each end and at each intermediary nogging. (See figures 3 and 4)

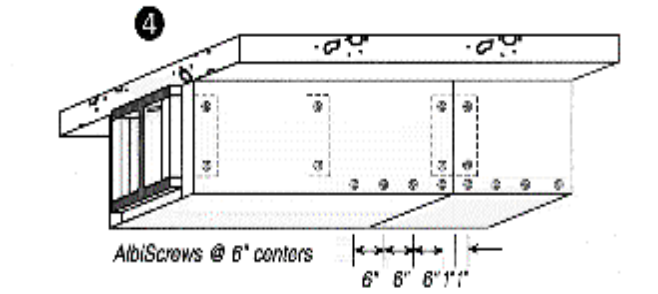
(C) Cut width of soffit boards to fit between side panels (nominal width of flange). Install panel tight up to flange with AlbiScrews at 6" centers along each side as shown in figures 3 and 4. For beams with flanges wider than 12" soffit boards require additional support. Use either DriClad Adhesive or steel pins as shown in figure 6.

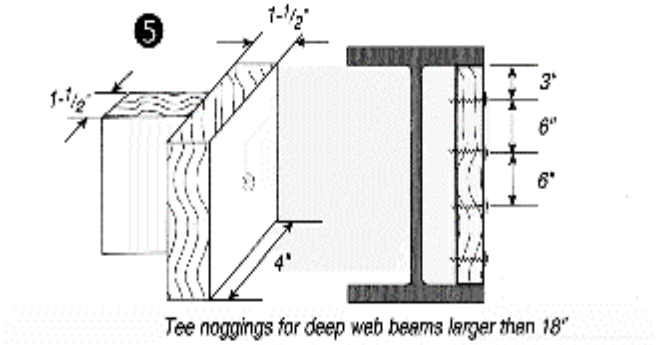
Note: The nominal minimum length of AlbiScrews is the total thickness of the DriClad boards being fixed together. e.g. 3/4" fireproofing plus 1-1/2" minimum nogging requires size 1 (2-1/4") AlbiScrews.

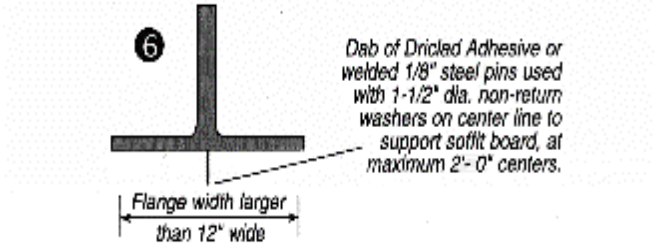
*Steel should be free from dust and loose particles where noggings are to be installed.











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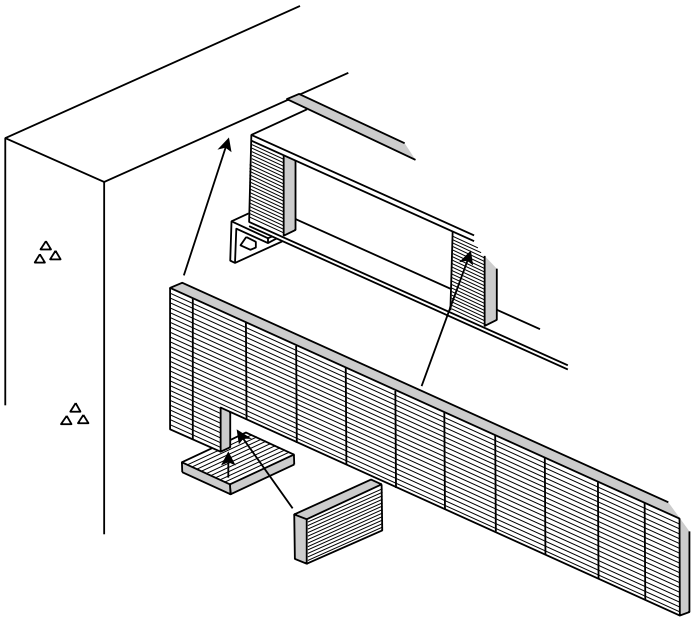

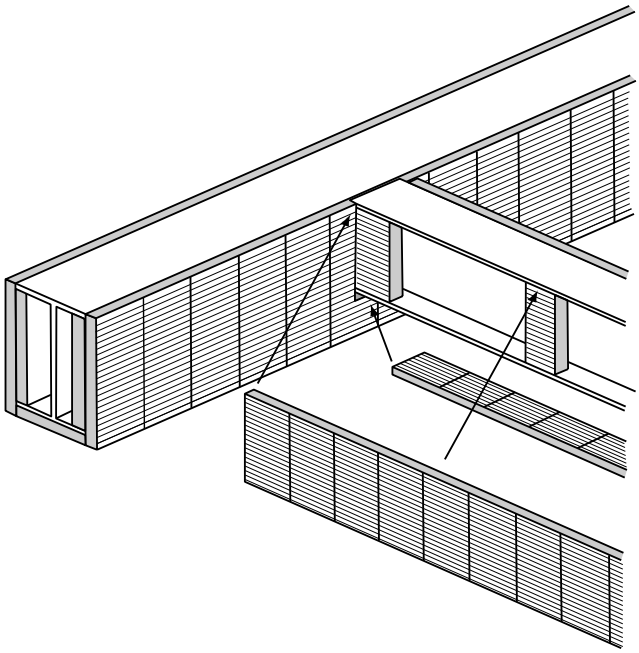

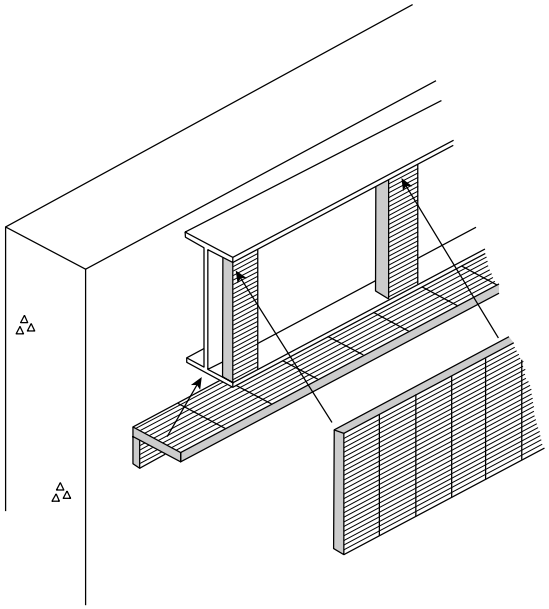

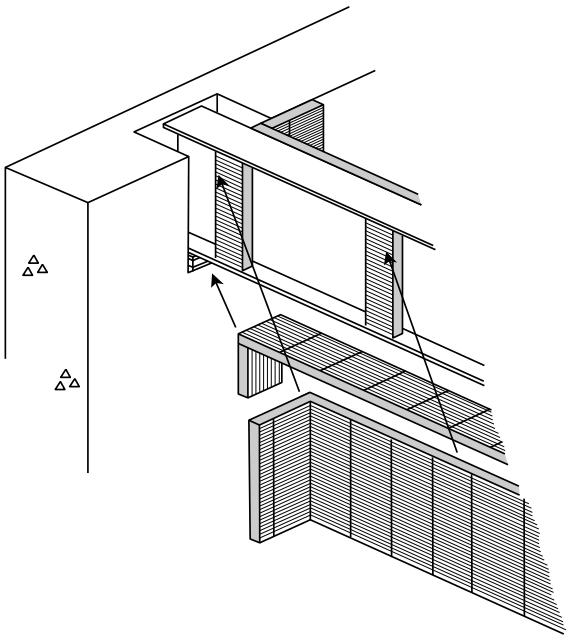

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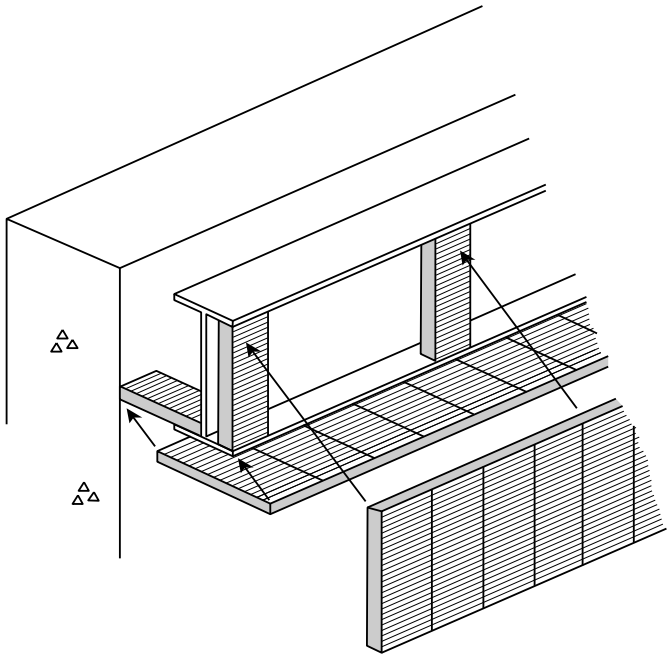

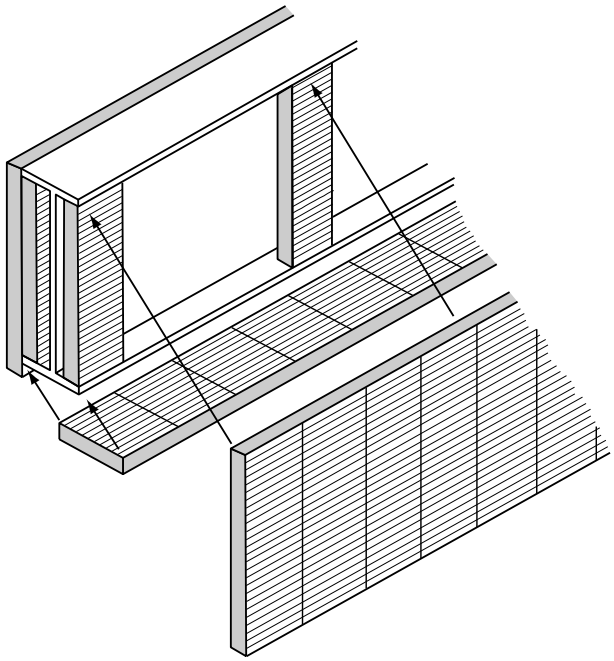

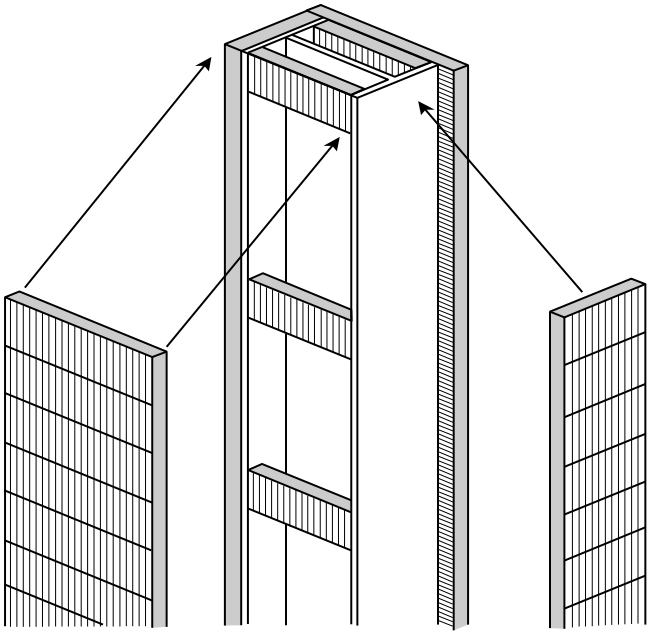

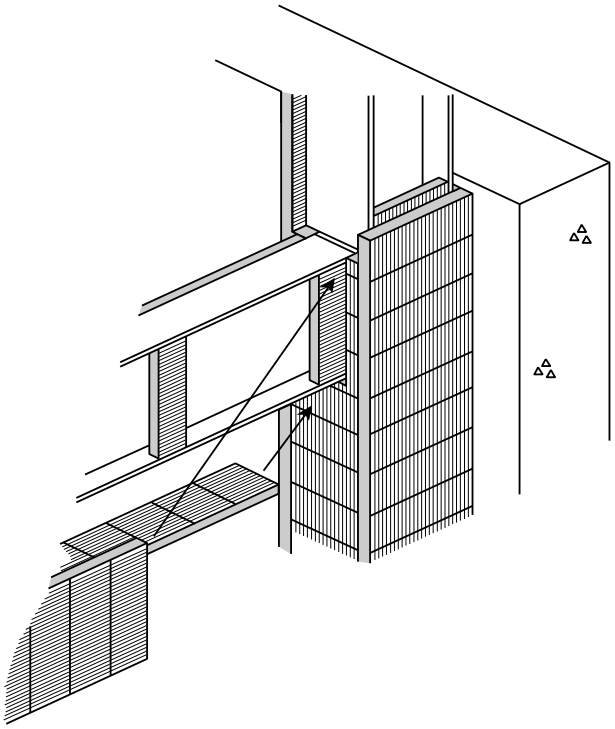

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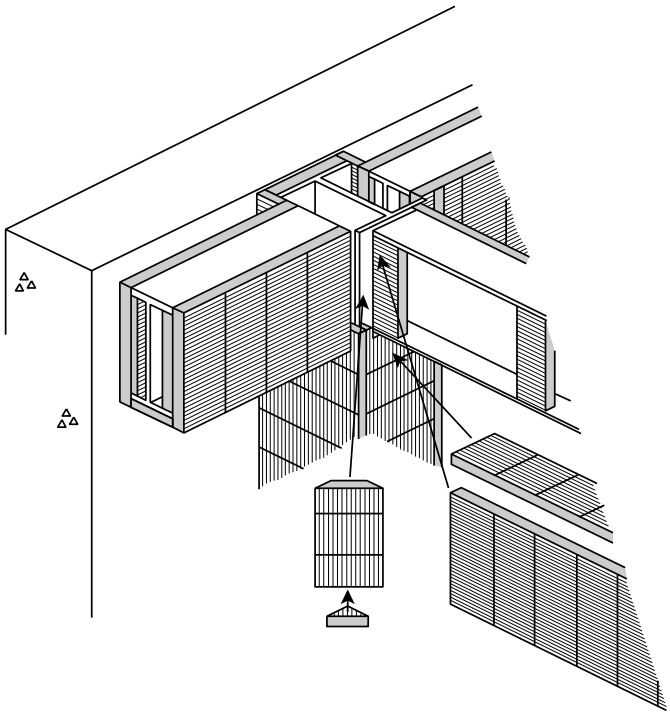
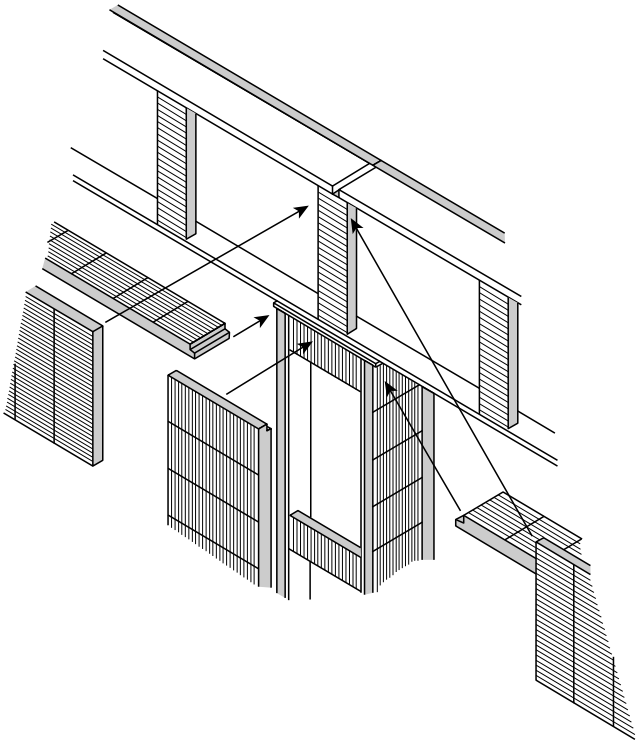
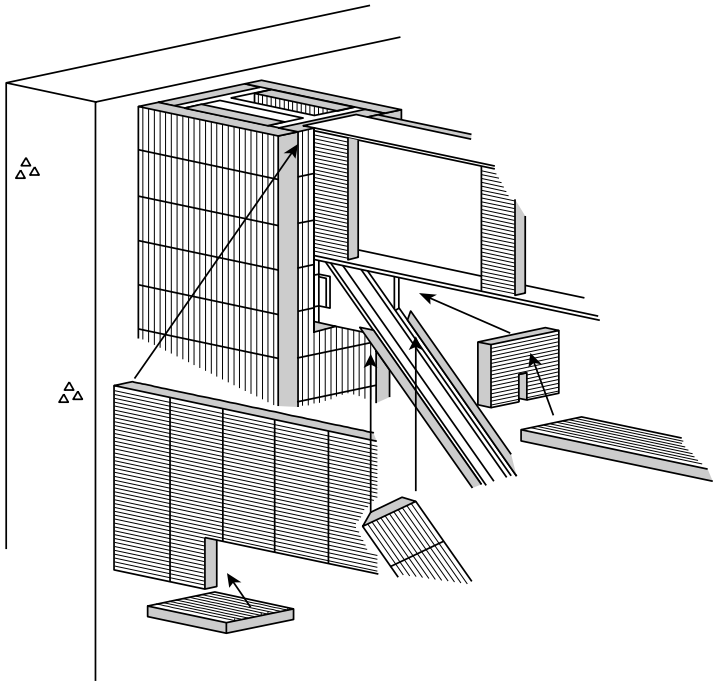
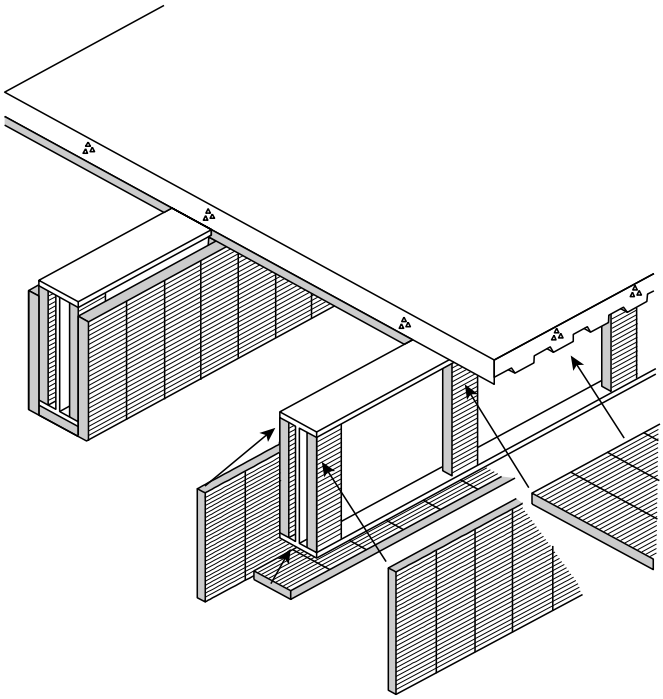








UNDERWRITERS' LABORATORIES, INC. - LISTINGS

COLUMNS: **Wide Flange** FIRE TEST: **ASTM E-119**

COLUMN SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W10 x 49	X-313	1 hr.	3/4 inches
	X-313	1-1/2 hrs.	1-1/4 inches
	X-313	2 hrs.	1-1/2 inches
	X-313	3 hrs.	2-1/2 inches
W12 x 120	X-313	4 hrs.	1-1/2 inches

BEAMS: **Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	S-301	1 hr.	3/4 inches
	S-301	1-1/2 hrs.	3/4 inches
	S-301	2 hrs.	1-1/2 inches

BEAMS: **Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	N-307	1 hr.	3/4 inches
	N-307	1-1/2 hrs.	3/4 inches
	N-307	2 hrs.(restrained)	3/4 inches
	N-307	2 hrs. (unrestrained)	1 1/2 inches
	N-307	3 hrs. (restrained)	1 1/2 inches

BEAMS: **Unprotected Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	P-930	1 hr.	3/4 inches
	P-930	1-1/2 hrs.	3/4 inches
	P-930	2 hrs.	1-1/2 inches

BEAMS: **Protected Roof / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	P-302	1 hr.	1 inch

ASSEMBLY: **Floor / Ceiling** (restrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-929	1 hr.	3/4 inches
	D-929	1-1/2 hrs.	3/4 inches
	D-929	2 hrs.	3/4 inches
	D-929	3 hrs.	1-1/2 inches

ASSEMBLY: **Floor / Ceiling** (unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-929	1 hr.	3/4 inches
	D-929	1-1/2 hrs.	3/4 inches
	D-929	2 hrs.	1-1/2 inches

ASSEMBLY: **Protected Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	D-303	2 hrs.	1 inch

ASSEMBLY: **Floor / Ceiling** (restrained & unrestrained) FIRE TEST: **ASTM E-119**

BEAM SIZE	U.L. DESIGN NO.	HOURLY RATING	MATERIAL THICKNESS
W8 x 28	G-301	3 hrs.	1 inch

WARRANTY/GUARANTEE INFORMATION

Limited warranty/limitation of liability: Information and recommendations provided by Albi are based upon extensive test data, laboratory experiments and years of field experience believed to be reliable. Statements made herein as to application and other properties will vary according to the nature and conditions of the surfaces to which the product is applied.

Albi warrants that its products will meet the specifications that it sets for them. Albi's responsibility under this warranty will be limited solely to replacing the products which prove defective, provided that Buyer gives Albi prompt notice in writing of said defect and satisfactory proof thereof. Products may be returned to Albi only after written authorization has been obtained from Albi. The foregoing warranty is in lieu of all other warranties, whether oral, written, express, implied or statutory. **IMPLIED WARRANTIES OF MERCHANTIBILITY AND FITNESS FOR A PARTICULAR PURPOSE WILL NOT APPLY.** Technical or other advice is furnished by us solely as an accommodation and shall not increase the scope of our responsibilities or liability. Albi's warranty obligations and Buyer's remedies hereunder are solely as stated herein. In no event will Albi be liable either for the labor and other associated costs incurred in replacing the product, including, but not limited to, its removal and application, or for other incidental or consequential damages.

Applicator shall guarantee that its installation of material conforms to manufacturer's recommendations, and shall further guarantee his workmanship connected with the installation for a period of one year from the date of installation.

ONLINE CERTIFICATIONS DIRECTORY

BXUV.S301
Fire Resistance Ratings - ANSI/UL 263

Page Bottom

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

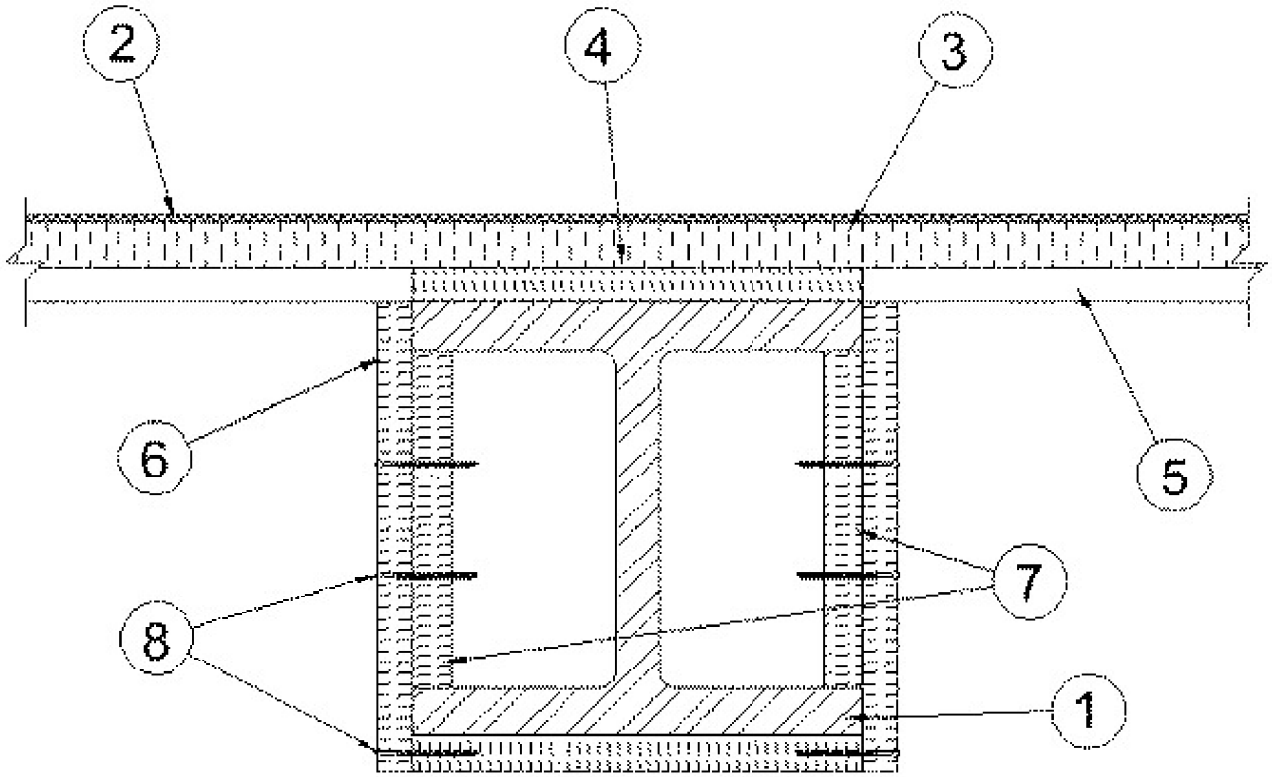
Design No. S301

February 07, 2003

Restrained Beam Ratings — 1, 1-1/2 or 2 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2 & 2 Hr (See Item 6)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam —** W8x28 min size.

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

3. **Mineral And Fiber Boards* —** 24 by 48 in. boards applied in single or multiple layers. Boards secured to steel roof deck units and previous layer of insulation, if multiple layers are used, with adhesive.

JOHNS MANVILLE INTERNATIONAL INC

4. **Adhesive* —** (Optional) Applied to steel roof deck units in 1/2 in. wide ribbons approx 6 in. OC at 0.4 gal per 100 sq ft. See Adhesive (BYWR) category for names of manufacturers.

5. **Steel Roof Deck —** (Unclassified) — Fluted, No. 22 MSG, galv 1-1/2 in. deep with 3-1/2 in. wide flutes spaced 6 in. OC. Ends overlapped at supports a min of 1-1/2 in. and welded to supports, 12 in. OC, max. Adjacent units button punched, welded or screwed together along side joints.

6. **Mineral and Fiber Boards —** Boards cut in various widths to be compatible with the size of beam being protected. Boards placed parallel with the flange of the beams are cut the width of the flange. Boards placed parallel with the web of the beams are cut the width of the beam (web side) plus twice the board thickness. The voids created by the flutes above the beam to be filled with mineral wool batts having a nom density of 4 lb per cu ft.

Restrained and Unrestrained Beam Ratings, Hr	Min Nominal Thkns In.
1	3/4
1-1/2	3/4
2	1-1/2

ALBI MFG, DIV OF STANCHEM INC — Type Dri-Clad

7. **Noggings —** Min 1-1/2 in. thick, pieces of mineral and fiber board (See Item 6). Cut to friction fit between beam flanges; located at horizontal butted joints of adjacent mineral and fiber board sections (Item 6) on the web sides of the beam.

8. **Fasteners —** The boards are fastened to the noggings and to each other by means of spiral type screws, spaced a max of 6 in. OC. The fasteners are installed on both sides of horizontal joints.

*Bearing the UL Classification Mark

Last Updated on 2003-02-07

Questions? Notice of Disclaimer Page Top

Great Scott Trio Engineering Judgment Report

EJ #3 - 1-Hour Fire Rating of Steel Beam

Convergence Architecture

7302 N Richmond Ave

Portland, OR 97203

Date: 2/16/2022

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GREAT SCOTT TRIO

NE 7TH AVE & E BURNSIDE ST, PORTLAND, OREGON

1 PROJECT OVERVIEW

The Great Scott Trio is a new project under construction, located at 701 NE Burnside Street in Portland, Oregon. It will be under the jurisdictional review of the City of Portland. The proposed design is a four (4) story mixed use (M, B, an R-2), Type V-A Construction and fully sprinklered throughout and approximately 18,800 gross square feet. The legal lot includes a one story existing brewery building that will remain. The first story is office/retail, lobby, and one Type A residential unit. The upper three floors include twelve (12) residential on either side of an open courtyard.

One or more of the building systems do not meet the prescriptive code requirements or do not meet tested fire resistive assembly requirements.

The Client is proposing the application two (2) layers of 5/8" Type "X" gypsum wall board and 3x nailers above and below the beam to provide protection of this assembly to meet or exceed a 1-hour fire-resistance rating as required per 2019 OSSC.

This Engineering Judgement (EJ) addresses the condition of the steel beam supporting the wood floor located at grid line 5, Level 2B at the balcony for the purpose of showing equivalent protection of 1-hour fire-resistance protection as required by 2019 OSSC. This EJ is only applicable to the element and location specified above. Other elements and locations were not reviewed for this document.

2 APPLICABLE CODES, STANDARDS, AND GUIDES

The review will be based on the following codes:

- 2019 Oregon Structural Specialty Code
- 2019 Oregon Fire Code

3 DISCUSSION

3.1 Approach

- The proposed beam assembly has been analyzed in accordance with:
  - **2019 OSSC §703.3 Alternative Methods for Determining Fire Resistance**
  - **2019 OSSC §704.3 Protection of the Primary Structural Frame Other Than Columns**
- The proposed assembly has been analyzed in comparison with the **UL Design No. N501** (for comparision reference), however does not include a 25 guage steel cage around the beam, although includes (2) layers of Type “X” gypsum wallboard and is only required to meet a 1-hour fire-resistance rating per code. With the two layers of gypsum this will exceed the required 60 min rating.
- Portions of the tested assembly are modified to suit the unique design condition. The modification is analyzed for equivalency using published fire test data and acceptable fire science principles.

4 PROPOSED DESIGN

The proposed beam assembly consists of a 3x wood nailer from above, two (2) layers of 5/8”” Type “X” to entirely encase the beam from each side, a 3x nailer below (that can be optional as it does not provide required fire protection to the encasement) and two (2)) layers of 5/8”” Type “X” from below as displayed in Figure 1 below.

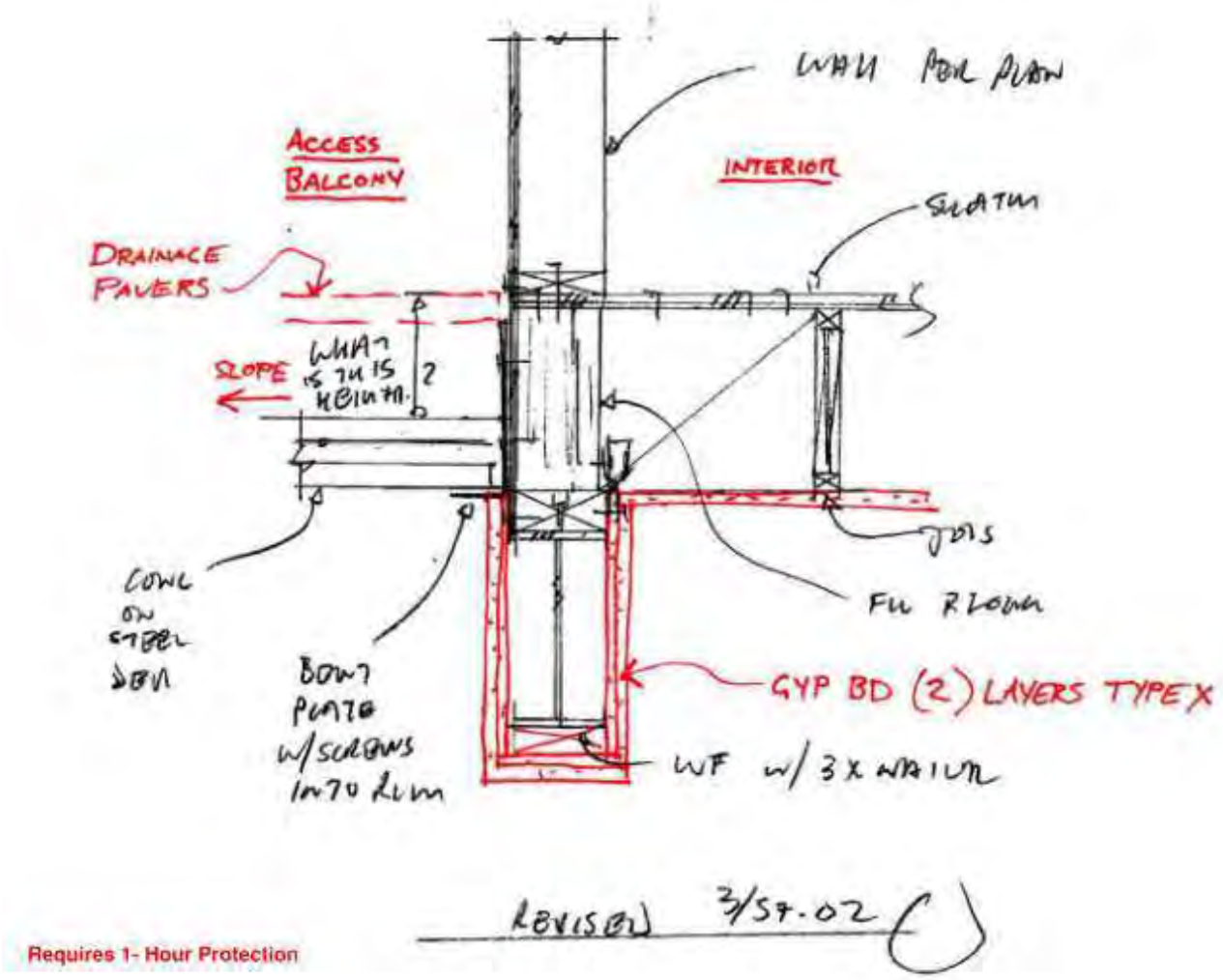


Figure 1: Proposed Assembly at 1A Detail Typical 1-Hour

5 CODE SECTIONS

§703.3 Alternative Methods for Determining Fire Resistance

The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures;

1. *Fire-resistance* designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance* ratings as determined by the test procedures set forth in ASTM E119 or UL 263.
5. Alternative protection methods as allowed by Section 104.11.
6. Fire-resistance designs certified by an approved agency.

§704.3 Protection of the Primary Structural Frame Other Than Columns

Protection of the primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a *fire-resistance rating* and support more than two floors or one floor and roof, or support a load-bearing wall or a non-load-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required *fire-resistance rating*.

> *Exception*: Individual encasement protection on all sides shall be permitted on all exposed sides provided that the extent of protection is in accordance with the required *fire-resistance rating*, as determined in Section 703.

6 ASSEMBLY ANALYSIS

The proposed steel beam assembly at grid line 5, Level 2B at the balcony is required to meet a 1-Hour fire-resistance rating per 2019 OSSC. It is assumed that the beam could be exposed to fire and the assembly will require continuous protection from all exposed sides. Per §704.3 requires individual encasement to provide protection for all fire exposed sides of the beam assembly to meet or exceed the required 1-hour fire-resistance rating.

The proposed beam assembly was compared to UL N501, the compared assembly has been tested for 2-hour fire-resistive construction, however the proposed assembly is only required to meet a 1-hour fire-resistance rating by code. With the installation two (2) layers of Type “X” gypsum board and the 3x nailer above and below, this assembly will exceed the required 1-hour rating.

Our analysis looks at the four sides of the beam individually with Table 1 providing a summary of the protection from each side, and Table 2 providing the comparison between the tested / listed assembly and the proposed assembly.

Path	Proposed Assembly Beam Size	Notes
1. Protection from above	• 3x Wood Blocking	**120-minute minimum protection** **Exceeds 1-hour FRR**
2. Protection from the Right side	• 2 Layers – 5/8" Type "X" Gypsum	**80-minute minimum protection** **Exceeds 1-hour FRR**
3. +Protection from the underside	• 3x Wood Blocking (optional) • 2 Layers – 5/8" Type "X" Gypsum	**80-minute minimum protection (minimum if wood nailer is not included)** **Exceeds 1-hour FRR**
4. Protection from the Left Side	• 2 Layers – 5/8" Type "X" Gypsum	**80-minute minimum protection** **Exceeds 1-hour FRR**

Table 1: Summary of Fire-Resistance for Proposed Beam at Grid Line 5, Level 2B

7 COMPARISON TO A LISTED SYSTEM

Element	UL N501 Minimum Beam Size W8x24	Proposed Assembly
Protection from above	Roof / Ceiling assembly	• Two (2) layers 5/8" Type "X" GYP • 3X Wood Blocking
Protection from the Right side	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	• 2 Layers – 5/8" Type "X" Gypsum
Protection from the Underside	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	• 3 X Wood Nailer • 2 Layers – 5/8" Type "X" Gypsum
Protection from the Left Side	• Beam Cage 25 gauge steel • 2 Layers – 5/8" Type "X" Gypsum	• 2 Layers – 5/8" Type "X" Gypsum
Fire-Resistance Rating	**2-Hour**	**1-Hour (minimum)**

Table 2: Comparison of Tested / Listed Assembly to Proposed Assembly to Meet 1-Hour FRR

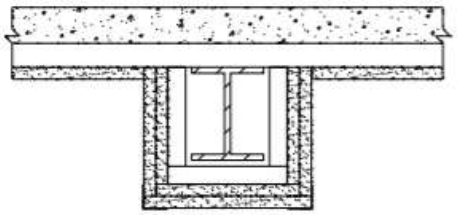
BEAMS, GIRDERS, AND TRUSSES, NONCOMBUSTIBLE

GA FILE NO. BM 2120	GENERIC	2 HOUR FIRE

STEEL FRAME, GYPSUM WALLBOARD

Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 1/4" Type S drywall screws 16" o.c. **Face** layer 5/8" type X gypsum wallboard or gypsum veneer base applied to beam cage with 1 3/4" Type S drywall screws 8" o.c.

Beam cage fabricated from horizontally installed steel angles (25 gage steel having 1" and 2" legs) located not less than 1/2" from beam flanges. 1" legs of the upper angles secured to steel deck units with 1/2" Type S pan head screws 12" o.c. "U" shaped brackets formed of 25 gage "U" shaped steel channels (1 11/16" wide with 1" legs) 24" o.c. suspended from upper angles with 1/2" Type S pan head screws and supported 1" x 2" angles at lower corners attached to brackets with 1/2" Type S pan head screws. Outside corners of gypsum board protected by 0.020" thick steel corner beads crimped or nailed. Minimum beam size W8x24. **(Two Hour restrained or unrestrained beam.)**



Fire Test: UL R4024-5, 9-14-66;
UL Design N501;
ULC Design O501

Figure 2: UL Design No. N501

The proposed assembly will substitute two (2) layers Type “X” gypsum In lieu of the 25 gauge steel beam cage and the protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501. The proposed assembly is required to meet a 1-hour fire-resistive rating per 2019 OSSC.

8 SUMMARY

The overall rating of the assembly was determined by the sum of the fire resistance rating of each component. The proposed assembly was found to meet the 1-hour requirements. The individual ratings were determined from §703.3, the code allows alternative methods for determining fire resistance. §722 provides methods for calculating the fire resistance of membranes.

The protection of the proposed beam is equivalent to an encased structural member as shown by comparison to UL listed assemblies Design No. N501, however does not require a 2-hour fire-resistance rating.

The difference between the proposed and the listed assembly design N501 is the 25 gauge steel beam cage element is not included in the proposed assembly as this does not provide any fire-resistance rating and is not part of the design.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam will meet the minimum 1-hour fire-resistance rating requirement by the OSSC and will extend and maintain continuity of the proposed beam and any penetrations.

9 CONCLUSION

The proposed design for the encased beam includes two (2) layers of 5/8” Type “X” gypsum wall board and a 3X Nailer from above and below.

We have analyzed the fire rating of the proposed assembly in accordance with §703.3 and §704.3, of the 2019 OSSC. The overall rating of the assembly was determined by review of each component in the compared assemblies and were found to meet the minimum 1-hour fire-resistance rating as detailed above through the protection provided by two (2) layers 5/8” Type “X” gypsum wall board UL No. N501.

The proposed design for the beam entirely covered on 4 sides will exceed the required 1-hour rating as compared and detailed in this letter with UL No. N501.

Therefore, as detailed above with the application of a published wall assembly tested per ASTM E119, the proposed design for the beam will meet the minimum 1-hour rating requirement by the 2019 OSSC and will extend and maintain continuity of the required fire protection of the beam when installed as proposed.

Approved By:

exp 12/31/2022

Nicholas A Moriarty

Digitally signed by Nicholas A Moriarty
DN: C=US, E=nick.moriarty@codeul.com, O=Code Unlimited, OU=Las Vegas, CN=Nicholas A Moriarty
Date: 2022.02.16 17:31:53-08'00'

Nicholas A Moriarty, PE

Principal, Senior Fire Protection Engineer

Code Unlimited

Prepared By:

Meghan Thelma Stormont

Digitally signed by Meghan Thelma Stormont
DN: C=US, E=megstormont@gmail.com, CN=Meghan Thelma Stormont
Reason: I am the author of this document
Contact Info: meghan.stormont@codeul.com
Date: 2022.02.16 17:25:14-08'00'

Meghan Stormont

Fire Analyst II

Code Unlimited LLC