# Development Services

## From Concept to Construction

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More Contact Info (http://www.portlandoregon.gov//bds/article/519984)

## APPEAL SUMMARY

**Status:** Decision Rendered - Held over from ID 18880, item #4 (1/16/19) for additional information

| | |
|---|---|
| **Appeal ID:** 19034 | **Project Address:** 1715 SW Salmon St |
| **Hearing Date:** 2/20/19 | **Appellant Name:** Andrew Pulliam |
| **Case No.:** B-008 | **Appellant Phone:** 503-445-7354 |
| **Appeal Type:** Building | **Plans Examiner/Inspector:** Brian McCall, Joe Thornton, Corey Stanley |
| **Project Type:** commercial | **Stories:** 8 **Occupancy:** R-2, A-2, B, S-1, S-2 **Construction Type:** III-A, I-A |
| **Building/Business Name:** 18S | **Fire Sprinklers:** Yes - Full NFPA 13 Throughout |
| **Appeal Involves:** Erection of a new structure,other: Update based on request for more information on appeal 18880 | **LUR or Permit Application No.:** 19-106743-CO |
| **Plan Submitted Option:** pdf [File 1] [File 2] [File 3] | **Proposed use:** Multifamily and Retail |

## APPEAL INFORMATION SHEET

### Appeal item 1

| | |
|---|---|
| **Code Section** | 602.3, 601, 2303.2 |
| **Requires** | The following has been updated to addresses a request for more information for appeal #18880 item 4.<br><br>OSSC Section 602.3 – Type III: Fire-retardant-treated (FRT) wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hr rating or less.<br><br>OSSC Section 2303.2: Fire-retardant-treated wood is any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTME E84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20 minutes. Additionally, the flame shall not progress more than 10 ½ feet beyond the centerline of the burners at any time during the test.<br><br>OSSC Section 705.5: The required fire-resistance rating of exterior walls with a fire separation distance of greater than 10 feet shall be rated for exposure to fire from the inside. |
| **Proposed Design** | The following proposed design addresses a request for more information for appeal #18880 item 4.<br><br>The building consists of Type III-A construction using FRT wood framing at the exterior walls over a I-A concrete podium. The building is provided throughout with an NFPA 13 sprinkler system. In specific locations glulam headers enclosed within the 2-hr exterior wall assembly are required to |

| | |
|---|---|
| | span openings. Please reference attached framing plan for highlighted locations (see Exhibit 1). The glulams are not available as factory FRT treated.<br><br>Per OSSC 704.10 the glulam headers in question require 2-hr fire protection. Given a fire separation distance greater than ten feet in all cases in question, the proposed configuration addresses 2-hr fire protection in terms of exposure from the inside only.<br><br>In lieu of pressure impregnated FRT glulams, the load-bearing glulam headers in question within the exterior wall assembly will be protected from exposure to fire on the interior by the following (see Exhibit 2):<br><br>(2) layers of type x gypsum board on the interior side of the glulam header. Per table OSSC 722.6.2(1) these layers provide 40 minutes of protection each, for a total of 80 minutes.<br>1" of sacrificial wood at the interior face of the header. Per AWC TR-10 the assumed char rate of softwood is 1 ½" per hour. This yields 40 minutes of fire protection from 1" of char. Refer to Exhibit 3 for structural calculations showing the design of the headers with a 4 ½" width, and specified as a 5 ½" width to provide for 1" of char.<br>FRT 2x lumber serving as fireblocking to protect the underside of the beam. Per the above-referenced char rate, (2) 2x members yields two hours of protection. |
| **Reason for alternative** | TYPE III-A construction allows the use of glulam beams in exterior load-bearing walls provided that they are fire-retardant treated.<br><br>Our findings indicate that pressure-impregnated FRT glulam beams are not warrantable due to the FRT chemicals altering the beam's structural integrity and are not available in our market. Additionally, the FRT chemicals are corrosive to the metal fasteners attaching to the beams.<br><br>The pathway outlined in this appeal for demonstrating equivalent fire protection is based on feedback from Corey Stanley, reflecting the AHJ's preference to utilize a code-calculated method for providing fire protection for the glulam headers, rather than relying on a field-applied product as previous approved appeals have done. This pathway provides equivalent protection while allowing for construction with available materials in a non-toxic & non-corrosive manner. |

## APPEAL DECISION

**Alternate 2 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 180 calendar days of the date this decision is published. For information on the appeals process and costs, including forms, appeal fee, payment methods and fee waivers, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.

# EXHIBIT 1 - TYPICAL FLOOR FRAMING PLAN


1 S01.05 Floor Framing Plan - LEVEL 5-7
1/8" = 1'-0"

## FLOOR FRAMING PLAN NOTES

A FOR A COMPLETE LEGEND OF ALL CALLOUTS AND SYMBOLS REF COVER SHEET AND SCHEDULES.
B FLOORS SHALL HAVE A 1" GYPCRETE TOPPING SLAB OVER THE SHEATHING.
C REFERENCE DETAIL 4/S06.21 FOR TYPICAL DOUBLE TOP PL SPLICE CONNECTION.
D REFERENCE S05.01 & S05.02 SHEETS FOR STAIR FRAMING.
E ALL POSTS FOR GIRDER TRUSSES, BEAMS, HEADERS AND / OR PURLINS SHALL CONTINUE DOWN FLOOR TO FLOOR TO PT SLAB, FOUNDATION OR LOWER BEAM / HEADER.
F STUD BEARING WALLS SHALL BE FRAMED PER BEARING WALL SCHEDULE
G VERIFY SIZE AND LOCATION OF ALL MECHANICAL AND WALL PENETRATIONS.
H REFERENCE ARCHITECTURAL FOR ALL EDGE OF SLAB DIMENSIONS.
I PROVIDE HEADER TYPE H1 AT ALL OPENINGS, TYP AT BEARING WALLS UNO. REF DETAIL 1/S06.21 FOR TYPICAL HEADER CONSTRUCTION, UNO.
J REFERENCE S00.05 FOR CONTINUOUS THREADED ROD SYSTEM

## KEYED NOTES

1 7/8" APA RATED SHEATHING WITH 1" MAX GYPCRETE WITH BLOCKED EDGES. PROVIDE 2x4 FLAT BLOCKING ALONG ALL UNSUPPORTED PANEL EDGES. ATTACH SHEATHING TO FRAMING AND BLOCKING WITH 0.148 DIA x 3" NAILS AT 6" OC PANEL EDGES, 12" OC FIELD.
4 ALL WOOD FRAMING IN EXTERIOR WALLS TO BE FIRE RETARDANT TREATED.
14 COORDINATE ELEVATOR RAIL ATTACHMENT WITH ELEVATOR MANUFACTURER. PROVIDE ATTACHMENTS AT FLOOR LEVELS REFERENCE DETAILS 5/S05.04 AND WHERE ATTACHMENTS OCCURS BETWEEN LEVELS REFERENCE DETAIL 2/S05.04.
15 ELEVATOR DIVIDER BEAM ATTACHMENT TO RIM BEAM, REFERENCE DETAIL 6/S05.04.
16 HSS 6x4x1/4 ELEVATOR DIVIDER BEAM, REFERENCE DETAIL 4/S05.04 FOR COLUMN CONNECTION TO HSS BEAM.
35 SIMPSON CS14 COIL STRAP x AS SHOWN. STRAP TO BE NAILED 6'-0" W/ 0.148" x 2 1/2" NAILS EVERY HOLE. REFERENCE DETAIL 22/S06.21.
36 SIMPSON CSMT14 COIL STRAP x 12'-0" LONG. STRAP TO BE NAILED 2'-0" WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF DOUBLE TOP PLATE AND NAILED 10'-0" TO 3x T&G DECKING AT CORRIDOR AND 3x JOIST BLOCKING AT 3" OC. REFERENCE DETAIL 22/S06.21.
38 SIMPSON CSMT4 COIL STRAP x 70'-0" LONG. STRAP TO NAILED TO TOP OF DOUBLE TOP PLATE WITH 0.162" DIA x 2 1/2" EVERY HOLE AND NAILED WITH 0.162" DIA x 2 1/2" NAILS AT 6" OC STAGGERED ON TOP OF JOISTS AND 3x JOIST BLOCKING BETWEEN JOIST.
39 SIMPSON CSMT14 COIL STRAP x AS SHOWN. STRAP TO NAILED TO 3x JOIST BLOCKING EVERY 6" OC STAGGERED AND NAILED 3-0" AT ENDS WITH 0.162" DIA x 2 1/2" NAILS EVERY HOLE.
40 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. CENTER STRAP ON WALL AND NAILED WITH 0.162" DIA x 2 1/2" NAILS ON TOP OF 3x JOIST BLOCKING AND TO TOP DOUBLE TOP PLATE. REFERENCE DETAIL 34/S06.21.
41 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. CENTER STRAP ON WALL AND NAIL WITH 0.162" DIA x 2 1/2" NAILS ON TOP CHORD OF JOISTS. REFERENCE DETAIL 19/S06.21.
43 SIMPSON CSMT14 COIL STRAP x 50'-0" LONG. STRAP TO BE NAILED 6'-0" WITH 0.162" DIA x 2 1/2" NAILS EVERY HOLE TO 3x JOIST BLOCKING AND NAILED ON TOP OF 4x T&G BLOCKING AT THE CORRIDOR.
44 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. STRAP TO BE CENTERED AT WALL AND NAILED TO TOP OF FLOOR JOIST AND 3x JOIST BLOCKING WITH 0.162" DIA x 2 1/2" NAILS.
45 SIMPSON CSMT14 COIL STRAP x 25'-0" LONG. STRAP TO BE NAILED WITH 0.162" x 2 1/2" NAILS TO 3x JOIST BLOCKING AND 3x T&G DECKING AND TO BE NAILED TO TOP OF DOUBLE TOP PLATE AT THE END AS SHOWN.
46 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. STRAP TO BE CENTERED ON BEAM AND NAILED WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF BEAM AND TOP OF DOUBLE TOP PLATE.
47 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. STRAP TO BE WELDED 1'-0" TO THE SIDE OF HSS BEAM AND NAILED TO THE SIDE OF DOUBLE TOP PLATE. STRAP TO BE CENTERED AT DOUBLE TOP PLATE.
51 SIMPSON CCQ COLUMN CAP WITH TABS TO BE SKEWED TO MATCH BEAM ANGLE.
55 SIMPSON CMST14 COIL STRAP x 8'-0". STRAP TO BE CENTERED AND NAILED TO THE TOP OF BEAM AND TOP OF DOUBLE TOP CHORD.
56 3 1/2 x 11 7/8 GL DRAG BEAM. ALIGN BEAM OVER SHEAR WALL AND EDGE NAIL SHEATHING TO BEAM.
57 3 1/2 x 11 7/8 GL DRAG BEAM. EDGE NAIL SHEATHING TO BEAM.
58 SIMPSON CSMT14 COIL STRAP x 6'-0" LONG. CENTER STRAP ON WALL AND NAIL WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF BEAM AND TO 3x BLOCKING BETWEEN JOISTS. REFERENCE DETAIL 19/S06.21.
59 SIMPSON CSMT14 COIL STRAP x 6'-0" LONG. CENTER STRAP OVER WALL AND NAIL WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF EACH BEAM. REFERENCE DETAIL 39/S06.22
60 SIMPSON CSMT14 COIL STRAP x AS SHOWN. STRAP TO BE NAILED 4'-0" WITH 0.162" DIA x 2 1/2" NAILS ON TOP OF BEAM ALL HOLES AND NAILED TO 3x JOIST BLOCKING EVERY OTHER HOLE.
61 SIMPSON CSMT14 COIL STRAP x 6'-0" LONG. STRAP TO BE CENTERED AT WALL AND NAILED WITH 0.162" DIA x 2 1/2" NAILS TO THE DOUBLE TOP PLATE AND TO THE TOP OF BEAM.
62 SIMPSON CSMT14 COIL STRAP x 8'-0" LONG. STRAP TO BE NAILED 4'-0" FROM WALL SPLICE WITH 0.162" DIA x 2 1/2" NAILS TO DOUBLE TOP PLATE AND TO 3x JOIST BLOCKING WHERE NEEDED.
63 SIMPSON CSMT14 COIL STRAP x 10'-0" LONG. CENTER STRAP OVER WALL AND NAIL WITH 0.162" DIA x 2 1/2" NAILS TO DOUBLE TOP PLATE AND AND TO 3x JOIST BLOCKING WHERE NEEDED.
64 SIMPSON CSMT14 COIL STRAP x 40'-0" LONG. STRAP TO BE NAILED 6'-0" WITH 0.162" DIA x 2 1/2" NAILS TO BEAM AND TO 3x JOIST BLOCKING WHERE NEEDED AND 3x TxG DECKING, EVERY OTHER HOLE.
65 SIMPSON CSMT14 COIL STRAP x 6'-0" LONG. CENTER STRAP OVER WALL AND NAIL WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF DOUBLE TOP PLATE AND TOP OF BEAM. REFERENCE DETAIL 30/S06.21
67 SIMPSON CSMT14 COIL STRAP x 4'-0" LONG. STRAP TO BE CENTERED AT WALL AND NAILED WITH 0.162" DIA x 2 1/2" NAILS TO THE DOUBLE TOP PLATE AND TO THE TOP OF BEAM.
68 SIMPSON CSMT14 COIL STRAP x 4'-0" LONG. STRAP TO BE CENTERER AT WALL NAILED WITH 0.162" DIA x 2 1/2" NAILS TO TOP OF BEAM AND TO TOP OF JOIST.

## BEAM SCHEDULE

| MARK | BEAM SIZE | COLUMN TYPE (UNO PER PLAN) | HANGERS | COMMENTS |
|---|---|---|---|---|
| H1 | 4x8 DF #2 | (1) 2x TRIMMER (1) 2x KING | | |
| H2 | 4x10 DF #2 | (1) 2x6 TRIMMER (1) 2x KING | | |
| H3 | FRT 4x10 DF #2 | (2) 2x6 TRIMMER (2) 2x KING | | |
| H4 | FRT 6x10 DF #1 | (2) 2x6 TRIMMER (2) 2x KING | | |
| H5 | FRT 5 1/2"x11 7/8" GL | (2) 2x6 TRIMMER (2) 2x KING | | |
| H6 | FRT 5 1/2"x15" GL | REF PLAN | | |
| H7 | FRT 6x12 DF#1 | (2) 2x6 TRIMMER (2) 2x KING | | |
| B1 | 3 1/2"x11 7/8" GL | (2) 2x STUD MIN | | |
| B2 | 5 1/2"x11 7/8" GL | (2) 2x STUD MIN | | |
| B3 | 6 3/4"x11 7/8" GL | 6x6 DF #1 | | |
| B4 | 5 1/2"x13 1/2" GL | REF PLAN | | |
| B5 | 6 3/4"x13 1/2" GL | REF PLAN | | |
| B6 | 5 1/2" x 7 1/2" GL | (2) 2x STUD MIN | | |

BEAM SCHEDULE NOTES:
1. HANGERS ARE TO BE USED AT LOCATIONS WHERE THE BEAM FRAMES INTO AN ADJACENT BEAM ONLY.
2. A SUFFIX OR PREFIX OF 'PT' INDICATES PRESERVATIVE TREATMENT. ALL HARDWARE (CONNECTORS, BOLTS, ETC) IN CONTACT WITH THESE MEMBERS SHALL USE HOT DIPPED GALVANIZED.
3. HU & HUC HANGERS SHALL BE INSTALLED WITH "MAX" NAILING NOTED BY MANUFACTURER.
4. A SUFFIX OR PREFIX OF 'FT' INDICATES FIRE TREATMENT, REF ARCH.
5. TYPICAL INTERIOR HEADERS SHALL BE TYPE 'H1'.
6. TYPICAL EXTERIOR HEADERS SHALL BE TYPE 'H3'.

## JOIST SCHEDULE

| MARK | DEPTH (SIZE) | EQUIVALENT TRUS-JOIST PRODUCT | MIN SHEAR CAPACITY (LBS) | MIN EI CAPACITY x106 (LBS-IN²) | MIN FLEXURAL CAPACITY (FT-LBS) |
|---|---|---|---|---|---|
| J1 | 11 7/8" | TJI-110 | 1560 | 267 | 3160 |
| J2 | 11 7/8" | TJI-230 | 1655 | 347 | 4215 |
| J3 | 11 7/8" | TJI-560 | 2050 | 636 | 9500 |

NOTES:
1. AT WOOD BEAM CONDITIONS HANGERS ARE TO BE SIMPSON ITS HANGERS UNO. REF DETAIL 23/S06.21, UNO. WHERE SCEWED CONNECTION IS REQUIRED, PROVIDE I-JOIST WEB STIFFENER AND USE SIMPSON LBV SCEWED HANGERS.
2. AT STEEL BEAM CONDITIONS HANGERS ARE TO BE SIMPSON LBV HANGERS UNO. REF DETAIL 33/S06.11, UNO.
3. WEB STIFFENERS ARE REQUIRED AT ALL SCEWED JOIST HANGERS AND WHERE NOTED ON PLAN. REFER TO JOIST MANUFACTURER FOR WEB STIFFENER MATERIAL, SIZE AND ATTACHMENT RECOMMENDATIONS.

## COLUMN SCHEDULE

| MARK | 8TH FLOOR | 7TH FLOOR | 6TH FLOOR | 5TH FLOOR | 4TH FLOOR |
|---|---|---|---|---|---|
| C1 | | 6x6 DF #1 | 6x6 DF #1 | 6x8 DF #1 | 6x8 DF #1 |
| C2 | 6x8 DF #1 | 5 1/2 x 7 1/2 GL | 5 1/2 x 7 1/2 GL | 5 1/2 x 9 GL | 5 1/2 x 10 1/2 GL |
| C3 | 6x6 DF #1 | 6x6 DF #1 | 6x6 DF #1 | 6x8 DF #1 | 6x8 DF #1 |
| C4 | | 6x8 DF #1 | 5 1/2 x 7 1/2 GL | 5 1/2 x 9 GL | 5 1/2 x 10 1/2 GL |
| C5 | FRT 6x8 DF #1 | FRT 6x8 DF #1 | FRT 5 1/2 x 7 1/2 GL | FRT 5 1/2 x 7 1/2 GL | FRT 5 1/2 x 9 GL |

NOTES:
1. TYPICAL INTERIOR COLUMN SHALL BE TYPE C3

SERA
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REGISTERED PROFESSIONAL ENGINEER 51411PE OREGON 18 SEPT. 22, 1995 TIMOTHY T. TERICH EXPIRES: 6-30-20

FROELICH ENGINEERS
17700 SW Upper Boones Ferry Rd. Suite #115
Portland, Oregon 97223
503.624.7005
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18-T066

18S
GREYSTAR
1715 SW Salmon St
Portland, OR 97205

REVISIONS

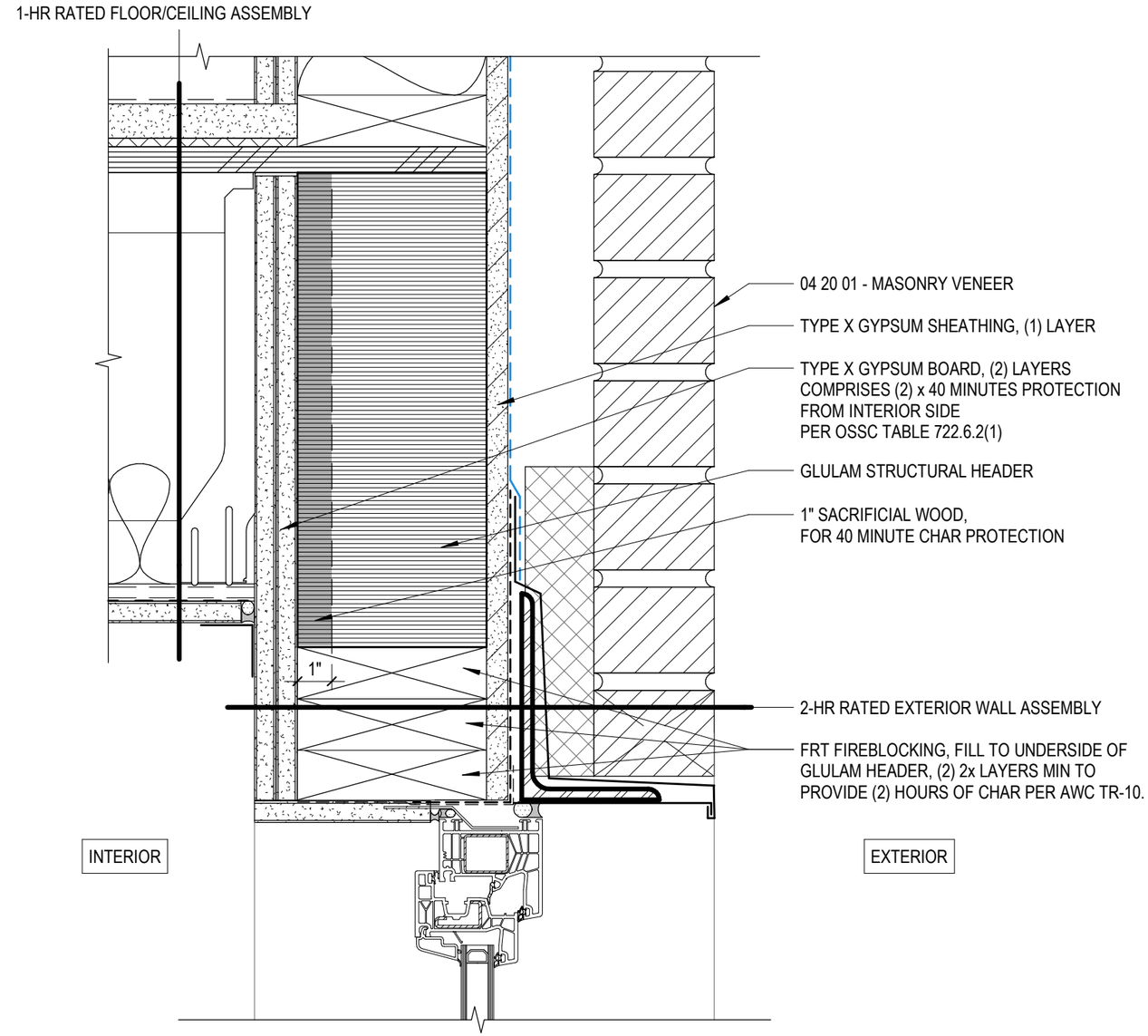
CHECKED BY: Checker
ISSUE DATE: 04 FEB 2019
PROJECT NO: 1803002

Construction Documents

FLOOR FRAMING PLAN LEVELS 5 TO 7

S01.05

1/30/2019 5:03:10 PM SERA Design and Architecture, Inc.

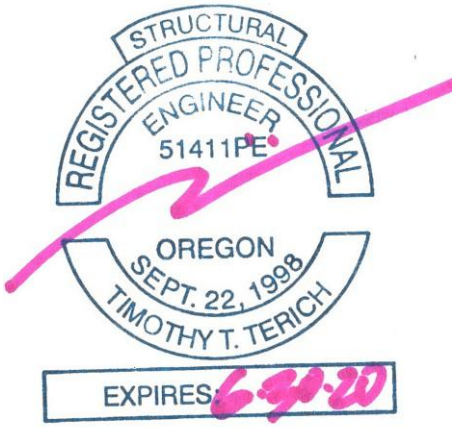



1 FIRE PROTECTION AT GLULAM HEADER
3" = 1'-0"

# Supplementary Structural Calculations
# For
# 18s

Portland, Oregon
Sera Architects

February 15, 2019
Job Number – 18-T066




FROELICH
ENGINEERS

*** * * LIMITATIONS * * ***

**ENGINEERING DESIGN IS BASED UPON INFORMATION PROVIDED BY THE CLIENT, WHO IS SOLELY RESPONSIBLE FOR ACCURACY OF SAME. NO RESPONSIBILITY AND / OR LIABILITY IS ASSUMED BY, OR IS TO BE ASSIGNED TO THE ENGINEER FOR ITEMS BEYOND THAT SHOWN ON THESE SHEETS.**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FROELICH
ENGINEERS

# Scope of Work

**Client:** SERA
**Project:** 18S
**Project Number:** 18-T066
**Date:** February 15, 2018
**By:** SPD

## Scope of Work:

Froelich Engineers, Inc. (FE) has provided supplementary structural calculations for the fire protection of the exterior glulam headers. These headers have been designed to char 1" on ONE side and will receive a minimum of (2) sacrificial layers of 1 ½" fire-blocking under the header.

FROELICH ENGINEERS
www.froelich-engineers.com

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☐ Denver Office
940 Kimbark St. Suite 3
Longmont, Colorado 80501
720-799-1001

CLIENT: SERA

PROJECT: 18S

NUMBER: 18-T0606

DATE:

BY:



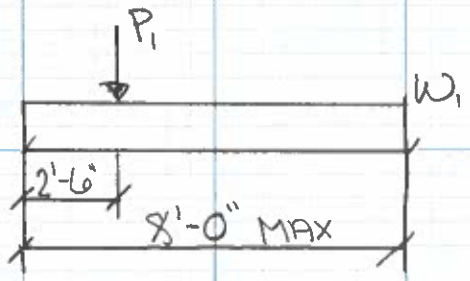
# UPDATED EXTERIOR HEADER CALCULATIONS

H5 :

SPAN: 8'-0"

$P_1$: DL = 3495 lb (FBH)
LL = 4674 lb

$W_1$: DL = 33 psf (10 ft) = 300 plf




∴ USE 5 1/2 x 13 1/2 GL
RAN AS 4 1/2 x 13 1/2 GL FOR CHAR RATING
SEE ATTACHED CALC

H6 :

SPAN: 11'-6"

$W_1$: DL = 33 psf (10 ft) = 330 plf
DL = 29 psf (8'-3")
LL = 40 psf (8'-3")

∴ USE 5 1/2 x 15 GL
RAN AS 4 1/2 x 15 GL FOR CHAR RATING
SEE ATTACHED CALC

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | Feb. 12, 2019 09:12 | FH1 (FRT) |

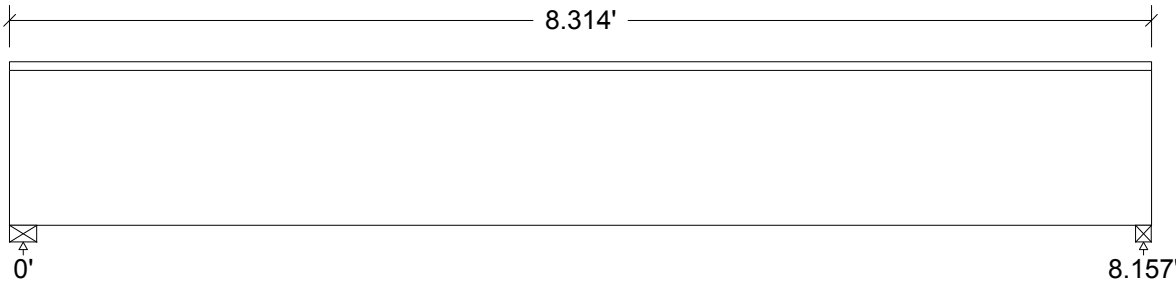
# Design Check Calculation Sheet

WoodWorks Sizer 11.1

## Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Dead | Full UDL | | | | 330.0 | | plf |
| Load2 | Dead | Point | | 2.70 | | 3495 | | lbs |
| Load3 | Live | Point | | 2.70 | | 4674 | | lbs |
| Self-weight | Dead | Full UDL | | | | 14.0 | | plf |

## Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 3817 | | 2536 |
| Live | 3184 | | 1490 |
| Factored: | | | |
| Total | 7001 | | 4025 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 7001 | | 4025 |
| Support | 7293 | | 4193 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.96 | | 0.96 |
| Load comb | #2 | | #2 |
| Length | 2.39 | | 1.38 |
| Min req'd | 2.39 | | 1.38 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.08 | | 1.08 |
| Fcp sup | 625 | | 625 |

**Glulam-Bal., West Species, 24F-1.8E WS, 4-1/2"x13-1/2"**

9 laminations, 4-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 8.31'; Clear span: 8'; volume = 3.5 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

## Analysis vs. Allowable Stress and Deflection using NDS 2015 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 162 | Fv' = 265 | psi | fv/Fv' = 0.61 |
| Bending(+) | fb = 1488 | Fb' = 2400 | psi | fb/Fb' = 0.62 |
| Live Defl'n | 0.05 = <L/999 | 0.27 = L/360 | in | 0.17 |
| Total Defl'n | 0.13 = L/763 | 0.16 = L/600 | in | 0.79 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 1.00 | 1.00 | 1.000 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 6968, V design = 6549 lbs

Bending(+): LC #2 = D+L, M = 16954 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 1661e06 lb-in2

"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | Feb. 12, 2019 09:13 | FH4 (FRT) |

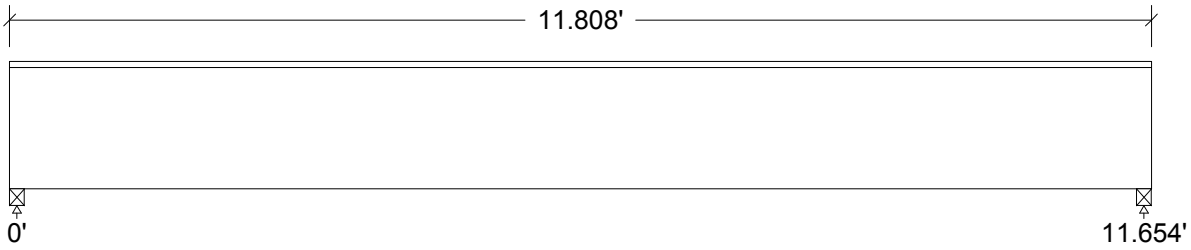
# Design Check Calculation Sheet

WoodWorks Sizer 11.1

## Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Dead | Full UDL | | | | 330.0 | | plf |
| Load2 | Dead | Full Area | | | | 29.00(8.25') | | psf |
| Load3 | Snow | Full Area | | | | 40.00(8.25') | | psf |
| Self-weight | Dead | Full UDL | | | | 15.5 | | plf |

## Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 3451 | | 3451 |
| Snow | 1948 | | 1948 |
| Factored: | | | |
| Total | 5400 | | 5400 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 5400 | | 5400 |
| Support | 5625 | | 5625 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.96 | | 0.96 |
| Load comb | #2 | | #2 |
| Length | 1.85 | | 1.85 |
| Min req'd | 1.85 | | 1.85 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.08 | | 1.08 |
| Fcp sup | 625 | | 625 |

**Glulam-Bal., West Species, 24F-1.8E WS, 4-1/2"x15"**

10 laminations, 4-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 11.81'; Clear span: 11.5'; volume = 5.5 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

## Analysis vs. Allowable Stress and Deflection using NDS 2015 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 91 | Fv' = 305 | psi | fv/Fv' = 0.30 |
| Bending(+) | fb = 1104 | Fb' = 2760 | psi | fb/Fb' = 0.40 |
| Live Defl'n | 0.06 = <L/999 | 0.39 = L/360 | in | 0.15 |
| Total Defl'n | 0.22 = L/635 | 0.23 = L/600 | in | 0.94 |

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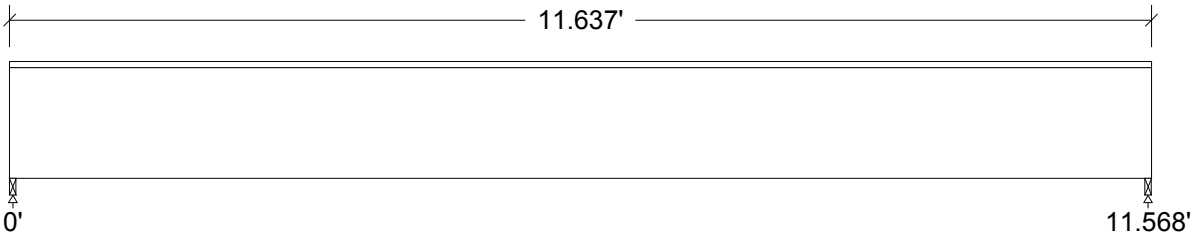
# Design Check Calculation Sheet

WoodWorks Sizer 11.1

## Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Dead | Full UDL | | | | 330.0 | | plf |
| Load2 | Dead | Full Area | | | | 29.00(1.00') | | psf |
| Load3 | Snow | Full Area | | | | 40.00(1.00') | | psf |
| Self-weight | Dead | Full UDL | | | | 14.0 | | plf |

## Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 2170 | | 2170 |
| Snow | 233 | | 233 |
| Factored: | | | |
| Total | 2402 | | 2402 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2402 | | 2402 |
| Support | 2503 | | 2503 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.96 | | 0.96 |
| Load comb | #2 | | #2 |
| Length | 0.82 | | 0.82 |
| Min req'd | 0.82 | | 0.82 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.08 | | 1.08 |
| Fcp sup | 625 | | 625 |

**Glulam-Bal., West Species, 24F-1.8E WS, 4-1/2"x13-1/2"**

9 laminations, 4-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 11.64'; Clear span: 11.5'; volume = 4.9 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

## Analysis vs. Allowable Stress and Deflection using NDS 2015 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 43 | Fv' = 238 | psi | fv/Fv' = 0.18 |
| Bending(+) | fb = 548 | Fb' = 2160 | psi | fb/Fb' = 0.25 |
| Live Defl'n | 0.01 = <L/999 | 0.39 = L/360 | in | 0.03 |
| Total Defl'n | 0.15 = L/954 | 0.23 = L/600 | in | 0.63 |