## **Development Services**

### From Concept to Construction

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### APPEAL SUMMARY

Appeal ID: 20516	Project Address: 1834 NW 25th Ave.	
Hearing Date: 6/12/19	Appellant Name: Bayard Mentrum	
Case No.: B-016	Appellant Phone: 9712709663	
Appeal Type: Building	Plans Examiner/Inspector: John Butler	
Project Type: commercial	Stories: 5 Occupancy: R-2 Construction Type: III-B	
	Fire Sprinklers: Yes - throughout	
Building/Business Name: 1834 Apartments	Fire Sprinklers: Yes - throughout	
Building/Business Name: 1834 Apartments         Appeal Involves: Reconsideration of appeal	Fire Sprinklers: Yes - throughout LUR or Permit Application No.: 16-283489-CO	

### APPEAL INFORMATION SHEET

#### Appeal item 1

Appear item I					
Code Section	2914 OSSC 602.3				
Requires	Type III construction is that type of construction in which exterior walls are of non combustible materials and the interior building elements are of any material permitted by this code.				
	Fire retardant treated (FRT) wood framing complying with section 2303.2 shall be permitted within exterior wall assemblies if a 2 hour rating or less.				
Proposed Design	The proposed design is a 5 story multi-family building, with 5 levels of type III B construction. The type IIIB construction houses primarily R2 occupancy.				
	We propose mineral wool insulation 2.0 lbs/ft 3 density friction fit between studs to fill the entire				
	nominal 6" wall cavity in lieu of fiberglass insulation.				
	While not permitted by the OSSC section 602.3, the use of Non-FRT wood is allowed per the				
	Portland Code guide OSSC/6#4 (type III Code guide) provided the 17 conditions listed in the code guide are met.				
	The proposed design is based on code guide OSSC /6 #4 that allows Non FRT wood framing				
	within the exterior walls if R2 occupancy buildings of type III construction. The building meets the requirements for the Portland City guide OSSC /6#4 except items 4.11 and 17.				
	Sacrifical studs per condition #4 wil not be installed. Mineral wool will be provided in exterior walls in lieu of fire resistant treated wood stud framing.				
	Regarding condition #11, aerial fire apparatus cannot be provided due to ovehead power lines so the design will meet the conditions of the " Alternate to Aerial Fire apparatus roads as prescribed				
	on the Portland Fire and Rescue & life safety requirements for fire department and water supplies				
	The design meets those conditions as follows :				
	The building is equpped with an approved NFPA 13 automatic sprinkler system throughout. There				
	are no combustible concealed attic spaces.				
	All stairways encosures have a fire rstance rating of not less than 2 hours				
	-				

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The roof slope is essentially flat with a slope of 1/4" per foot.
Approved access is provided to the roof from all stairways.
Each stairway is equpped with a standpipe to the roof via a 2 hour enclosure and a compliant roof hatch.
Regarding condition #17 all framing details (1-19) will be followed with the exception the sacrificial studs will not be used. Mineral wool will be provided in exterior walls in lieu of fire resistant wood framing.
At all exterior walls requiring 2 hour fire rating that surpass the performance of the FRT framing and replace the FRT with standard exterior wood framing as described by the structural engineer.
A mineral wool brochure will be attached along with the set of 11 x 17" plans when paying in person.
See the new white paper requested by John Butler attached.
The fire retardant chemicals used in the FRT have potential long term environmental impacts and hence the request for the alternative. There are also concerns regarding the health impact to the occupants of the building from long term exposure to the chemicals used in pressure impregnation.
Unlike the chemical FRT process the mineral wool is made from inorganic fiber that does not have adverse impact on the environment or occupant health. The FRT also reduces the structural strength of wood that must be accounted for in the structural design. The presence of FRT degrades typical wood strength properties, resulting in increased cracks and splits in framing over time. The analysis that will be submitted along with the plans concludes that untreated wood framed walls with Comfort Batt/ ROXUL mineral wool insulation will out perform FRT wood framed walls without such insulation. The addition of protection of all building exterior walls with mineral wool exceeds the OSSC required minimum.Please refer to previously granted appeals #14099 and

### APPEAL DECISION

Non fire resistant treated wood in exterior walls of Type III construction with engineering analysis: Granted provided mineral wool insulation is installed in all exterior walls and provided special inspection of the mineral wool installation is performed.

Appellant may contact John Butler (503 823-7339) with questions.

The Administrative Appeal Board finds with the conditions noted, 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.



# Mineral Wool Wall Analysis

### Engineering Judgement Report 1834 Apartments Building

Client Name: MMP Investments Oregon LLC Client Address: PO Box 28526, Portland, Oregon 97228 Date: 6/3/2019

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## 1 PROJECT OVERVIEW

The 1834 Apartments building is a new project in Portland, Oregon being designed by Mentrum Architecture Incorporated and built by Pavilion Construction. The building will consist of 5 stories of Type III-B construction. The building will have a total area of 16,682 sf and accommodate 25 apartment units (R-2 occupancy). Code Unlimited has been asked to produce an engineering judgment (EJ) letter to demonstrate that mineral wool insulation used in lieu of fire-retardant-treated wood in exterior walls will meet or exceed the code intent behind the prescriptive OSSC code requirements.

## 2 APPLICABLE CODES, STANDARDS, AND GUIDES

• 2014 Oregon Structural Specialty Code (OSSC)

### 3 DISCUSSION

• The proposed wall assembly has been analyzed in accordance with 2014 OSSC §703.3 Alternative Methods for Determining Fire Resistance.

Fire-retardant treated (FRT) wood framing is permitted by code within exterior Type III wall assemblies with a fire-resistance rating of 2 hours or less. This is based on the improved fire spread performance of treated wood compared to untreated wood of the same species. FRT of wood delays ignition and resists flame spread once it reaches ignition temperature. The proposed design of the exterior wall assembly uses compressed mineral wool insulation between non-treated wood framing members to provide equivalent protection to Fire Retardant Treated (FRT) wood wall assembly.

Code Unlimited has analyzed the issue of using non-FRT wood in place of FRT wood on multiple projects via an engineering white paper. This has been driven by many stakeholders within the Pacific Northwest region; local and state governments, universities and other research groups, manufacturers, real estate developers, and design and construction industry professionals. This white paper delivered for these projects is based on rigorous analysis, review, and input from senior fire protection engineers and code experts.

The white paper provides the following information to show that the use of non-treated wood in Type III exterior wall assemblies with compacted mineral wool insulation is equivalent to FRT wood allowed in Type III exterior walls:

A detailed understanding of the code regulations that are driving the requirement for FRT in Type III
exterior walls, with excerpts from the International Building Code (IBC) commentary to clarify intent where
necessary.

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• Code citations in the Oregon Structural Specialty Code (OSSC) and the IBC where the use of mineral wool delays ignition and inhibits flame migration.

Many code provisions have evolved from traditional construction practices and then undergo rigorous analysis and/or testing to substantiate performance in those applications. The referenced white paper analysis follows that time-tested path by including a rigorous performance analysis based on currently available test data in support of non-FRT wood in an exterior wall assembly of a Type III construction building.

Our analysis found that the fire performance of a non-FRT wood framed wall with mineral wool insulation is equal or superior to an FRT wood framed wall. Research from other authorities shows that this approach also reduces the potential for chemical exposure to the environment and to the occupants of these buildings compared to the current practice of using FRT wood.

Similar granted appeal references: #18728, #20398

## 4 PROPOSED DESIGN

The proposed design is to provide a 2-hour exterior wall assembly that consists of untreated wood stud framing with two layers of 5/8" thick type X gypsum board on the interior and two layers of 5/8" type X gypsum sheathing on the exterior side of the wall (Non-Symmetric wall) for walls that are further than 10 feet from the property line. Rockwool insulation will be friction fit between studs to fill the entire 6-inch nominal wall cavity.

Note: Third-party inspection of Mineral Wool may be required by City of Portland to ensure installation follows the intent of this EJ.

### **Engineering Analysis**



Figure 1: Exterior Wall

## 5 ASSEMBLY COMPARISON TO FRT STUDWALLS

An excerpt from the original white paper is provided below in Table 1.

Charring and loss of load-supporting cross-section of the wood studs begins at approximately 43 minutes after exposure of the wall to fire, as heat conducts through the gypsum board and the temperature at the inside face of the gypsum board wall reaches the auto ignition temperature of wood. Ignition of the FRTW is delayed by approximately 7 minutes by the action of the fire-retardant treatment. By approximately 50 minutes after exposure, both studs are experiencing charring.

At 60 minutes after exposure, approximately 50% of the allowable cross-section of the FRTW stud has been consumed by charring. Somewhat less (27%) of the insulated non-FRTW stud has been consumed at the same point, due to the effects of mineral wool in limiting heat transfer to the wood.

At 70 minutes, the FRTW has lost sufficient cross section that it fails in load. At this point, approximately 25% of the original FRTW stud cross-section remains. However, only 39% of the insulated stud has been consumed.

At approximately 112 minutes, charring of the insulated non-FRTW stud reaches the point at which less than 25% of the original cross-section remains and the stud fails.

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The table below provides a comparative analysis that clearly shows that standard wood framing with mineral wool insulation performs better than FRT wood framing under fire conditions.

Time Interval (minutes)	Description	FRTW Stud Reaction	Standard Stud with Mineral Wool Insulation Reaction
t = 0	Gypsum board face of wall is first exposed to flames/heat, interior of stud wall at ambient temperature	None	None
t = 43	Temperature at edge face of stud attached to gypsum board exceeds autoignition point of wood (500°F), stud cavity of FRTW exceeds autoignition point of wood (500°F) (See Fig. 2)	FRT of wood stud inhibits ignition of FRT studs	Charring begins on narrow edge of stud (1.5" wide)
t=50	Chemical and mechanical inhibition of ignition of FRT wood exhausted	Charring begins on narrow edge of stud (1.5" wide) and along both exposed long faces (5.5" wide each)	Charring along wide faces nearest to the gypsum board
t=60		Charring has consumed 50% of allowable	Charring has consumed approximately 27% of allowable
t =70		Char layer exceeds allowable, insufficient cross-section of stud available to support load, stud fails	Charring has consumed approximately 39% of allowable
t = 112.6			Char layer exceeds allowable, insufficient cross-section of stud available to support load, stud fails



### 6 SUMMARY

FRT reduces the structural strength of wood studs and requires more wood than a non-FRT wood wall. The chemical used has long term environmental impact with unknown potential long term affects. Hence the request for alternate.

The fire analysis supports the use of mineral wool insulation in the wall cavity of untreated wood stud framing as an alternate to FRT wood stud framing permitted by the OSSC section 602.3. The analysis compares between untreated wood and FRT wood framed wall assemblies. The analysis is based on published temperature data from full scale testing of multiple configurations of fire rated stud walls. The conclusion is that untreated wood framed walls with comfort batt mineral wool insulation will outperform FRT wood framed walls

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without such insulation. This building then far exceeds a comparable building that has FRT wood in exterior walls as permitted by OSSC 602.3.

## 7 CONCLUSION

I have reviewed the proposed wall assembly provided above. The addition of protection of the three non-street facing walls with mineral wool filled stud cavities provides a much safer building. With these modifications, we conclude a higher level of safety has clearly been provided for this project over code minimum requirement.

Therefore, the proposed design for the wall utilizing Mineral Wool will meet the intent of OSSC section 602.3.

EXPIRES 12-31-19

Franklin Callfas Principal/Fire Protection Engineer Code Unlimited