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

Appeal ID: 14910	**Project Address:** 2390 SE Hawthorne Blvd
Hearing Date: 4/12/17	**Appellant Name:** Magda Gerencer
Case No.: B-002	**Appellant Phone:** 5032211121
Appeal Type: Building	**Plans Examiner/Inspector:** Kathy Aulwes
Project Type: commercial	**Stories:** 4 **Occupancy:** S-2, R-2, M **Construction Type:** 1-A over V-A
Building/Business Name: 23rd & Hawhtorne Apartments	**Fire Sprinklers:** Yes - entire structure full NFPA 13
Appeal Involves: Erection of a new structure	**LUR or Permit Application No.:** 16-274971-CO
Plan Submitted Option: pdf [File 1] [File 2] [File 3] [File 4] [File 5] [File 6] [File 7]	**Proposed use:** retail and parking at ground level with housing above

APPEAL INFORMATION SHEET

Appeal item 1

Code Section	OSSC 703.3
Requires	703.3 Alternative Methods for determining fire resistance. The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E 119 or UL 263. The required fire resistance of a building element, component or assembly shall be permitted to be established by of the following methods or procedures. Fire-resistance designs documented in 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 comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E 119 or UL 263 Alternative protection methods as allowed by Section 104.11
Proposed Design	Proposed one-hour rated floor/ceiling assembly F3 at corridors (see attached exhibit F3): Carpet and carpet pad 1” cementitious underlayment; ¾” sheathing; 3x lumber decking minimum; a non-rated suspended gypsum ceiling will also be provided below the above mentioned rated floor assembly Per our Fire Protection Engineer, stamped opinion attached, this corridor decking floor-ceiling assembly has at least one-hour of fire resistance. This conclusion is based on published rate of

	char for wood and structural engineering analysis of the remaining assembly after one hour of ASTM E-119 fire exposure.
Reason for alternative	The narrow rated floor/ceiling assembly at corridors is preferred for ease of construction, will provide significantly higher ceilings for the occupants, will allow the corridor sprinkler protection to be located higher, provide a preferred aesthetic for the owner, and provide a finished non-rated suspended ceiling assembly within the corridor. There is precedent for the proposed floor-ceiling assembly in recently permitted Portland projects including Grant Park Village Phase II and recently completed projects including Art House.

Appeal item 2

Code Section	OSSC 1207
Requires	1207.1 SCOPE: This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public areas such as halls, corridors, stairs or service areas. 1207.2 AIR_BORNE SOUND: Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if tested) for air-borne noise when tested in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to dwelling unit entrance doors; however, such doors shall be tight fitting to the frame and sill 1207.3 STRUCTURE-BORNE SOUND: Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492. The ASTM standards are the laboratory equivalent of the field tests conducted for finished assemblies.
Proposed Design	Proposed one-hour rated roof/ceiling assembly R3 at Amenity deck (see attached Exhibit R3): Cement paver with adjustable pedestals 3/8" rubber pad below pedestals TPO roofing system Cover board R-24 rigid insulation (2 layers), staggered Air barrier/vapor retarder Roof sheathing 4x6 wood joists @ 16" OC Resilent channel Two (2) layers of 5/8" type X gypsum board The STC and IIC ratings have been calculated by an acoustical engineer, see attached stamped letter, and satisfy the code requirements for sound transmission.
Reason for alternative	This assembly is based on calculated fire resistance per table 722.6.2(1) which doesn't provide the STC or IIC rating. The rubber pads under the paver pedestals provide superior sound insulation well above minimum required by code.

Appeal item 3

Code Section	OSSC 1207
Requires	1207.1 SCOPE: This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public areas such as halls, corridors, stairs or service areas. 1207.2 AIR_BORNE SOUND: Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if tested) for air-borne noise when tested in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to dwelling unit entrance doors; however, such doors shall be tight fitting to the frame and sill 1207.3 STRUCTURE-BORNE SOUND: Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492. The ASTM standards are the laboratory equivalent of the field tests conducted for finished assemblies.
Proposed Design	Proposed one-hour rated roof/ceiling assembly R7 at balcony deck (see attached Exhibit R7): Aluminum deck Rubber pads Protection board Cold fluid applied waterproofing Wood structural panels Wood joists Min R-30 semi-rigid fiberboard insulation & air barrier, fill cavity Resilient channel Three (3) layers of 5/8" type X gypsum board The STC and IIC ratings have been calculated by an acoustical engineer, see attached stamped letter, and satisfy the code requirements for sound transmission.
Reason for alternative	This assembly is based on GA file 5529 which doesn't provide the STC or IIC rating.

APPEAL DECISION

1. Alternate 1 hour rated floor / ceiling assembly at corridors per engineered analysis: Hold for additional information. Appellant may contact John Butler (503-823-7339) with questions.

2. Sound transmission ratings (STC / IIC) for 1 hour rated roof / ceiling assembly at amenity deck per Acoustical Engineer's analysis: Granted as proposed.

3. Sound transmission ratings (STC / IIC) for 1 hour rated roof / ceiling assembly at balcony decks per Acoustical Engineer's 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.

FIRE PROTECTION CONSULTING
3115 NW 132nd Place, Portland, OR 97229-7037
Phone 503-531-8717 Fax 503-531-8564 e-mail dgessert@frontier.com

Letter

Date:	March 22, 2017
To:	LRS Architects 720 NW Davis Street Suite 300 Portland, OR 97209 Sent via email
Attention:	Julio Rocha, Architect
From:	David Gessert, P. E. Fire Protection Engineer
Subject/Project:	23rd & Hawthorne Apartments Floor/Ceiling Assembly Opinion of Fire Resistance
Job No.:	2017-01.19

Total Pages: 2

Executive Summary

This engineer has been requested to provide an opinion of the fire resistance of Floor/Ceiling Assembly shown on Sheet F3 for the 23rd & Hawthorne Apartments project. The detail has been analyzed and shows at least 60 minutes (1-hour) of fire resistance.

23rd & Hawthorne Apartments – Floor/Ceiling Assembly – Fire Resistance

Detail F3 shows the following layers from top to bottom:

Carpet and Carpet Pad
1 inch Cementitious Underlayment
3/4 inch Sheathing
3 inch (2½ inch actual) Decking Minimum

To determine if 60 minutes of fire resistance is present in subject floor/ceiling assembly analysis of sacrificial wood char is selected. Published data shows wood chars at a rate of 1.4-1.5 inches per hour. Moreover this char rate has been written into Code for fastener protection. Code Reference: OSSC 2014 722.6.3.3 There is variation in char rates of specific species of wood and actual char is non-linear but these variations are minor.

Primary fire exposure of the assembly is from the underside since the hot gases rise due to their buoyancy. Cooler dense air is drawn to the fire at the floor level resulting in cooling of the floor.

Wood is a poor conductor of heat. While the bottom surface of the wood deck is hot, the interior of the wood deck remains cool and retains its load bearing capability.

After one hour of fire exposure the 3 inch wood decking has been reduced to a thickness of 1 inch. The floor/ceiling assembly after one hour of fire exposure becomes from top to bottom:

1 inch Cementitious Underlayment
3/4 inch Sheathing
1 inch Decking – (originally 2½ inch actual)

This reduced section assembly has been analyzed by the project structural engineer and using reasonable assumptions the assembly would remain in place. See the March 16, 2017 Structural Calculation Fire Design at Corridor Framing. This calculation is sealed by Hamid R. Afghan, P. E. (Structural Engineer).

Conclusion

The 23rd and Hawthorne Apartments – Floor/Ceiling Assembly details shows least one-hour of fire resistance.

I will be pleased to address your questions and comments.

References

Calculating the Fire Resistance of Exposed Wood Members, Technical Report 10, 2003, American Forest & Paper Association, American Wood Council, Washington, DC

Sheet F3 GMP Set 01/27/17, Assembly F3, 1 Hr Rated Floor-Ceiling Assembly, 23rd & Hawthorne Apartments, Date Created 02/27/17, LRS Architects, Portland, Oregon

SFPE Handbook of Fire Protection Engineering, Fifth Edition, 2016, Springer International Publishing AG, Cham, Switzerland

Oregon Structural Specialty Code, 2014 Edition, International Code Council, Country Club Hills, Illinois

Structural Calculations fire Design at Corridor Framing, Project: 23rd and Hawthorne, Portland Oregon, Project No.: A16154, Date: March 16, 2017, Plan Review Response, sealed by Hamid R. Afghan, AAI Engineering, Afghan Associates, Beaverton, Oregon

End of Report

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www.a3acoustics.com

March 31, 2017

Julio Rocha
LRS Architects
720 NW Davis, Suite 300
Portland, OR 97209

Predicted Acoustic Performance for the 23rd & Hawthorne Apartments Roof Assemblies

Dear Mr. Rocha,

This letter presents our results from our acoustic analysis of the proposed floor-ceiling assemblies and wall types to ensure they meet the City of Portland Building Code STC 50 and IIC 50 performance for the 23rd & Hawthorne Apartments. The airborne sound and footfall transmission performance have been calculated using existing laboratory test data, computer modeling software, and based on our previous experiences with floor-ceiling assemblies.

I. Predictive Methods

This performance prediction is based on laboratory test results from the California *Catalog of STC and IIC Ratings for Wall and Floor/Ceiling Assemblies*, the Gypsum Association *Fire Resistance Design Manual Sound Control*, and *National Research Council of Canada*; predictions of each piece of the total assembly with the Marshall Day Acoustics INSUL sound insulation prediction tool for floor/ceilings; field test results from similar assemblies. The laboratory test results used for this prediction were completed per ASTM E 90 *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements* and E 492 *Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor Ceiling Assemblies Using the Tapping Machine*. Sound Transmission Class (STC) and Impact Insulation Class (IIC) ratings are not directly equivalent to decibel values, but the ratings are based on the exponential decibel scale.

II. Performance Standards

City of Portland Building Code

The City of Portland Development Services Center states that common wall and floor/ceiling assemblies between adjacent units and between dwelling units and adjacent public areas such as halls, corridors, stairs, or services areas have a minimum Sound Transmission Class (STC) of 50 and floor-ceiling assemblies also have a minimum Impact Insulation Class (IIC) of 50.

The designer has three options for documenting required STC and IIC ratings:

1. Detail listed and approved STC and IIC assemblies on the plans from approved list of published assemblies, noted here.
2. Obtain approval from Administrative Appeal Board for an alternative assembly. To be approved, the Appeal must include a detail of the proposed assembly, and an analysis stamped by a qualified state of Oregon licensed professional that concludes that the proposed assembly will provide the required STC and IIC ratings.
3. Specify an assembly to be Field Tested. Be aware there is a risk that an assembly can fail the field test, and require modifications after the building is finished.

International Building Code (IBC)

Section 1207 – Sound Transmission

1207.1 Scope. This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public areas such as hall, corridors, stairs and service areas.

1207.2 Air-borne sound. Walls, partitions, and floor/ceiling assemblies separating dwelling units from each other or from public or service areas hall have a sound transmission class (STC) of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E 90.

1207.3 Structure-borne sound. Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492.

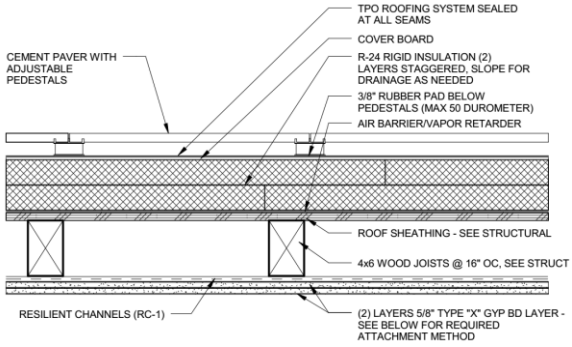
These ASTM standards are the laboratory equivalent of the field tests conducted for finished assemblies.

III. Assembly Description & Predicted Performance

The following proposed roof-ceiling assembly was evaluated with respect to air-borne sound and footfall noise impact performance to the STC 50 and IIC 50 performance requirements. When assemblies were noted to perform below the requirements remediation measures are noted and the improved performance documented to show compliance.

Roof Deck Assembly R3

Cement pedestal paver (13 - 20 psf)
AWS Pedestal System (ABS & PVC Plastic)
Cover Board (2.0 psf)
Roofing Membrane (1.5 psf)
2 Layers of R-24 Rigid Insulation (<1.0 psf)
Plywood Sheathing (1.8 psf)
4x6 Wood Joists
1/2” Resilient Channel
2 Layers of 5/8” Type X gypsum board (4.4 psf)



Laboratory data for concrete roof pavers was published in January 2017.

Table 1: Roof Deck Assembly R3

Proposed Assembly Evaluated	Performance
Prediction for overall assembly **Laboratory Test Results: Architectural Testing, Inc. G6527.14-113-11 (01/17/17)** 1. 2” Stone Pavers 2. 2” adjustable deck supports 3. 1/2" dimpled rubber mat 4. 2” Owens Corning FOAMULAR 250 R-10 Insulation Sheathing 5. 1/2" Plywood Sheathing 6. 3/4" Oriented Strand Board Sheathing 7. 9-1/2” Owens Corning R-30 Fiberglass Insulation 8. 12” TJI Joist 9. 1/2" Resilient Channel (ClarkDietrich RC Deluxe) 10. 2 Layers of 5/8” GWB	STC 60 IIC 72
Deviations from Laboratory Test & Performance Impact Differences (calculated with INSUL 8.0 Sound Insulation Predictor) + Cover Board (plus STC +4 / IIC +1) - 3/8” rubber compared to tested 1/2" rubber mat (minus STC 0 / IIC -2) + 2 Layers of R-24 Rigid Insulation (plus STC 0 / IIC +1) - Only 1 layer of wood sheathing (minus STC -2 / IIC -2) - 5-1/2” air cavity solid joists instead of 12” TJI Joists (minus STC -5 / IIC -9) - No batt insulation (minus STC -3 / IIC -3)	*Estimated* STC -6 IIC -14
Predicted Laboratory Measured Performance *(actual field conditions may be up to 5 points lower than values noted)*	STC 54 IIC 58

Roof Deck Assembly R7

Aluminum Water-Tight Deck (1.5 psf)
Rubber Pad (0.8 psf)
Protection Board (2.0 psf)
Roofing Membrane (1.5 psf)
Plywood Sheathing (1.8 psf)
2x10 Wood Joists
R-30 semi-rigid fiberboard – fill cavity (2.5 psf)
1/2" resilient channel
3 Layers of 5/8” Type X gypsum board (6.6 psf)

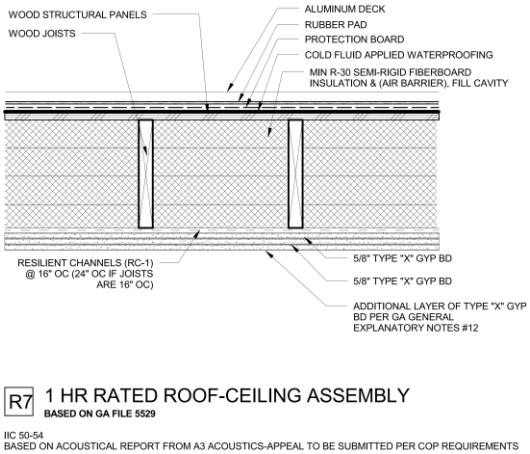


Table 2: Roof Deck Assembly R7

Proposed Assembly Evaluated	**Performance**
<u>Prediction for overall assembly</u> **Laboratory Test Results: Cedar Knolls Acoustical Labs 6712-12 / 6712-13 (1967) – California Catalog of STC and IIC Ratings** 1. 0.063” vinyl tile 2. 1/2” plywood nailed 3. 1/2" gypsum board 4. 3/8” particle board 5. 2x10 wood joists 6. 3” batt insulation 7. ½” resilient channel 8. 2 layers of ½” gypsum board	STC 49 IIC 50
<u>Deviations from Laboratory Test & Performance Impact</u> Differences (calculated with INSUL 8.0 Sound Insulation Predictor) + Aluminum deck on rubber underlayment (plus STC +2 / IIC +4) Layers of sheathing are acoustically similar between lab test and proposed + 10” semi-rigid fiberboard insulation (plus STC +3 / IIC +2) + 3 layers of 5/8” gypsum board (plus STC +6 / IIC +4) • Increase from 3.3 psf from lab test to 6.7	*Estimated* STC +10 IIC +10
Predicted Laboratory Measured Performance *(actual field conditions may be up to 5 points lower than values noted)*	STC 59 IIC 60

IV. Conclusion

The proposed flooring-ceiling assemblies will satisfy the International Building Code (IBC) sound transmission requirements of STC 50 and IIC 50 as noted in this report.

Please contact us if you have any questions or for additional information.

Sincerely,

Erik Miller-Klein, P.E., INCE Bd. Cert.
Partner & Acoustical Consultant

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206.792.7796 – Office
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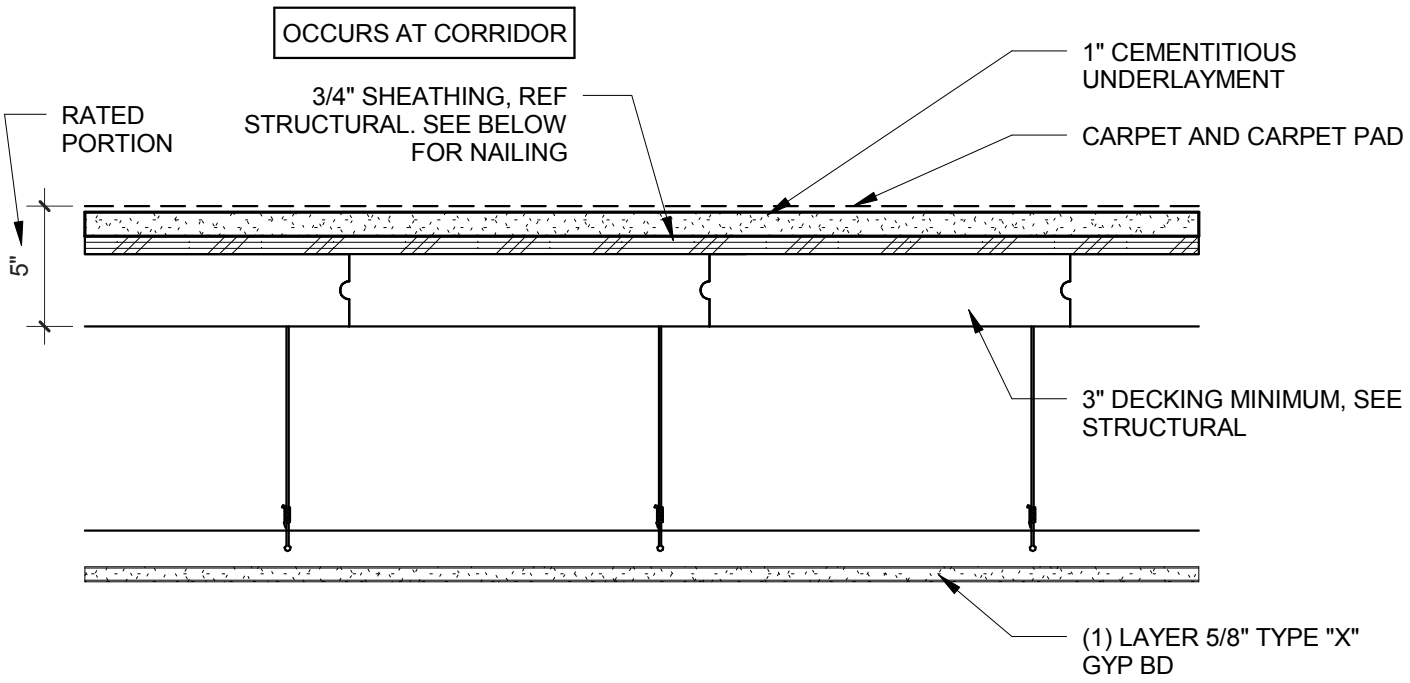
RENEWAL DATE: 12/31/2018



F3 1 HR RATED FLOOR-CEILING ASSEMBLY

602.4.2 Floor framing. Wood beams and girders shall be of sawn or glued-laminated timber and shall be not less than 6 inches (152 mm) nominal in width and not less than 10 inches (254 mm) nominal in depth. Framed timber trusses supporting floor loads shall have members of not less than 8 inches (203 mm) nominal in any dimension.

602.4.4 Floors. Floors shall be without concealed spaces. Wood floors shall be of sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, or 0.5-inch (12.7 mm) particleboard or planks not less than 4 inches (102 mm) nominal in width section edge close together and well spiked and covered with1-inch (25 mm) nominal dimension flooring or 15/32-inch(12 mm) wood structural panel or 0.5-inch (12.7 mm)particleboard. The lumber shall be laid so that no continuous line of joints will occur except at points of support.Floors shall not extend closer than 0.5 inch (12.7 mm) to walls. Such 0.5-inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor.

NOTE: APPEAL TO BE SUBMITTED INCLUDING FIRE RESISTANCE CALCULATION FROM REGISTERED FIRE PROTECTION ENGINEER.

SHEET TITLE: ***ASSEMBLY F3***

LRS ARCHITECTS
720 NW Davis
Suite 300
Portland OR 97209
503.221.1121
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PROJECT NAME: *23RD & HAWTHORNE APARTMENTS*
PROJECT NUMBER: *215237*
DRAWN BY: *MAG*
DATE CREATED: *02/27/17*

SHEET: ***F3***
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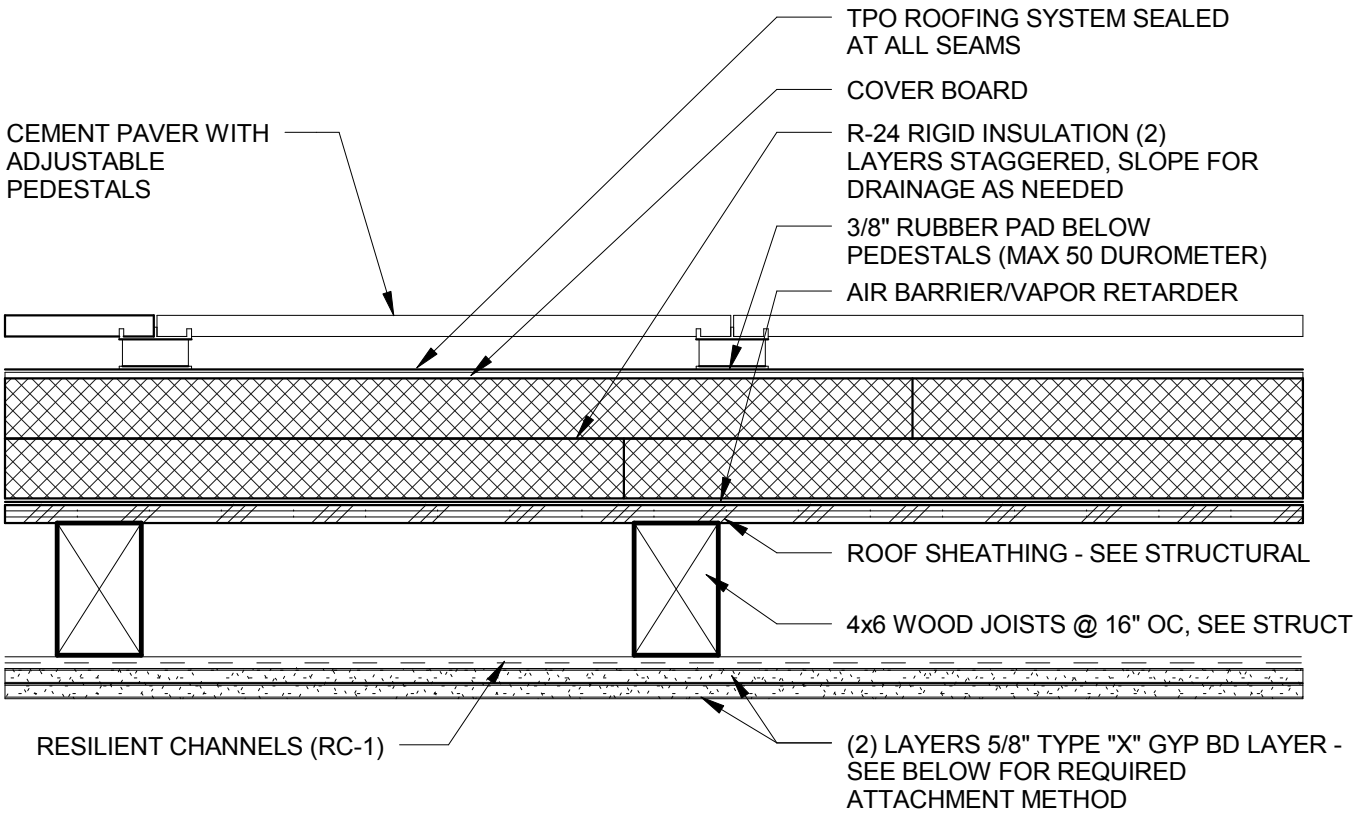

R3 1 HR RATED ROOF-CEILING ASSEMBLY

BASED ON OSSC 2014 SECTION 722 CALCULATED FIRE RESISTANCE

Per table 722.6.2(1) : Time assigned to wallboard membranes.

5/8 inch Type X gypsum wallboard= 40 minutes
(2) layers of Type X gypsum wallboard achieves a rating of 80 minutes.

a. These values apply only when membranes are installed on framing members which are spaced 16 inches o.c. or less.

b. Gypsum wallboard installed over framing or furring shall be installed so that all edges are supported, except 5/8" type X gypsum wallboard shall be permitted to be installed horizontally with the horizontal joints staggered 24 inches each side and unsupported but finished.

c. On wood frame floor/ceiling or roof/ceiling assemblies, gypsum board shall be installed with the long dimensions perpendicular to framing members and shall have all joints finished.

d. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly. When dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.

e. The time assigned is not a finished rating.

SHEET TITLE: ***ASSEMBLY R3***

1 GMP SET 01/27/17

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PROJECT NAME: *23RD & HAWTHORNE APARTMENTS*
PROJECT NUMBER: *215237*
DRAWN BY: *Author*
DATE CREATED: *03/31/17*

SHEET: ***R3***
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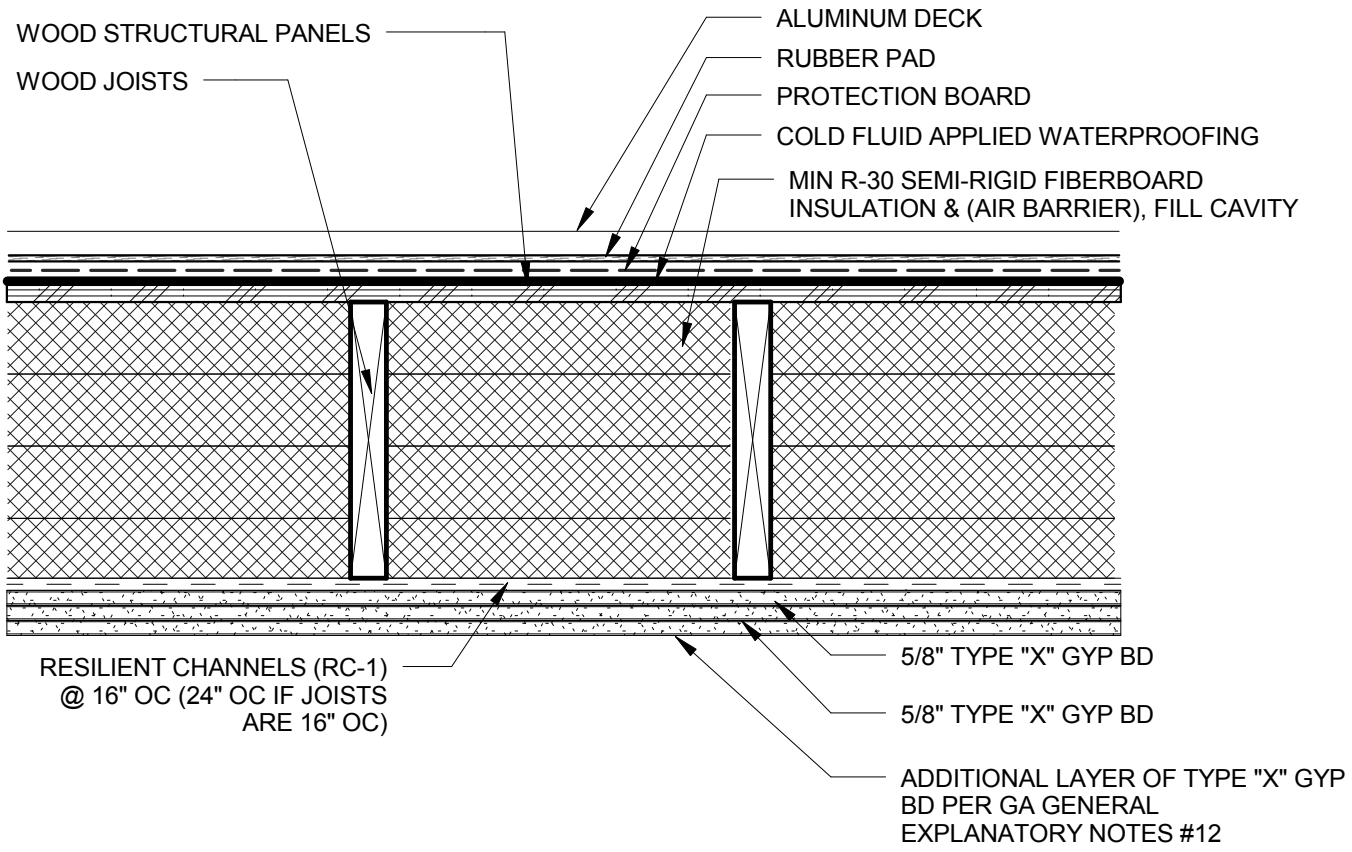

R7 1 HR RATED ROOF-CEILING ASSEMBLY

BASED ON GA FILE 5529

IIC 50-54
BASED ON ACOUSTICAL REPORT FROM A3 ACOUSTICS-APPEAL TO BE SUBMITTED PER COP REQUIREMENTS

SHEET TITLE: ***ASSEMBLY R7***

1 GMP SET 01/27/17

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PROJECT NAME: *23RD & HAWTHORNE APARTMENTS*
PROJECT NUMBER: *215237*
DRAWN BY: *Author*
DATE CREATED: *02/27/17*

SHEET: ***R7***

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AAI afghan associates, inc.
ENGINEERING

STRUCTURAL CALCULATIONS FIRE DESIGN AT CORRIDOR FRAMING

PROJECT: 23rd and HAWTHORNE
PORTLAND, OREGON

PROJECT No.: A16154
DATE: March 16, 2017

PLAN REVIEW RESPONSE

Contents:

4875 SW Griffith Drive | Suite 300 | Beaverton, OR | 97005

503.620.3030 | tel 503.620.5539 | fax

www.aaieng.com

1 HOUR CHAR REDUCTION:

PER FIRE PROTECTION CONSULTING, 2½" THICK DECKING IS REDUCED TO 1" OVERALL THICKNESS.

CLEAR SPAN OF CORRIDOR IS 6'-2¼" = 6.1875"

DESIGN LOAD IS 40 psf LL + 33 psf DL × $\left(\frac{5.5}{12}\right)$

$W = 18.34 + 15.13$ plf = 33.5 plf TL

$M = \frac{WL^2}{8} = \frac{33.5(6.1875')^2}{8} = 160.32$ ft-lbs

$V = \frac{WL}{2} = \frac{33.5(6.1875)}{2} = 103.65$ ft-lbs

COMMERCIAL DEX DECKING DF-L

$F_b C_r$	C_F	C_M	C_{fu}	
1650 psi:	1.04	1.0	1.0	= 1716 psi Adjusted

FOR FIRE DESIGN THESE VALUES ARE MULTIPLIED BY 2.85 PER TABLE 16.2.2

$F_b''_{FIRE} = 2.85(1716\text{ psi}) = 4890$ psi

ASSUME 1" THICK BOARDS: $S = \frac{5.5"(1")^2}{6} = 0.9167\text{ in}^3$

$f_b = \frac{160.32 \times 12}{0.9167\text{ in}^3} = 2098$ psi

SR = 0.43

ASSUME 0.7" THICK BOARDS $S = \frac{5.5(0.7)^2}{6} = 0.45\text{ in}^3$

$f_b = 4275$ psi SR = 0.67

↳ THIS EQUATES TO A 51 psf ALLOWABLE LIVE LOAD.

NDS TABLE 16.2.1 INDICATES 1.8 in Effective CHAR LAYER THICKNESS @ 1 HOUR RATING

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23RD & HAWTHORNE
CAPACITY OF CORRIDOR DECKING AT 1 HOUR CHAR REDUCTION

By: DEL Date: 8/24/16
Project No.: A16154
Sheet: C1 of: C2

BEARING — CHECK LEDGER

1 HOUR

LENGTH = 2.5" − 0.5" − 1.8" = 0.2in × 5.5" = 1.1 in²

BEARING → $\frac{104 \text{ lbs}}{1.1 \text{ in}^2}$ = 94 psi < 625

SR = 0.15 OK

CONNECTION:

SIDE MEMBER THICKNESS = 0.70 in

¼" × 5" SDS SCREWS w/ ¾" SIDE MEMBER THICKNESS. 100 lbs CAPACITY PER SCREW

× 2' / 1.333' = 150 plf

ASSUME C_D = 1.25 7 DAYS

187.5 plf

60 psf TOTAL LOAD

≈ 25psf LIVE LOAD.

GO 12" o.c. FOR SCREWS → CURRENTLY SPECIFIED ON 4/S603

$\frac{100 \text{ lbs} \times 2}{1'}$ = 200 plf

C_D × 1.25

250 plf

80 psf TOTAL LOAD CAPACITY

≈ 50psf LIVE LOAD CAPACITY OK

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23RD & HAWTHORNE

FIRE DESIGN AT CORRIDORS

By: DEL Date: 8/24/16

Project No.: A16154

Sheet: C2 of: C2

FIRE DESIGN OF WOOD MEMBERS

AMERICAN FOREST & PAPER ASSOCIATION

16

R1 of R3

16.1 General

Chapter 16 establishes general fire design provisions that apply to all wood structural members and connections covered under this Specification, unless otherwise noted. Each wood member or connection shall be of sufficient size and capacity to carry the applied loads without exceeding the design provisions specified herein. Reference design values and specific design provisions applicable to particular wood products or connections to be used with the provisions of this Chapter are given in other Chapters of this Specification.

16.2 Design Procedures for Exposed Wood Members

The induced stress shall not exceed the resisting strength which have been adjusted for fire exposure. Wood member design provisions herein are limited to fire resistance calculations not exceeding 2 hours.

16.2.1 Char Rate

The effective char rate to be used in the this procedure can be estimated from published nominal 1-hour char rate data using the following equation:

$$\beta_{eff} = \frac{1.2\beta_n}{t^{0.187}} \qquad (16.2\text{-}1)$$

where:

β_{eff} = effective char rate (in./hr.), adjusted for exposure time, t

β_n = nominal char rate (in./hr.), linear char rate based on 1-hour exposure

t = exposure time (hrs.)

A nominal char rate, β_n, of 1.5 in./hr. is commonly assumed for solid sawn and structural glued laminated softwood members. For β_n = 1.5 in./hr., the effective char rates, β_{eff}, and effective char layer thicknesses, a_{char}, for each exposed surface are shown in Table 16.2.1.

Table 16.2.1 Effective Char Rates and Char Layer Thicknesses (for β_n = 1.5 in./hr.)

Required Fire Endurance (hr.)	Effective Char Rate, β_{eff} (in./hr.)	Effective Char Layer Thickness, a_{char} (in.)
1-Hour	1.8	1.8
1½-Hour	1.67	2.5
2-Hour	1.58	3.2

Section properties shall be calculated using standard equations for area, section modulus, and moment of inertia using the reduced cross-sectional dimensions. The dimensions are reduced by the effective char layer thickness, a_{char}, for each surface exposed to fire.

16.2.2 Member Strength

For solid sawn, structural glued laminated timber, and structural composite lumber wood members, the average member strength can be approximated by multiplying reference design values (F_b, F_t, F_c, F_{bE}, F_{cE}) by the adjustment factors specified in Table 16.2.2.

All member strength and cross-sectional properties shall be adjusted prior to use of the interaction calculations in 3.9 or 15.4.

16.2.3 Design of Members

The induced stress calculated using reduced section properties determined in 16.2.1 shall not exceed the member strength determined in 16.2.2.

R2 of R3

16.2.4 Special Provisions for Structural Glued Laminated Timber Beams

For structural glued laminated timber bending members given in Table 5A and rated for 1-hour fire endurance, an outer tension lamination shall be substituted for a core lamination on the tension side for unbalanced beams and on both sides for balanced beams. For structural glued laminated timber bending members given in Table 5A and rated for 1½- or 2-hour fire endurance, 2 outer tension laminations shall be substituted for 2 core laminations on the tension side for unbalanced beams and on both sides for balanced beams.

16.2.5 Provisions for Timber Decks

Timber decks consist of planks that are at least 2" (actual) thick. The planks shall span the distance between supporting beams. Single and double tongue-and-groove (T&G) decking shall be designed as an assembly of wood beams fully exposed on one face. Butt-jointed decking shall be designed as an assembly of wood beams partially exposed on the sides and fully exposed on one face. To compute the effects of partial exposure of the decking on its sides, the char rate for this limited exposure shall be reduced to 33% of the effective char rate. These calculation procedures do not address thermal separation.

Table 16.2.2 Adjustment Factors for Fire Design[1]

			ASD					
			Design Stress to Member Strength Factor	Size Factor[2]	Volume Factor[2]	Flat Use Factor[2]	Beam Stability Factor[3]	Column Stability Factor[3]
Bending Strength	F_b	x	2.85	C_F	C_V	C_{fu}	C_L	-
Tensile Strength	F_t	x	2.85	C_F	-	-	-	-
Compression Strength	F_c	x	2.58	C_F	-	-	-	C_P
Beam Buckling Strength	F_{bE}	x	2.03	-	-	-	-	-
Column Buckling Strength	F_{cE}	x	2.03	-	-	-	-	-

1. See 4.3, 5.3 and 8.3 for applicability of adjustment factors for specific products.
2. Factor shall be based on initial cross-section dimensions.
3. Factor shall be based on reduced cross-section dimensions.

16.3 Wood Connections

Where fire endurance is required, connectors and fasteners shall be protected from fire exposure by wood, fire-rated gypsum board, or any coating approved for the required endurance time.

R3 of R3

AAI afghan associates, inc.
ENGINEERING

MEMORANDUM

DATE: 04/07/2017

TO: Magda Gerencer – LRS Architects
Julio Rocha – LRS Architects

BY: Derek Larsen, P.E., S.E. DEL

SUBJECT: 1 Hour Fire Rating of 3x Decking above Corridor

PROJECT: 23rd and Hawthorne Apartments

PROJECT NO.: A16154

Magda,

As you have requested, we have reviewed the 3x T & G decking over the corridors at the 23rd and Hawthorne project for a 1 hour fire rating per the method outlined in Chapter 16 of the 2012 NDS (See attached calculations). Per this method, we have found that the char thickness is 1.8" after 1 hour of exposure. Based on our analysis, we have found that the decking as detailed in the construction documents for this project satisfies the required 1 hour fire rating.

Please feel free to call if you have any questions.

cc: FILE -
Hamid Afghan, P.E., S.E. – AAI Engineering
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-
-

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