

ENB-15.20 - Wood Frame, Rated Construction- UBC/6/#2

WOOD FRAME, RATED CONSTRUCTION

Administrative Rule Adopted by Bureau Pursuant to Rule-Making Authority

ARB-ENB-15.20

TOPIC: Rated Wood Construction - UBC/6/#2

CODE: Structural Specialty Code: 1998 Edition

APPROVED: March 1, 1999

REFERENCE: Sections 606, 708 - 711 " Structural Specialty Code

SUBJECT: Wood Frame, Rated Construction

QUESTION: How is one-hour fire resistance to be achieved in wood construction? What are acceptable designs and practices?

RESPONSE: One-hour wood construction is the most common of the rated construction built today. Yet many of the construction techniques and detailing are not commonly understood or practiced. Rated construction is a system of building components which protect a building from fire. A whole building can be of rated construction or just one element of a building. It is essential that the rated construction act as a whole. Integrity of the construction around openings and through wall and floor cavities is essential regardless of the purpose of the rated construction.

Purposes of one-hour construction:

- Higher level of overall fire safety than in non-rated building construction (may be required due to occupancy or in order to obtain larger building area or height).
- Protection of exterior walls located near property lines.
- Separation of occupancies and special use areas.
- Separation of building areas.
- Protection of means of egress (exiting) system.
- Protection of vertical penetrations through a building (shafts and exit enclosures).

Each of these purposes may require a different application of materials to achieve the needed protection. Protection is obtained through the use of a material or an assembly of materials to achieve a "fire-resistive rating."

This code guide provides a summary of code requirements and acceptable practices for achieving one-hour construction. While rated construction can be accomplished with a variety of materials, this guide focuses on one-hour rated construction for wood frame structures. This guide is not intended to be used alone. It must be used in conjunction with the building code to be fully effective. Many of the techniques discussed in this guide, however, may be readily adaptable for use in other types of construction.

A. General Framing

1. General

Sections 603.1, 604.1, and 606.1 of the Oregon Structural Code requires Type II One-hour, Type III One-hour and Type V One-hour buildings be of one hour construction throughout the building. In other types of construction, specific elements are frequently required to be of one-hour fire-resistive construction although the entire building is not of one-hour construction. Other code provisions based on occupancies require that buildings be of one-hour construction through-out.

2. Perpendicular and parallel framing

Except at area separation walls (see Section G) or occupancy separation walls (see Section H) or exterior walls in close proximity to property lines (see Section I), the protection of framing does not need to be continuous through floor/ceiling or roof/ceiling assemblies. Figures B1 through B8, attached. See also Section C of this guide for Attic and Crawl space applications.

3. Protection of structural columns

As part of the structural frame of the building columns need to be of materials which will resist fire for at least one-hour such as concrete or heavy timber; or enclosed (surrounded) by materials that will protect the column from fire for at least one hour.

- Columns (including those of steel) located within one hour rated wall assemblies need not be separately protected.
- Columns must be separately protected within interstitial spaces such as attic and crawl spaces, and above

suspended and drop ceilings.

- o Columns of heavy timbers need not be separately fire protected where:
 - a. In sprinklered buildings, columns are not less than 6 by 6 inch solid timber or not less than 5-1/8 by 5-1/8 inch glu-lam column.
 - b. In non-sprinklered buildings, columns are not less than 8 by 8 inch solid timber or not less than 6-3/4 by 6-3/4 inch glu-lam column.

4. Protection of structural connections

Structural connections are the screwed, nailed, welded or bolted connection of wood or steel beams and columns to their supporting elements. In other than fully sprinklered buildings, where the connections are exposed because they are not enclosed within one-hour walls or floor/ceilings assemblies, structural connections need to be independently protected.

5. Framing of beams and headers into walls

As part of the structural frame of the building, beams and headers need to be of materials which will resist fire for at least one-hour such as concrete or heavy timber; or enclosed (surrounded) by materials that will protect the column from fire for at least one hour.

- Beams and headers (including those of steel) located within a one hour rated wall, floor/ceiling or roof/ceiling assembly need not be separately protected.
- Beams and headers must be separately protected within interstitial spaces such as attic and crawl spaces, and above suspended and drop ceilings.
- Beams and headers of heavy timbers need not be separately fire protected, when located within an assembly, where:
 - a. In sprinklered buildings, beams and headers are not less than 6 by 6 inch solid timber or not less than 5-1/8 by 5-1/8 inch glu-lam member.
 - b. In non-sprinklered buildings, beams and headers are not less than 8 by 8 inch solid timber or not less than 6-3/4 by 6-3/4 inch glu-lam member.
- Where glu-laminated timbers are be exposed outside of a one-hour assembly, without separate protection, the depth of glu-lam members must be increased by one lamination over the sizes listed in Section A.5 above or by one lamination over that specified by the architect or engineer if those specified are larger than indicated in Section A.5 above. All exposed connections must be separately protected as indicated in Section A.4 above.

6. Furred down areas and soffits

Soffits and similar furred down areas must be either:

- Constructed as part of the one-hour floor/ceiling and wall assemblies that it abuts; e.g. the one-hour materials wrap around the soffit to included it into the wall or ceiling; or
- The soffit may be unrated if the one-hour materials of the assemblies are continuous above and behind the soffit or furred down area. See Figure F1.

7. Fireblocking and Draftstops

Fireblocking and draftstops must be provided in locations specified in Section 708.2 and 708.3 of the code. These are required in combustible construction even when the building is not required to be of one-hour rated construction.

- Draftstopping is not required within any apartment dwelling unit or within a hotel/motel guest room at the gap created between a joist and an RC or similar channel. See Figure E1.
- Draftstopping in the floor/ceiling cavity above a unit separation wall or corridor wall and where a floor/ceiling assembly intersects an exterior wall in buildings where manufactured joist are used, can be achieved by blocking with web stiffeners and solid blocking of manufactured joist material or solid 2X lumber. Where web stiffeners are not used, fire safing, mineral wool, fiberglass, foam other draftstopping materials may be used to fill gaps up to 1 inch, if the material is firmly held in place. See Figure E2 for unit separation wall applications and Figures C3 and C4 for exterior wall applications. Materials such as batt insulation or fire safing must be minimum of R-11 of 1" thickness and not less than 3 inches wide tto provide an overlap of 1-1/2 inches on either side of the blocking.
- Pipes, conduits and similar elements in wall cavities which penetrate a floor ceiling assembly, need draftstopping at the ceiling line or the floor line, but not both. See Figure E3
- Fireblocking using solid wood at intersections of interior walls and floor/ceiling assemblies are shown in Figures B1 through B8.

8. Opening protection

Opening protection is generally not required in either exterior or interior locations where the requirement is only for a building of one-hour construction. Where openings include an element such as a window, a door, or a through wall air-conditioning unit, the sides, head and sill of the rough opening need not be protected. Where the opening is to be

left open, with no inset element, the framing forming the sides, head and sill of the opening must be protected with a wrap on all sides of one hour materials. In other words, it must be a framed opening using at least 2X solid material or cased with 5/8" Type X gypsum board to protect the structural members.

See the other applications of one-hour construction, below, each of which require opening protection.

9. Stairways

If located within a one-hour or greater stairway enclosure, the stairway (stairs and landings) does not need to be independently protected. Gypsum board in a stairway enclosure is to be continuous behind the structural framing of the stair and landings (i.e. between the stair stringers and landing framing and the wall framing of the stairway enclosure).

Stairways, and associated landings, not within enclosures need to be of one hour materials, heavy timber members or protected with one hour materials. As noted above stringers and landing framing may not penetrate the one hour membranes of adjacent walls.

Enclosed usable space under the stairway is not permitted within stairway enclosures. Where the stairway is not within an enclosure and enclosed usable space is created under the stairway, the stairway shall be protected from such space by one-hour fire-resistive construction.

B. Exterior Walls

1. General

Sections 603.1, 604.1, and 606.1 of the Oregon Structural Code requires Type II One-hour, Type III One-hour and Type V One-hour buildings be of one hour construction throughout the building. This includes the exterior walls and projections from those walls. For requirements due to location on property, close to property lines, see below. [There are also conditions where the exit travel path runs by exterior walls and openings, such as in an exit court, which would require protection of these elements. (Section 1006.3.5 of the code.)]

In addition to the general requirements listed above, the following specific standards apply to exterior walls.

2. Exterior wall penetrations (Section 709.6 of the code) Penetrations passing entirely through the exterior wall must be provided with through-penetration firestops. The fire stop must be suitable to method of penetration [i.e. the type of penetrating item (pipe, duct, etc) and the material the penetrating item is made of (metal, plastic, etc).] For penetrations which do not go through the wall, see the section on interior wall construction.

3. Openings protections.

See Section A.8 of this guide.

4. Fireblocking and Draftstopping.

See Section A.7 of this guide.

5. Exterior Opening separation

In unsprinklered buildings of more than 3 stories, exterior openings must be separated per Section 709.3.2.3 of the code (i.e. horizontal fire barriers).

6. Gable end walls and walls between roof segments at differing heights

In a gable portion of an exterior wall and walls between higher and lower roofs, one hour fire resistive construction should either be achieved by installing a solid 2X block, or two layers of gypsum board installed continuous to the roof sheathing (see Section I.3 for specific detail requirements where walls are required to be rated due to proximity to property lines). See Figures D3 through D7.

7. Exterior balconies

Are to be considered as extensions of the floor/ceiling assembly, and, therefore, need to be of one hour construction. When the balcony is exposed to weather on both top and bottom, the joist space must be vented. This venting may not be located on a horizontal surface.

Balconies constructed of heavy timber conforming in size to Sections A.3, A.4, and A.5 above with minimum 3X T & G decking or equal, need not be separately protected with one hour rated construction.

8. Eaves, roof overhangs, eave vents

At truss ends above exterior walls, solid blocking is to be provided in either a vertical or rotated position, provided that there is no gap between the block and the top of the exterior wall at the roof framing. See Figure D1. To insure proper transfer of roof diaphragm loads, the architect or structural engineer shall specify the location of this blocking and its method of attachment to the roof sheathing and wall framing .

Enclosed eaves must be vented on the vertical faces or from above with roof (mushroom) vents. Where eaves are not enclosed, attics may be vented by birdblocking. Eave vents must be at least 5 feet, measured horizontally, from any opening in a wall located below the eave (Sec. 709.3.2.3 of the code.)

9. Buildings without exterior walls

Where a building is without exterior walls such as a carport or pedestrian walkway and rated construction is required, only the framing members must be protected and not the projecting elements like eave overhangs.

Protection of framing members may either be one hour rated construction or the framing members may be constructed of heavy timber conforming in size to Sections A.3, A.4, and A.5 above.

C. Attic and Crawl Spaces

1. General

Where one-hour construction is required, the protection must extend into attic and crawl spaces.

2. Crawl spaces

One-hour material may be omitted from the crawl space side of the floor/ceiling assembly separating the crawl space from the inside of the building provided no usable space occurs in the crawl space. Columns, bearing walls, and area separation walls must be separately protected in the crawl space when such columns or walls continue above the floor assembly to support higher levels. See Figures A5 and A6.

3. Attics, attic draft stops

One-hour material may be omitted from the attic side of a floor/ceiling assembly separating the attic from the inside of the building, provided no usable space occurs in the attic. Draft stops must be provided in attics as required by Section 708.3 of the code. In Group R-1 hotel, motel, condominium and apartment occupancies, draft stops are required to continue through the attic as a continuation of the unit separation walls. Penetration of such draft stops must be protected per Section 708.3.1.3 of the code.

4. Attic ventilation

Attics may be vented through gable end walls provided openings are not prohibited nor required to be protected due to location on property (proximity to a property line). Eave vents shall comply with Section B.8 above.

5. Attic access

Where access to an attic is provided through a one-hour floor/ceiling assembly, the opening must be protected to maintain the rating of the assembly.

D. Shafts and Chases (including Stair Enclosures)

1. General

Regardless of other construction requirements for the building, shafts must be provided and constructed as required in Section 711 of the code.

Regardless of other construction requirements for the building, stair enclosures must be provided and constructed as required in Section 1005.3.3 of the code.

2. Double stud walls or thickened walls used as pipe chases

Where piping (combustible or noncombustible), gas vents or conduits, are located within fire resistive wall cavities, a shaft is not required provided penetrations of these elements are firestopped at each floor line. Fireblocking must also be provided as specified in Section 708.2. Piping, gas vents or conduits need not be enclosed in shaft construction where they pass through the attic provided penetrations of these elements are firestopped at the top plate of the wall where they enter the attic.

3. Penetrations

Penetrations of shafts must be protected as required in Section 711.4 of the code.

4. HVAC ducts in joist spaces

Horizontal runs of HVAC ducts (supply, return or exhaust), may be located within joist spaces provided either:

- a. Dampers are provided where the HVAC duct penetrates the ceiling; or
- b. Dampers may be omitted if the entire joist space containing the duct is lined with one-hour materials. See Figure F2 and F3.

E. Miscellaneous

1. Recessed items

Many items are built into the walls or ceilings of a building such as medicine cabinets, fire extinguisher cabinets, and ceiling lamp fixtures. These items interrupt the rated construction. In order to maintain the continuity of the rating, the recess must be "wrapped" with materials for one-hour fire resistive construction. Essentially the recess into which the penetrating item is installed must be completely finished as a one-hour rated box with 2X construction wrapped around the perimeter of the opening and 2 layers of gypsum board on the back of the opening.

2. Tubs and showers

Gypsum board is to be continuous behind the tubs and showers (i.e. between the actual tub or shower fixture and the walls surrounding the tub or shower) unless the wall is a wall interior to the dwelling unit or guest room. Shower valves can not be placed back to back within a wall that is a separation wall between different units or guest rooms.

Underneath the tub, one hour construction can be achieved by installing two layers of plywood or similar construction. Plumbing drains which penetrate into the floor construction must be protected with approved draft stopping material. See Figure F4.

F. Unit Separation Walls

1. General

The code requires dwelling unit and guest room separation walls to be of one-hour construction. These walls are to be continuous through floor/ceiling assemblies or if the walls stop at the ceiling, fireblocking must be installed within the floor/ceiling assembly (see Section A.7 of this guide). For continuation of walls into attic, see Section C.3 of this guide.

2. Penetrations

Back to back penetrations of unit separation walls are prohibited. Electrical outlet boxes must be offset by at least 24 inches so that they occur in different stud spaces. Plumbing, if not offset as for electrical, must be firestopped.

3. Guest room communication doors

Doors between two adjoining guest rooms are not required to be rated.

4. Mechanical systems

Combined, horizontal vents, such as bathroom or laundry exhausts, which penetrate unit separation walls must be protected with fire and smoke dampers at each wall penetration. See also Section D.4 of this guide.

G. Area Separation Walls

1. General

Area separation walls divide a large building into two or more distinct buildings for building code purposes. Area separation walls can divide a building that is not otherwise rated construction. Such walls limit the size of each "building" so that the spread of fire can be contained. The extent and location of such area separation walls shall provide a complete separation. Therefore, the integrity of these walls is critical to the fire safety of the buildings. Area separation walls are either of two or four hour construction depending on the construction type of the building.

2. Horizontal terminations

The rated construction of an area separation wall must continue to the outer edges of horizontal projecting elements such as balconies, roof overhangs, marquees and other architectural projections extending beyond the floor area of the building. See Figure A12. See Section 504.6.3 of the code for exceptions for such elements as enclosed projections.

3. Vertical terminations

The rated construction must continue from the foundation to a point at least 30 inches above the roof. See Figure A11. See Section 504.6.4 of the code for alternative designs for the termination at the roof.

4. Buildings of different heights

Where buildings on either side of an area separation walls are of different height, the area separation wall may terminate a point 30 inches above the lower of the two buildings. Openings are prohibited in the lower roof within the 10 foot distance of the wall separating the two buildings. Openings in the wall above a lower roof are required to be protected with 3/4 hour rated assemblies within 10 feet of the lower roof. See Section 504.6.6 of the code for alternative designs for this termination.

5. Continuation through floor/ceiling and roof ceiling assemblies The preferred design of area separation walls is for the wall to continue vertically and horizontally in the same plane. However designers will frequently show a wall which jogs around building spaces to align with separations between units or between units and public spaces, usually corridors. A jog in the wall on one floor must be the same on all floors and through the attic. See Figure A7 for an attic condition.

The construction of the area separation wall takes precedence over the construction of floor/ceiling and roof/ceiling assemblies. See Figures A3, A5, A8, A9 and A10.

Solid wood blocking may be provided through the floor/ceiling assembly to maintain the continuity of the wall. Such blocking shall be of solid timbers or blocks a thickness of not less than 5-1/8 inch. See Figures A1 through A4.

6. Interior wall intersections

Where interior walls intersect with an area separation wall, the area separation wall must be continuous without the other wall penetrating into the fire resistive membranes of the area separation wall. See Figure A13.

7. Penetrations

All openings and penetrations in the area separation wall shall be protected by fire rated assemblies (3 hours at 4 hour walls, 1-1/2 hours at 2 hours walls). Total length of all openings in an area separation wall is limited to 25% of the total length of the wall.

Openings and penetrations of roofs and exterior walls adjoining the termination of an area separation wall may be limited depending on the termination designed used. See Sections 504.6.3 and 504.6.4 of the code.

H. Occupancy Separations

1. General

When a building is used for more than one occupancy, each part of the building is classified as a distinct occupancy (business, factory, institutional, residential, etc). Different occupancies are required to be separated by an occupancy separation wall as specified in Table 3-B of the code. Such walls can be rated from 1 to 4 hours of fire resistivity. Some occupancies do not need to be separated. See Section 302 of the code.

2. Buildings of different heights

Occupancy separation walls can terminate at the lower roof in buildings of different heights.

3. Continuity

Occupancy separations need to be continuous in order to completely separate the distinct uses. Such separations may include both vertical (walls) and horizontal (floor/ceiling or roof/ceiling) assemblies. These separations can terminate at other interior fire-resistive assemblies. Where the separation continues to an exterior wall, they can terminate at an exterior wall or roof without any requirement for a parapet or other protection of the exterior assembly.

4. Penetrations

See Section 302.3 of the code for limitations and protection of opening in occupancy separation walls.

5. Special uses areas

The code identifies a variety of special use rooms or areas which are generally part of an occupancy but also require separation from the rest of the building by an occupancy separation wall. In residential construction, laundry rooms and storage rooms are considered such special use rooms and must be separated from the rest of the building by a one-hour fire resistive occupancy separation. All openings must also be one-hour protected. In most occupancies, a central heating plant or hot water boiler must be enclosed in a one hour occupancy separation.

I. Exterior Walls - proximity to property lines

1. General

Regardless of the construction of the rest of the building, exterior walls are required to be of rated construction based on their proximity to property lines and the occupancy of the building. For the specific hourly requirement, see Table 5-A of the code. Where a building is required to be of one hour construction throughout the exterior walls must be of one hour construction regardless of their proximity to a property line.

2. Openings and penetrations

Openings are either permitted without protection, permitted with protection or are not permitted at all, depending on the distance between the wall and the property line. See, also Table 5-A of the code. Penetrations such as vents and other mechanical openings require the same protection as for window and door openings. If a wall is located where openings are prohibited, mechanical openings and vents are also prohibited.

3. Continuity.

The rated construction of exterior walls shall be continuous through all floor/ceiling assemblies where exterior walls are required to be rated due to proximity to property lines per Table 5-A. See Figures C1 through C5. If the exterior walls are rated only because the building is required to be one hour construction throughout and not due to proximity to property lines then the rated construction does not need to be continuous through the floor ceiling assemblies. Fireblocking and draftstopping must be provided as required by Section 708 of the code.

Where openings are either prohibited or required to be protected, the rated construction of the exterior wall must also continue into an attic to the underside of the roof sheathing. See Figures D2, D5 and D7. Where openings are either prohibited or required to be protected, the rated construction of the exterior wall must also continue above the roof as a parapet (see Section I.4 below).

Where unprotected openings are allowed, the interior finish of the exterior wall may be omitted in the attic. See Figures D4 and D6.

4. Parapets (Section 709.4 of the code)

Where parapets are required, they must also be of rated construction, as is required for the wall that they are an extension of. The code provides the following exceptions to parapets applicable in a building built to onehour standards.

- a. If opening protection is not required due to location on property; parapets are not required.

- b. If no floor of the building is larger than 1,000 square feet.
- c. Walls which terminate at roofs which are either of non-combustible construction or at least 2-hour fire resistive construction.
- d. Walls may terminate at the underside of the roof sheathing provided:
 - 1) Where roof/ceiling framing is parallel to the exterior wall the roof/ceiling framing and its supporting construction shall be of one hour fire resistive construction for a width of five (5) feet for R and U occupancies and ten (10) feet in all other occupancies measured from the interior side of the exterior wall.
 - 2) Where roof ceiling framing is not parallel to the exterior wall the entire span of the roof/ceiling framing and its supporting construction shall be of one hour fire resistive construction.
 - 3) Openings in the roof shall not be located within five (5) feet of the exterior wall for R and U occupancies and within ten (10) feet of the exterior wall for all other occupancies.
 - 4) The entire building shall be provided with a minimum Class B roofing assembly.

J. Corridors

1. General

Chapter 10, Means of Egress, requires corridors to be of one-hour fire resistive construction under specified conditions. See Section 1005.1 of the code. This requirement is imposed regardless of the construction type of the building.

2. Continuity

All walls and the ceiling of the corridor must be of one hour construction. The walls must be continuous to the floor/ceiling assembly above, or may terminate at a one-hour ceiling assembly (to create a tunnel) installed below the floor/ceiling assembly. See Figures B1 through B8 and E4.

3. Openings and Penetrations

Doors in corridors are to be at least 20 minute, self-closing assemblies. The doors must also be gasketed to resist the passage of smoke. Openings other than doors and ducts, shall be fixed, glazed assemblies labeled for fire protection for not less than 3/4 hour. The total of all openings other than doors shall not exceed 25% of the total area of the walls. Duct penetrations require the installation of one-hour rated fire and smoke dampers at each penetration into the corridor. See Section 1005.8 of the code.

4. Ventilation

Corridors shall not be used as plenums or for the circulation of air to other spaces.

[Wood Frame Details](#)

HISTORY

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