

Two-family Dwellings and Townhouses

Based on the 2020 Minnesota Residential Code

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Senior Code Development Coordinator

Objective and Outcome

Objective:

Provide an **overview** of the special requirements for two-family homes and townhouses.

Outcome:

Participants will be able to **identify** the special requirements unique to two-family homes and townhomes.

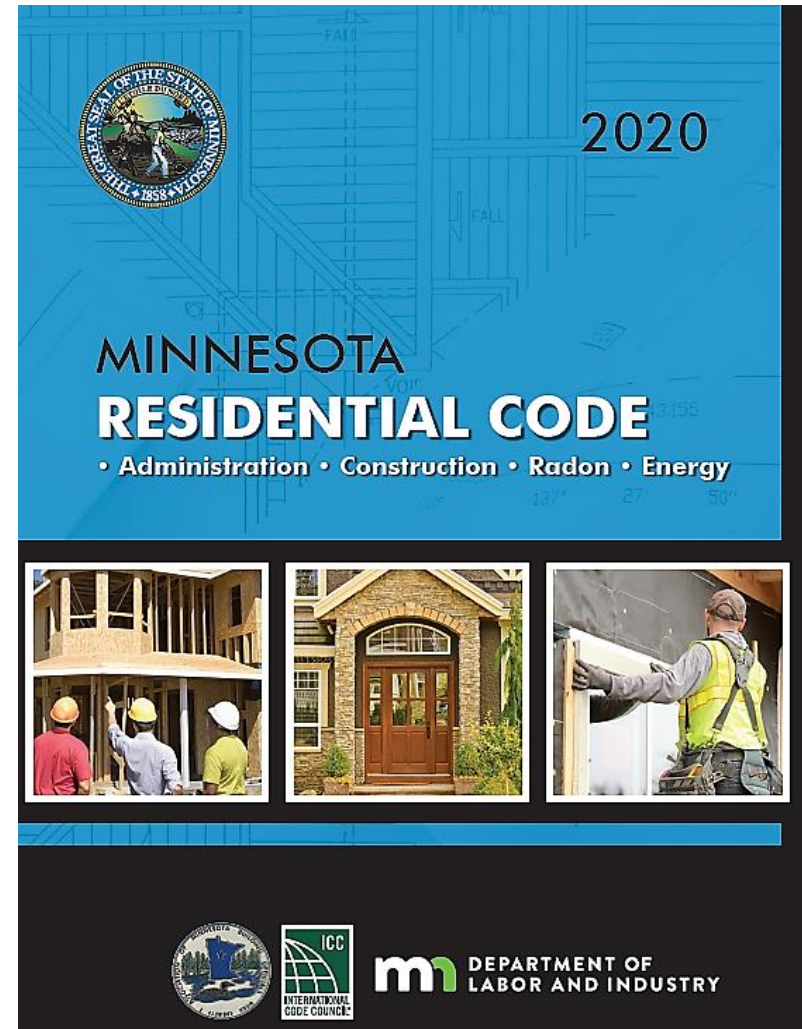
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Please open and follow along in the 2020 Minnesota Residential Code

Code reference sections and page numbers are provided in the bottom left corner of slides for convenience.

Section– page number



DLI/CCLD image

Scope and definitions

Occupancy classifications:

IRC-1 single-family dwellings;

IRC-2 two-family dwellings;

IRC-3 townhouses; and

IRC-4 accessory structures:

A. garages;

B. storage sheds; and

C. similar structures.

MR 1300.0070 subpart 12b– 2020 Minnesota Residential Code (MRC)

SECTION R300 CLASSIFICATION

R300.1. Occupancy classification. Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups in accordance with Table R300.1

**TABLE R300.1
OCCUPANCY CLASSIFICATIONS**

IRC-1	Dwelling, single-family
IRC-2	Dwelling, two-family
IRC-3	Townhouse
IRC-4	Accessory structures

Section R301 – 2020 Minnesota Residential Code (MRC)

SCOPE.

Subp. 2. Compliance.

- Structures classified under part 1300.0070, subpart 12b, as IRC-1, IRC-2, IRC-3, and IRC-4 occupancies
- not more than three stories above grade plane in height
- with a separate means of egress shall comply with chapter 1309 and other applicable rules.
- Other buildings and structures and appurtenances connected or attached to them shall comply with chapter 1305 and other applicable rules.

DWELLING.

TWO-FAMILY.

- Any building that contains **two separate dwelling units**
- with separation either horizontal or vertical
- on **one lot**
- that is used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or occupied for living purposes.

DWELLING.

TOWNHOUSE.

- A single-family dwelling unit constructed in a **group of two or more** attached units
- in which each unit extends from the **foundation to the roof** and
- having **open space on at least two sides** of each unit.
- Each single-family dwelling unit shall be considered to be a **separate building**.
- **Separate building service utilities** shall be provided to each single-family dwelling unit when required by other chapters of the State Building Code.

Scope and definitions

Two-family.

- Any building that contains two separate dwelling units.
- Either horizontal or vertical separation.
- **On one lot.**



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Scope and definitions

Two-family. (vertical)

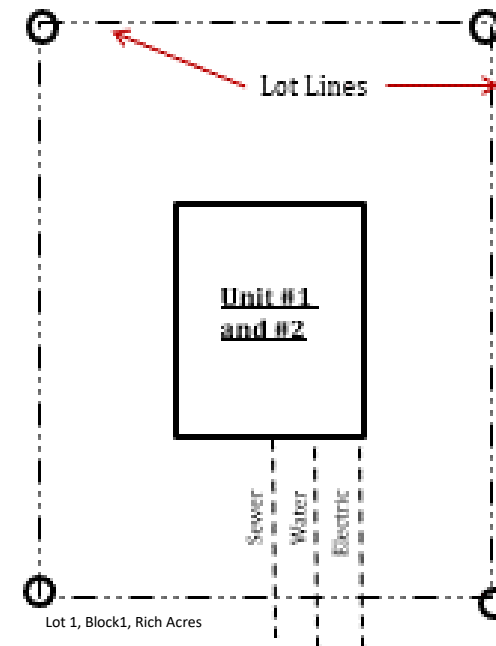
- Any building that contains two separate dwelling units.
- Either horizontal or vertical separation.
- On one lot.



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DLI/CCLD Illustration

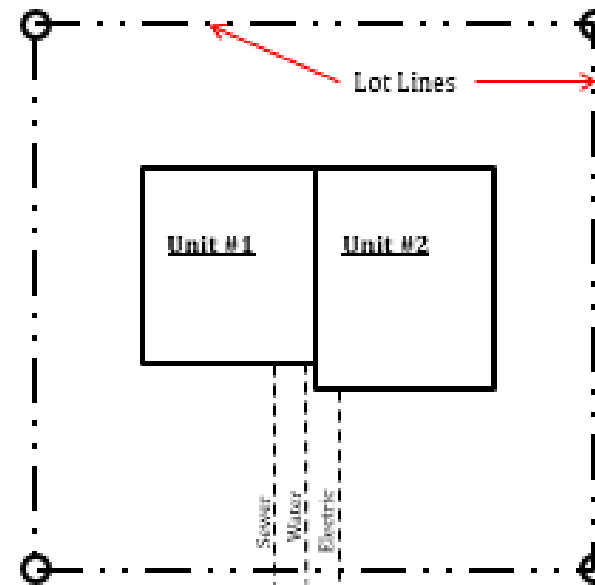
Scope and definitions

Two-family. (horizontal)

- Any building that contains two separate dwelling units.
- Either horizontal or vertical separation.
- On one lot.



DLI/CCLD Photo



Lot 1, Block1, Rich Acres

DLI/CCLD Illustration

Scope and definitions

Townhouse.

- A single-family dwelling unit constructed in a group of **two or more attached units**
- Each unit extends from the **foundation to the roof.**
- Open space on at **least two sides** of each unit.



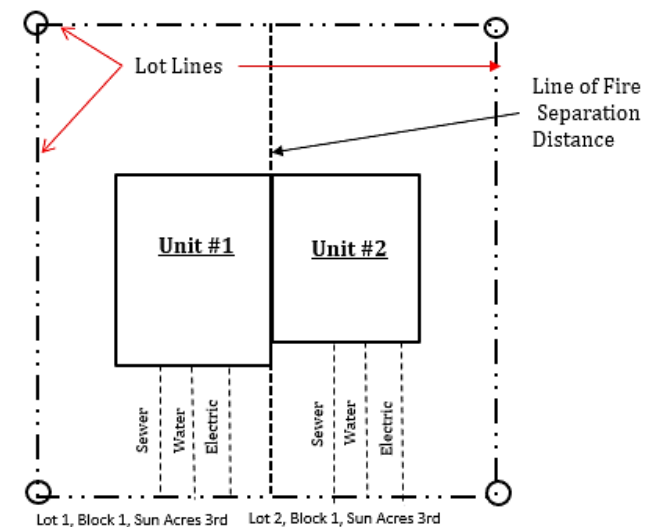
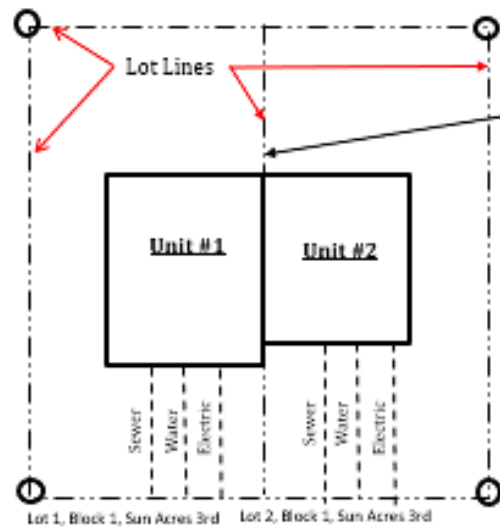
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Scope and definitions

Townhouse. (two-unit townhouse)



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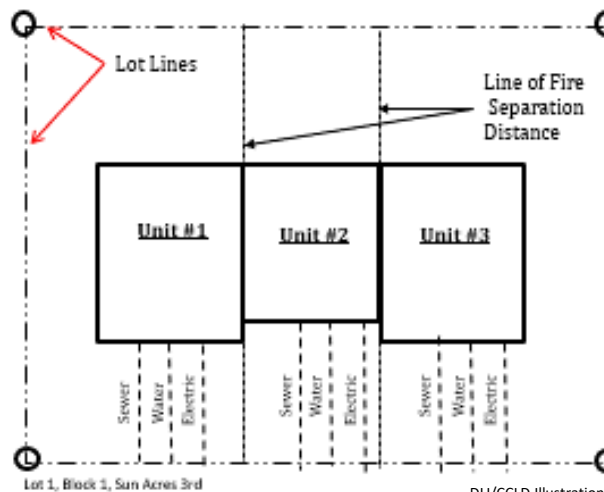
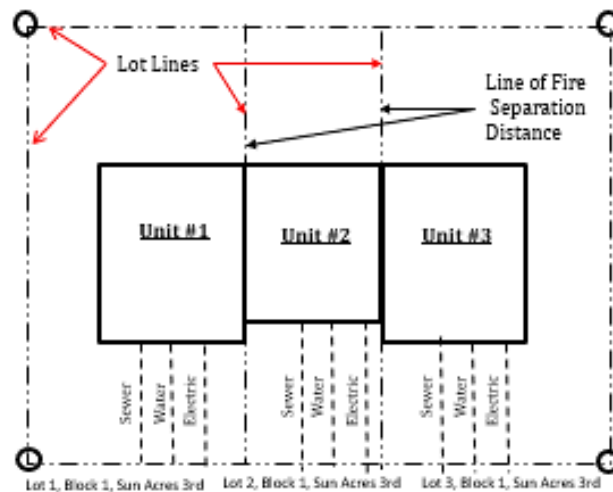
DLI/CCLD Illustrations

Scope and definitions

Townhouse. (three or more townhouse units)



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DLI/CCLD Illustrations

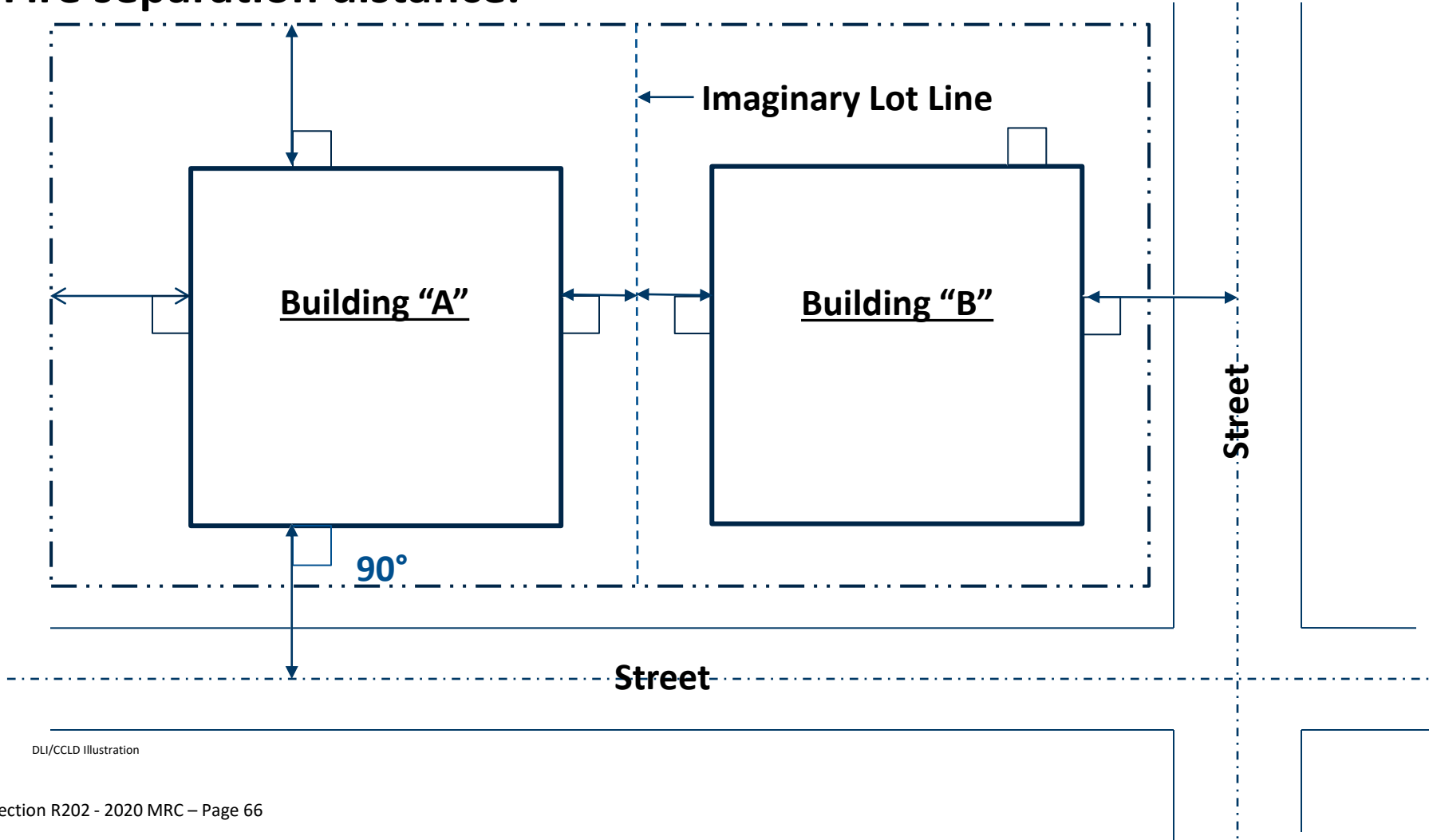
Fire separation distance.

FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

- To the closest interior lot line; or
- to the centerline of a street, an alley or public way; or
- to an imaginary line between two buildings on the lot.
- The distance shall be measured at a right angle from the face of the wall.

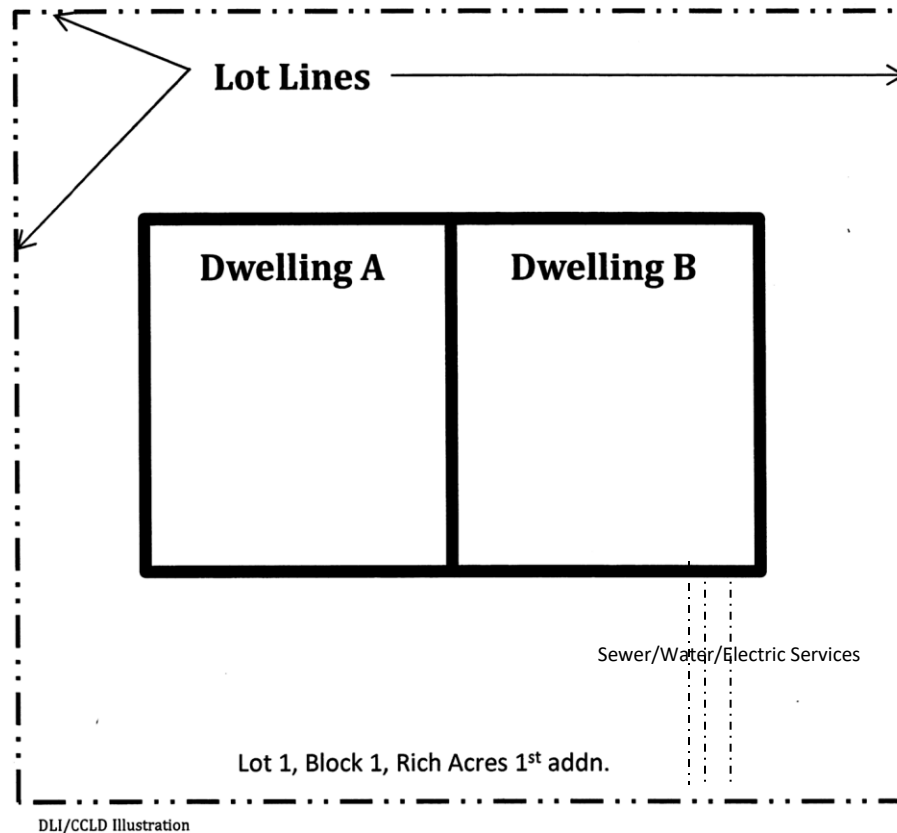
Scope and definitions

Fire separation distance.



Scope and definitions

Exercise/Discussion



**Two-Family Dwelling or
Townhouse?**

Why?

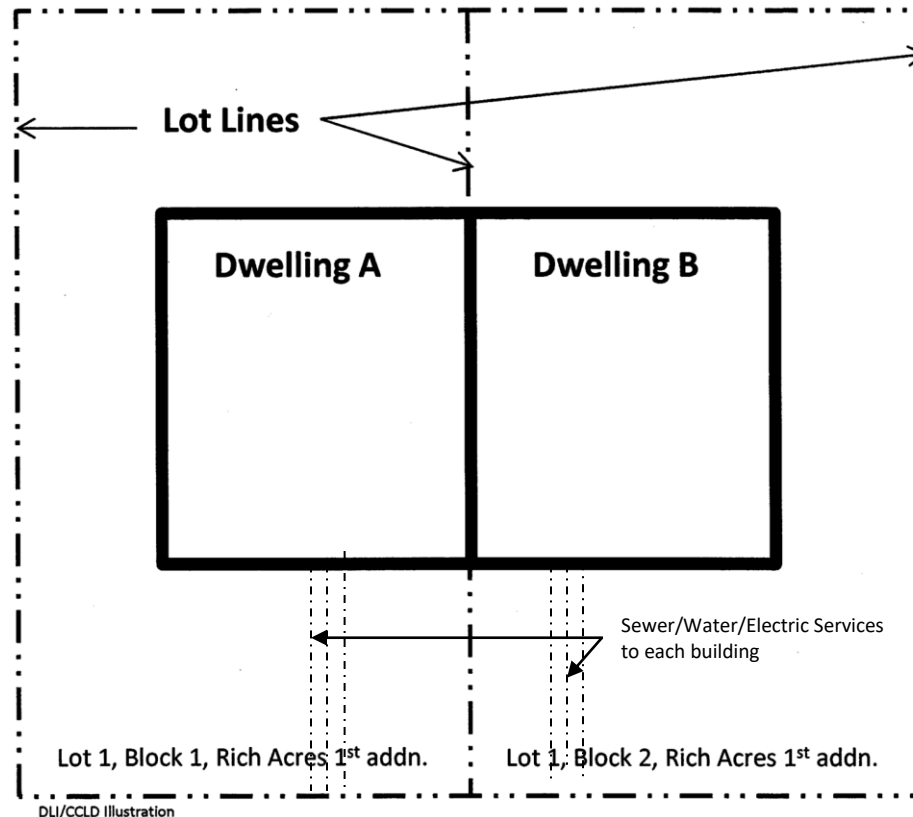
Answer:

Two-family dwelling:

- Two dwellings on one lot
- Single sewer/water/electric service to building
- Construct to Section R302.3

Scope and definitions

Exercise/Discussion



**Two-Family Dwelling or
Townhouse?**

Why?

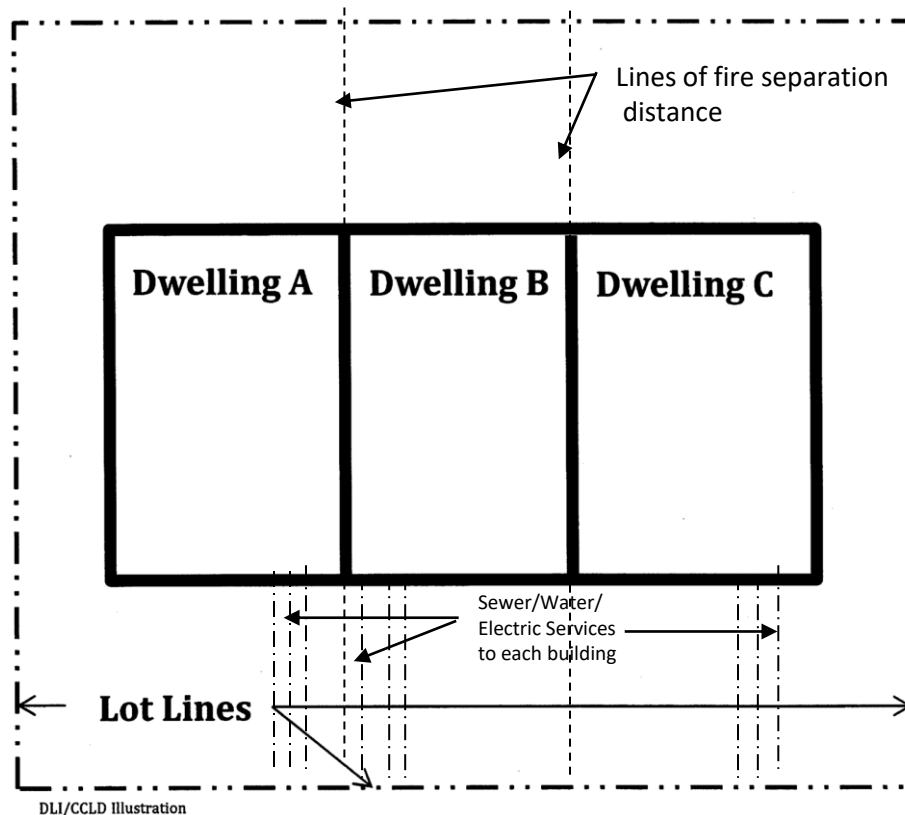
Answer:

Two-unit townhouse:

- Separate lots
- Two sides open
- Separate sewer/water/
electric service to buildings
- Construct to Section R302.2

Scope and definitions

Exercise/Discussion



Townhouse?

Why?

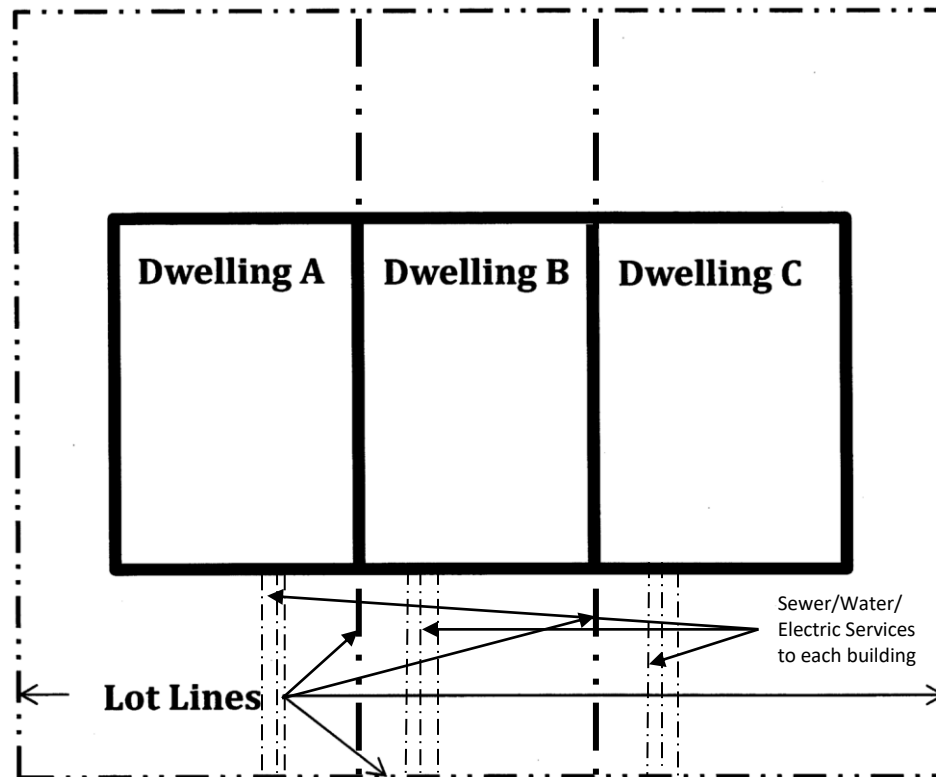
Answer:

Three-unit townhouse:

- On one lot
- Two sides open
- Separate sewer/water/
electric service to buildings
- Construct to Section R302.2

Scope and definitions

Exercise/Discussion



DLI/CCLD Illustration

Townhouse?

Why?

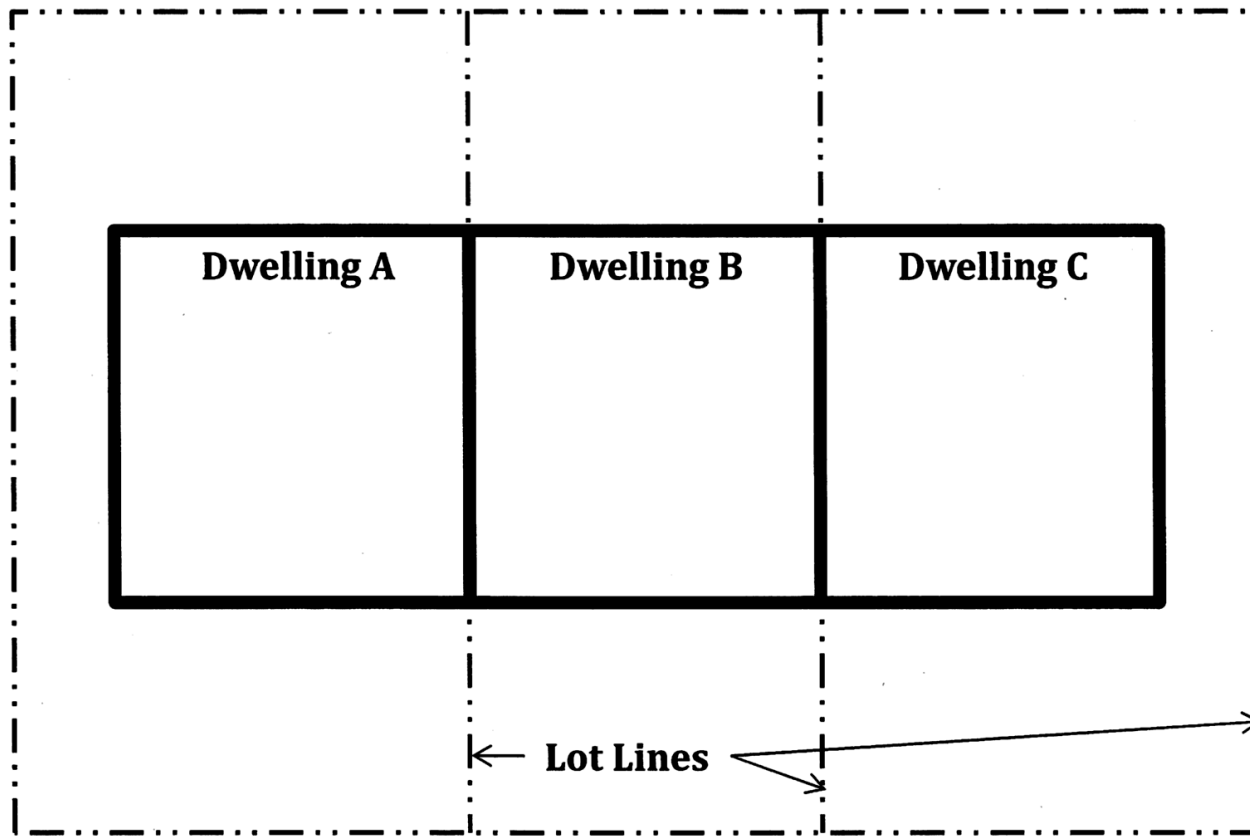
Answer:

Three-unit townhouse:

- On separate lots
- Two sides open
- Separate sewer/water/
electric service to buildings
- Construct to Section R302.2

Scope and definitions

Exercise/Discussion



DLI/CCLD Illustration

Exercise/Discussion

IRC or IBC?

Why?

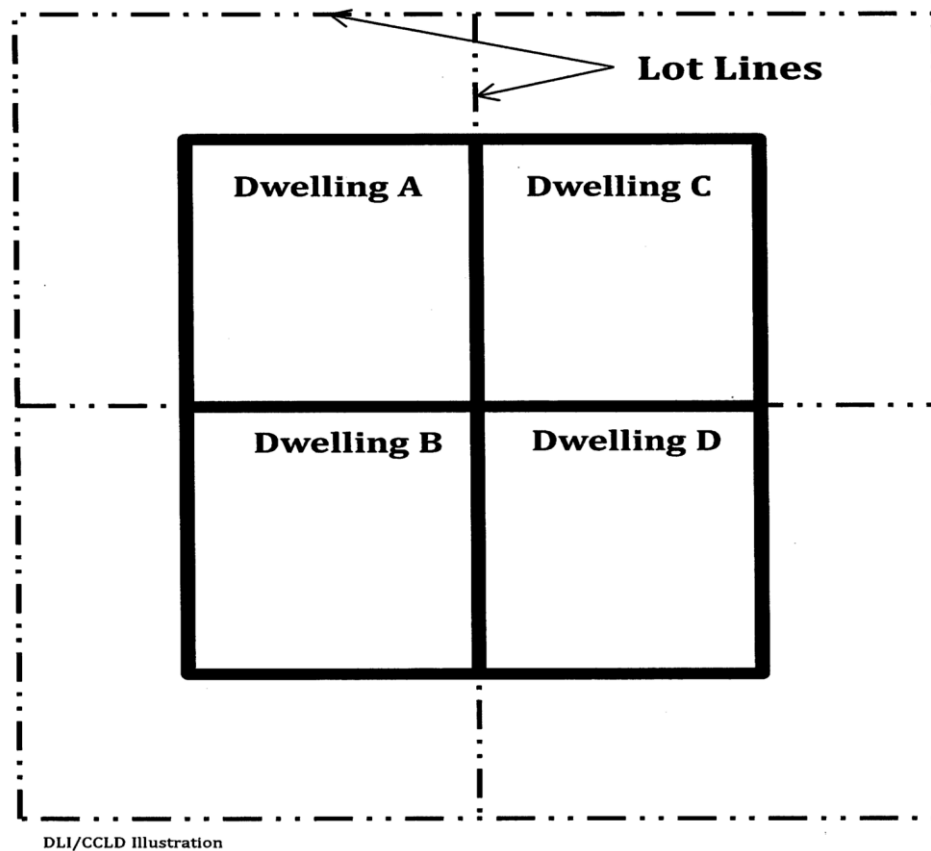
Answer:

IRC:

- MR 1300.0040
- Three stories or less
- Two sides open
- Separate Means of egress
- Construct to Section R302.2

Scope and definitions

Exercise/Discussion



IRC or IBC?
Why?

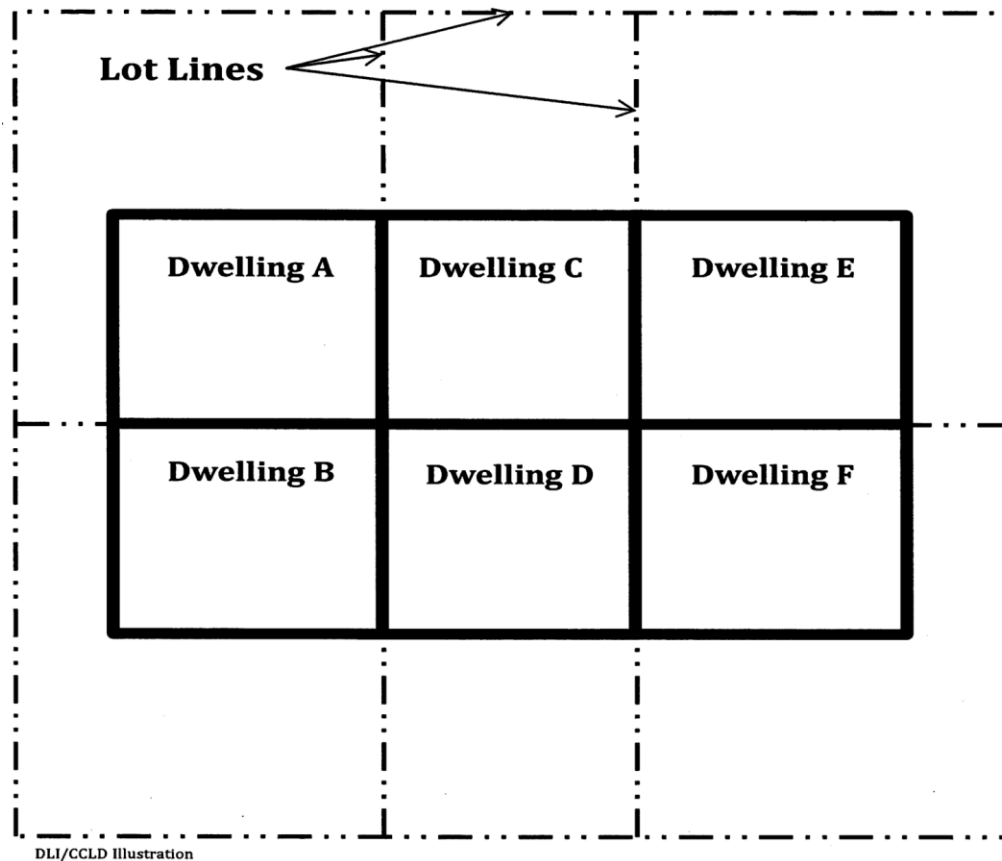
Answer:

IRC:

- MR 1300.0040
- Three stories or less
- Two sides open
- Separate Means of egress
- Construct to Section R302.2

Scope and definitions

Exercise/Discussion



DLI/CCLD Illustration

**IRC or IBC?
Why?**

Answer:

IBC:

- MR 1300.0040
- One side open at Dwelling C and D

Scope and definitions

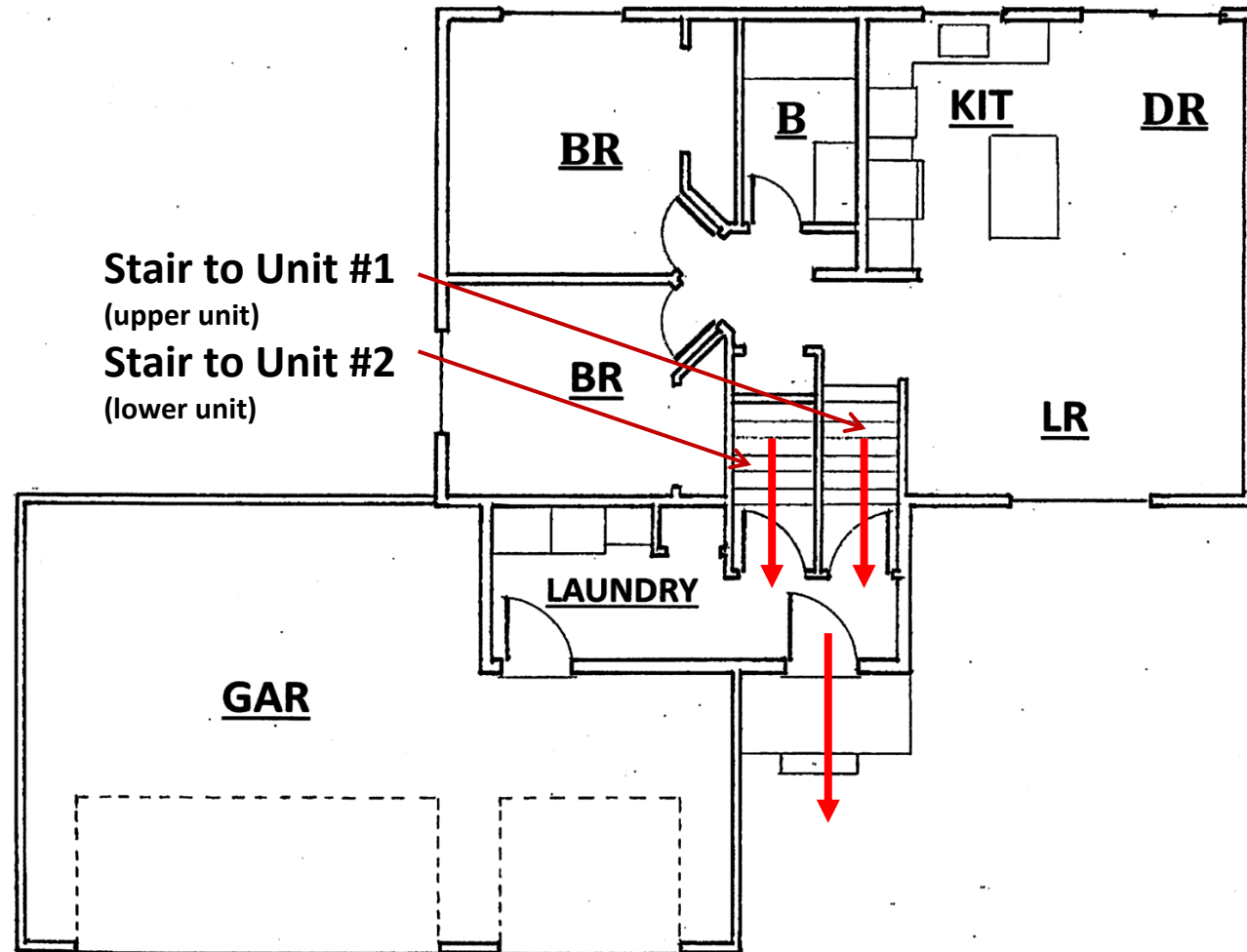
Exercise/Discussion

IRC or IBC?
Why?

Answer:

IBC:

- MR 1300.0040
- Shared means of egress

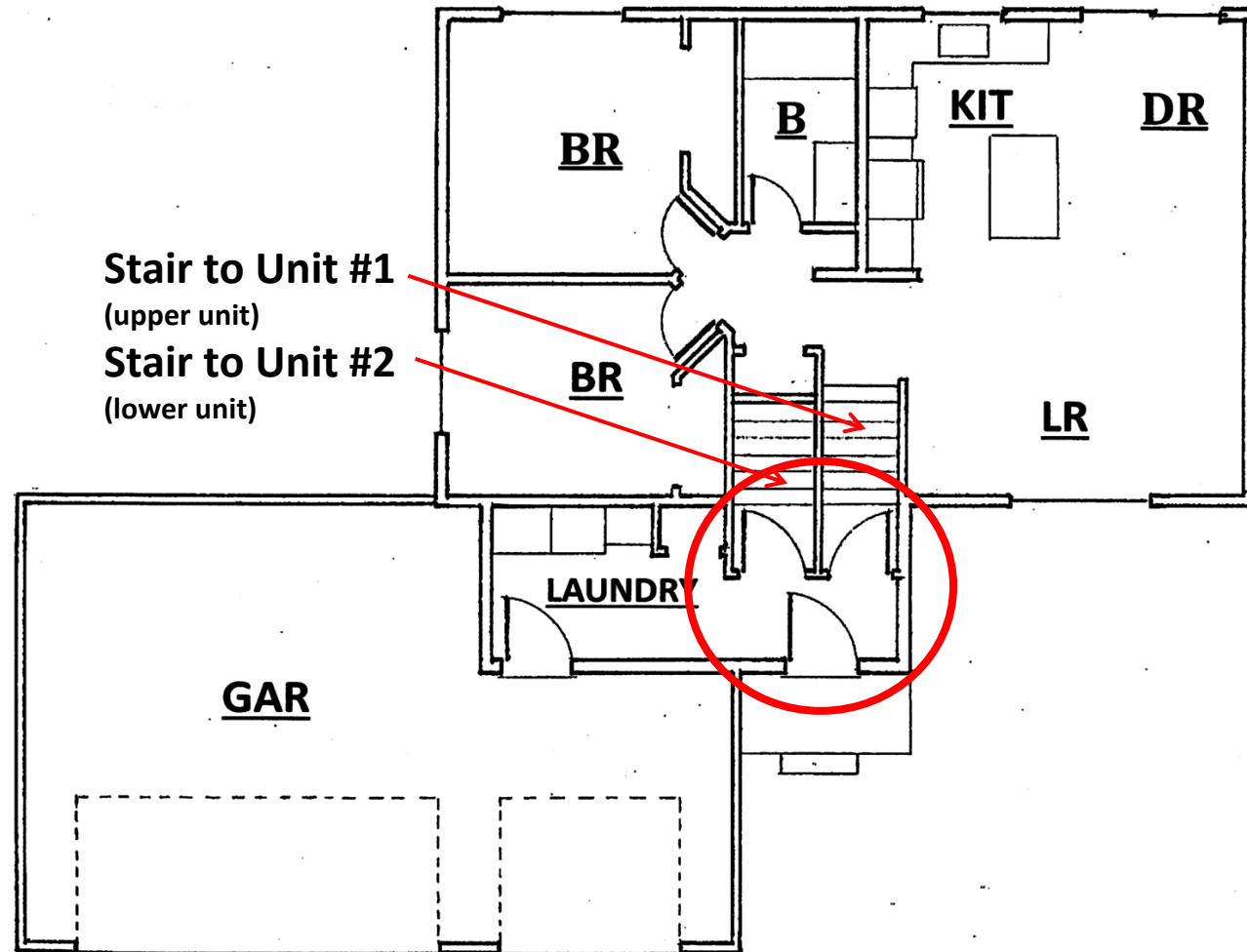


DLI/CCLD Illustration

Scope and definitions

Exercise/Discussion

IRC or IBC?
Why?

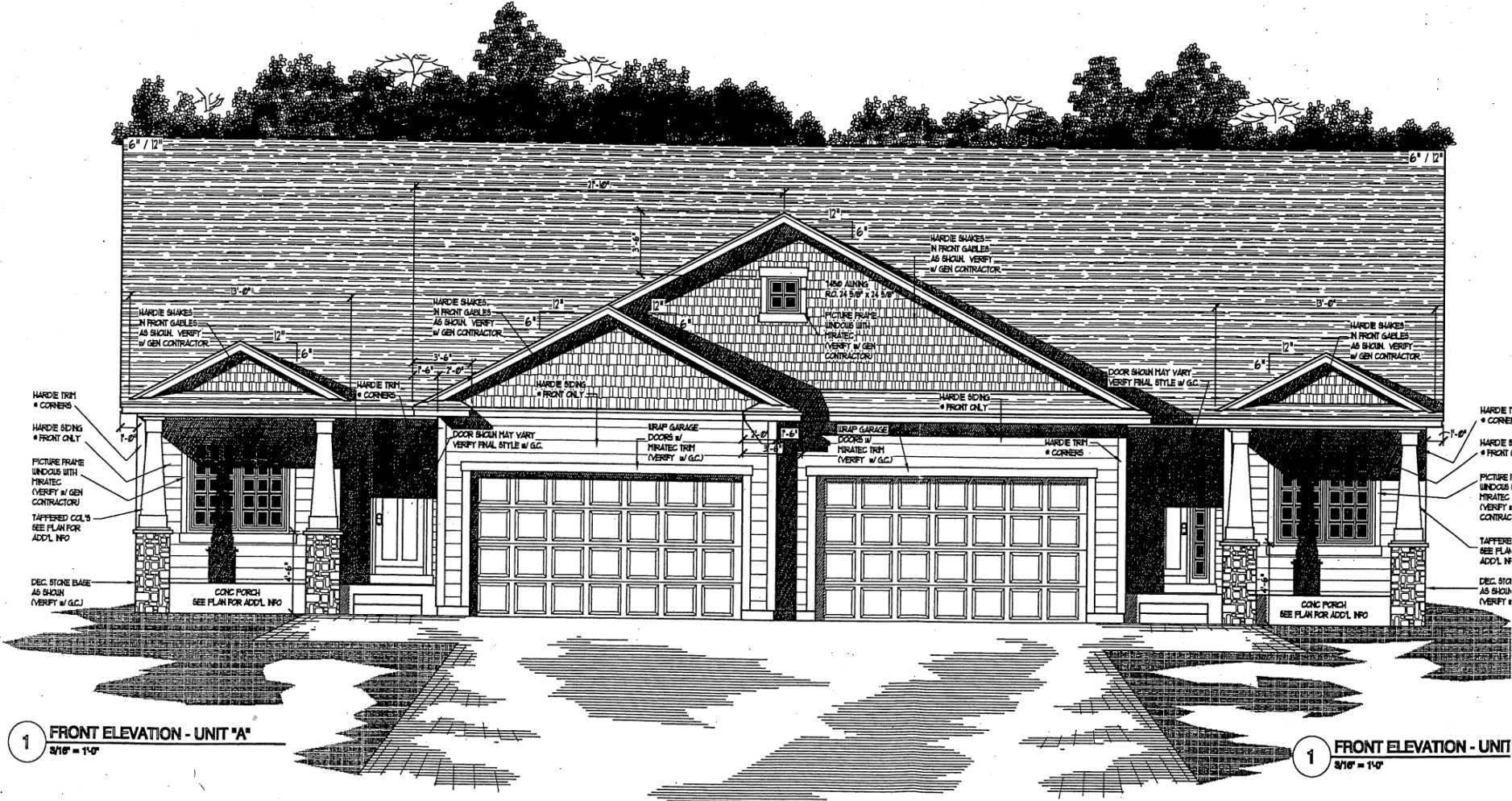


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Distribute plans

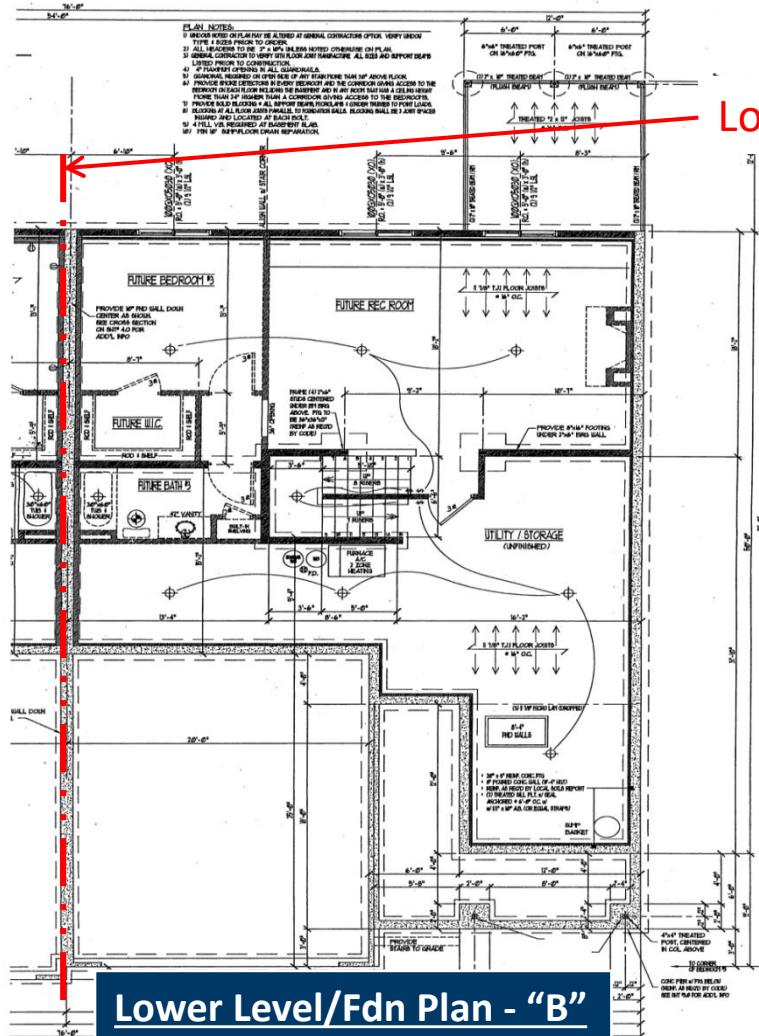


Distribute plans

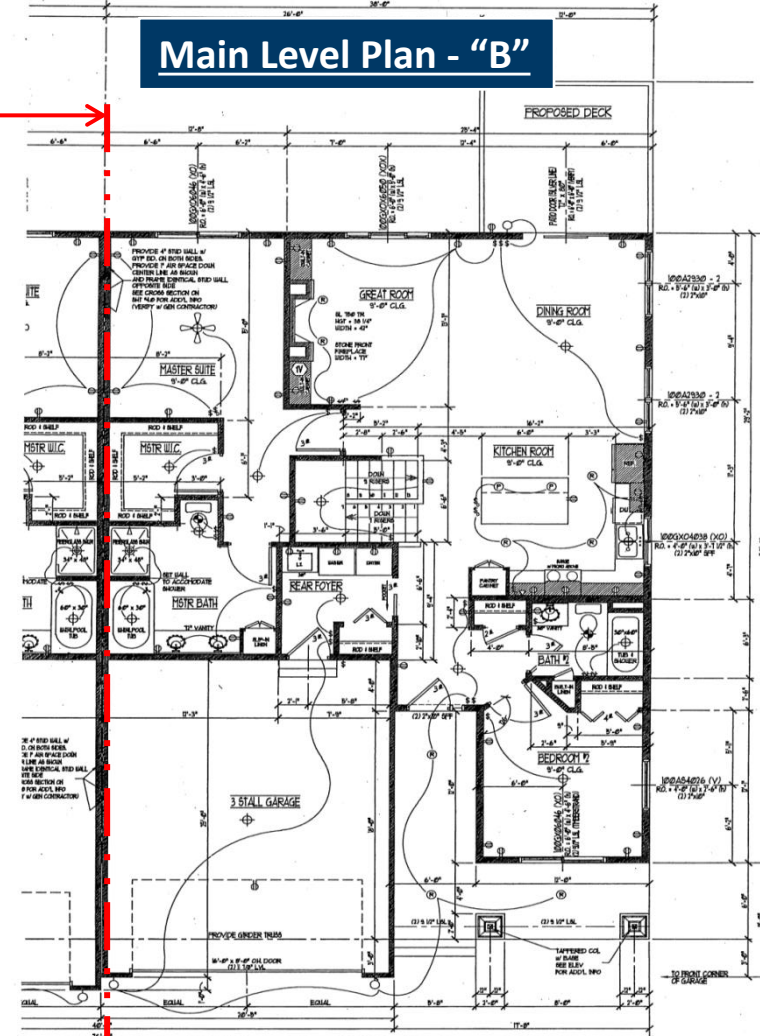


Plan courtesy of Norcutt Homes

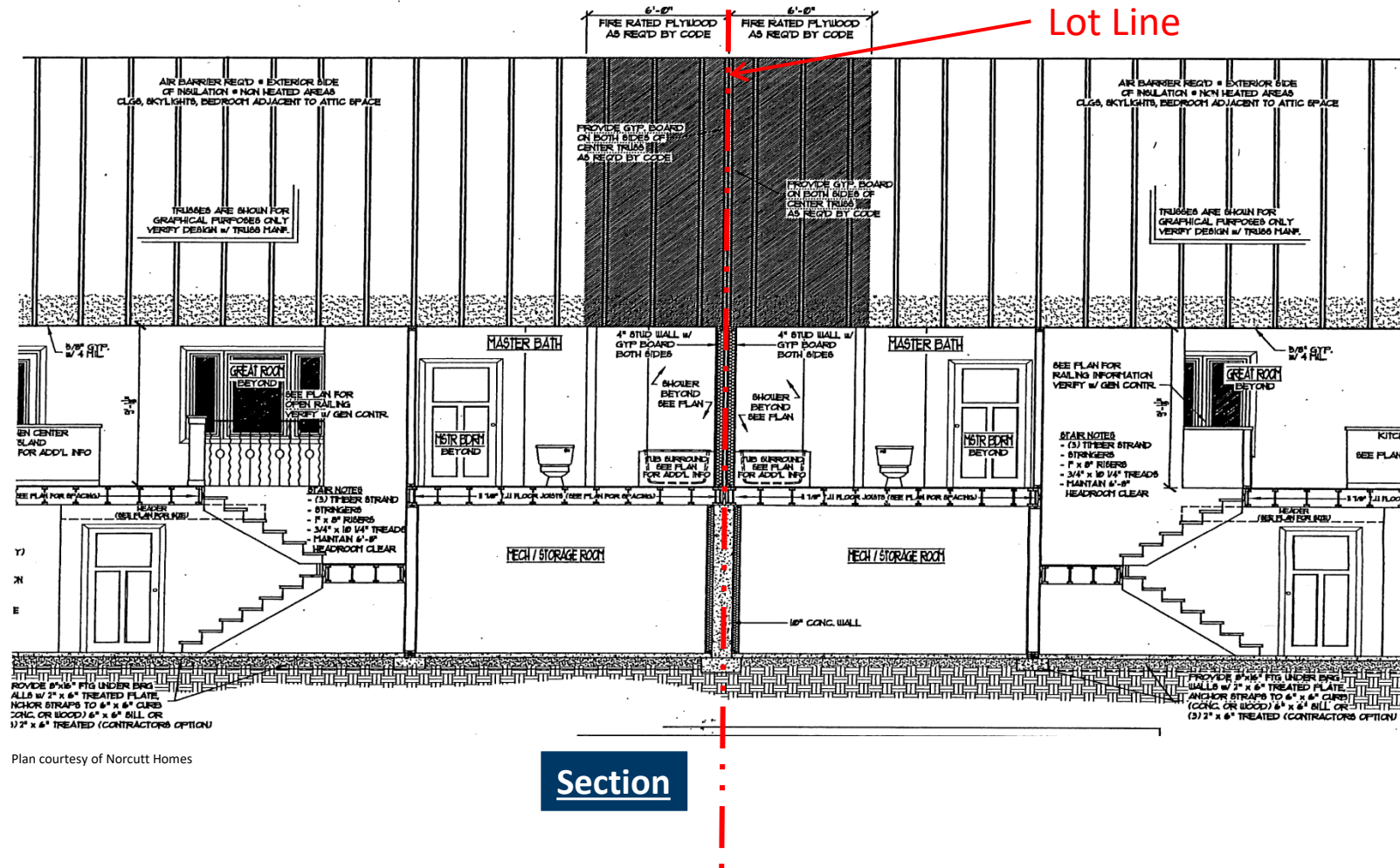
Distribute plans



Lot Line



Distribute plans



Plan courtesy of Norcutt Homes

Section

Townhouses



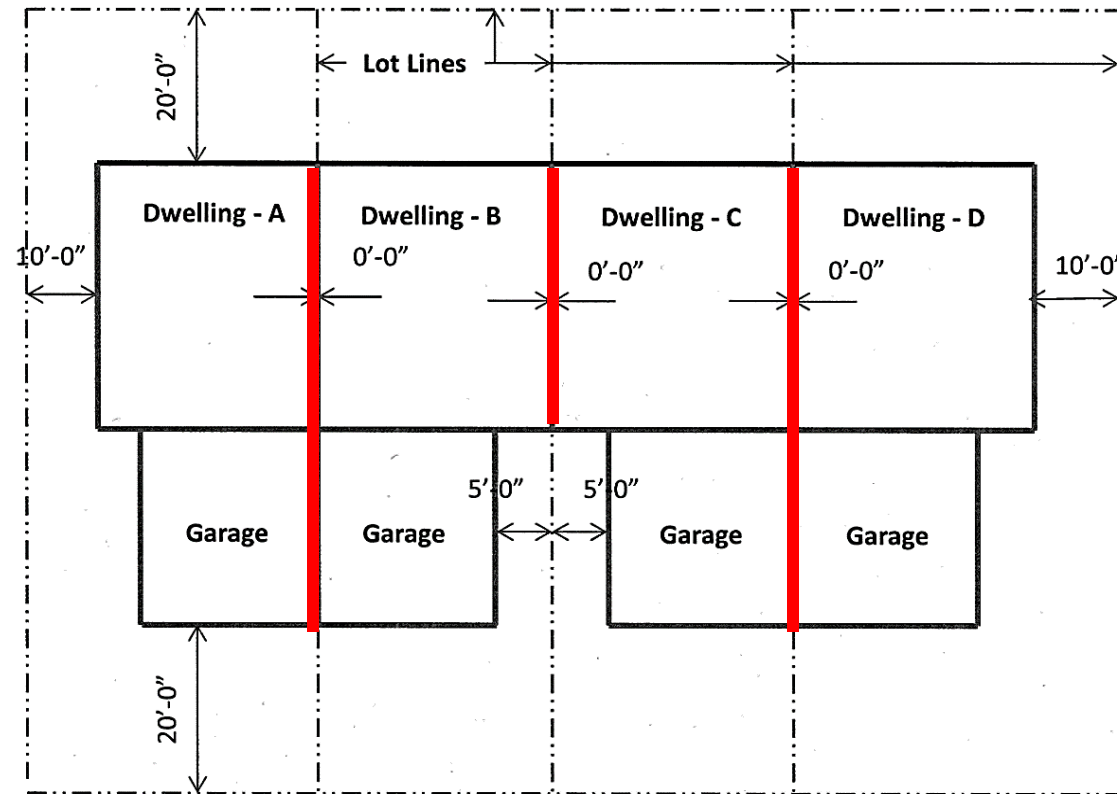
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Townhouses.

Walls separating townhouses shall be constructed in accordance with Section R302.2.1 or R302.2.2.

R302.2.1 – Double walls

R302.2.2 – Common walls



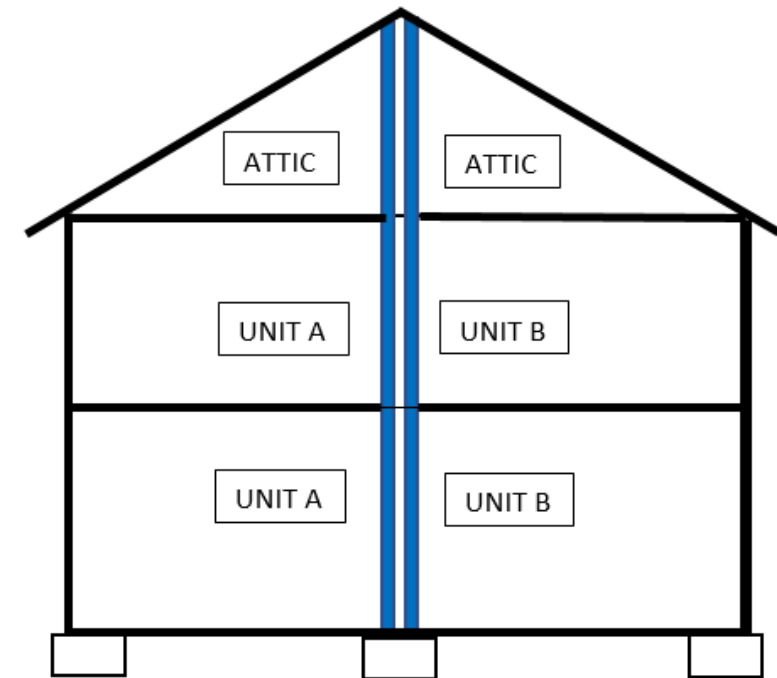
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Townhouses.

R302.2.1 Double walls.

Each townhouse shall be separated by **two 1-hour fire-resistance-rated wall assemblies**

Tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.



DLI/CCLD Illustration

Townhouses.

R302.2.2 Common walls.

Common walls separating townhouses shall be assigned a fire-resistance rating in accordance with [Item 1 or 2](#).

The common wall shared by two townhouses shall be constructed [without plumbing or mechanical equipment, ducts or vents](#) in the cavity of the common wall.

The wall shall be [rated for fire exposure from both sides](#) and shall extend to and be tight against exterior walls and the underside of the roof sheathing.

Townhouses.

R302.2.2 Common walls. (cont)

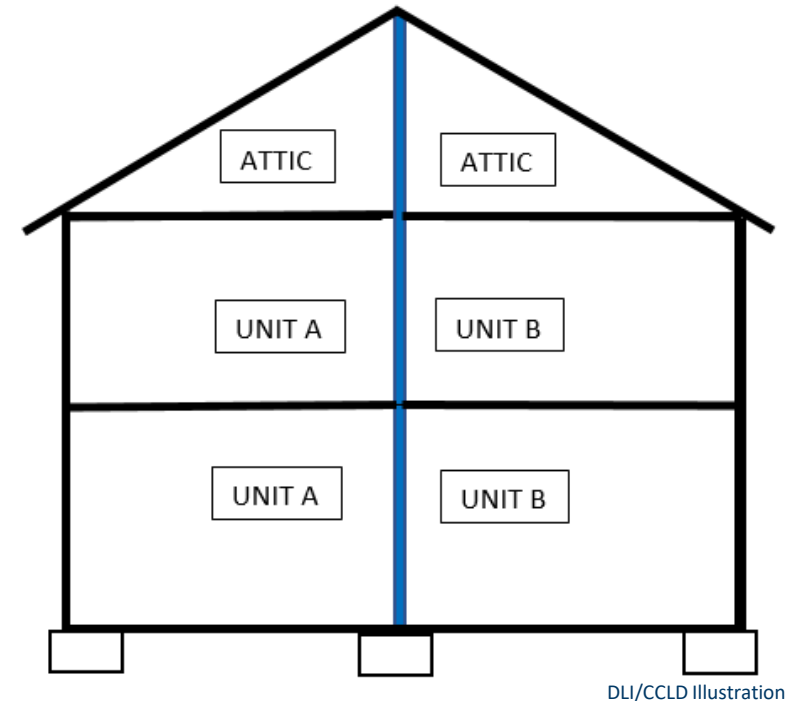
Electrical installations shall be in accordance with Chapters 34 through 43. ([See Minnesota Electrical Code](#))

Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

Townhouses.

R302.2.2 Common walls. (cont)

1. Where a **fire sprinkler system** in accordance with Section P2904 is **provided**, the common wall shall be **not less than a 1-hour** fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.



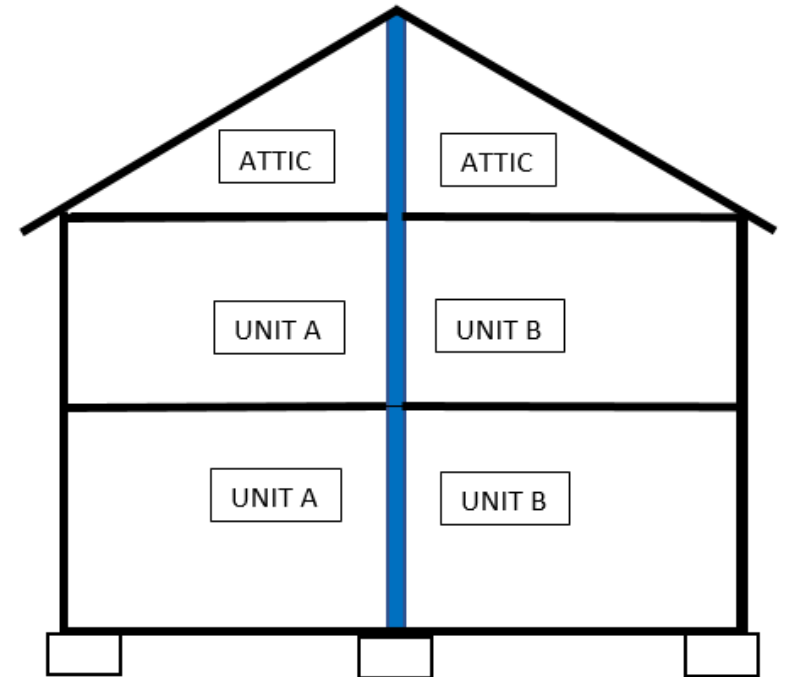
1 - One Hour Wall
w/ fire sprinkler system
(NO plumbing or mechanical equipment)
IRC R302.2.2 item #1

All Townhouses Sprinkled (three or more) - MN

Townhouses.

R302.2.2 Common walls. (cont)

2. Where a **fire sprinkler system** in accordance with Section P2904 is **not** provided, the common wall shall be **not less than a 2-hour** fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.



DLI/CCLD Illustration

1 - Two Hour Wall
w/o fire sprinkler system
(NO plumbing or mechanical equipment)
IRC R302.2.2 item #2

Two Unit Townhouse Only

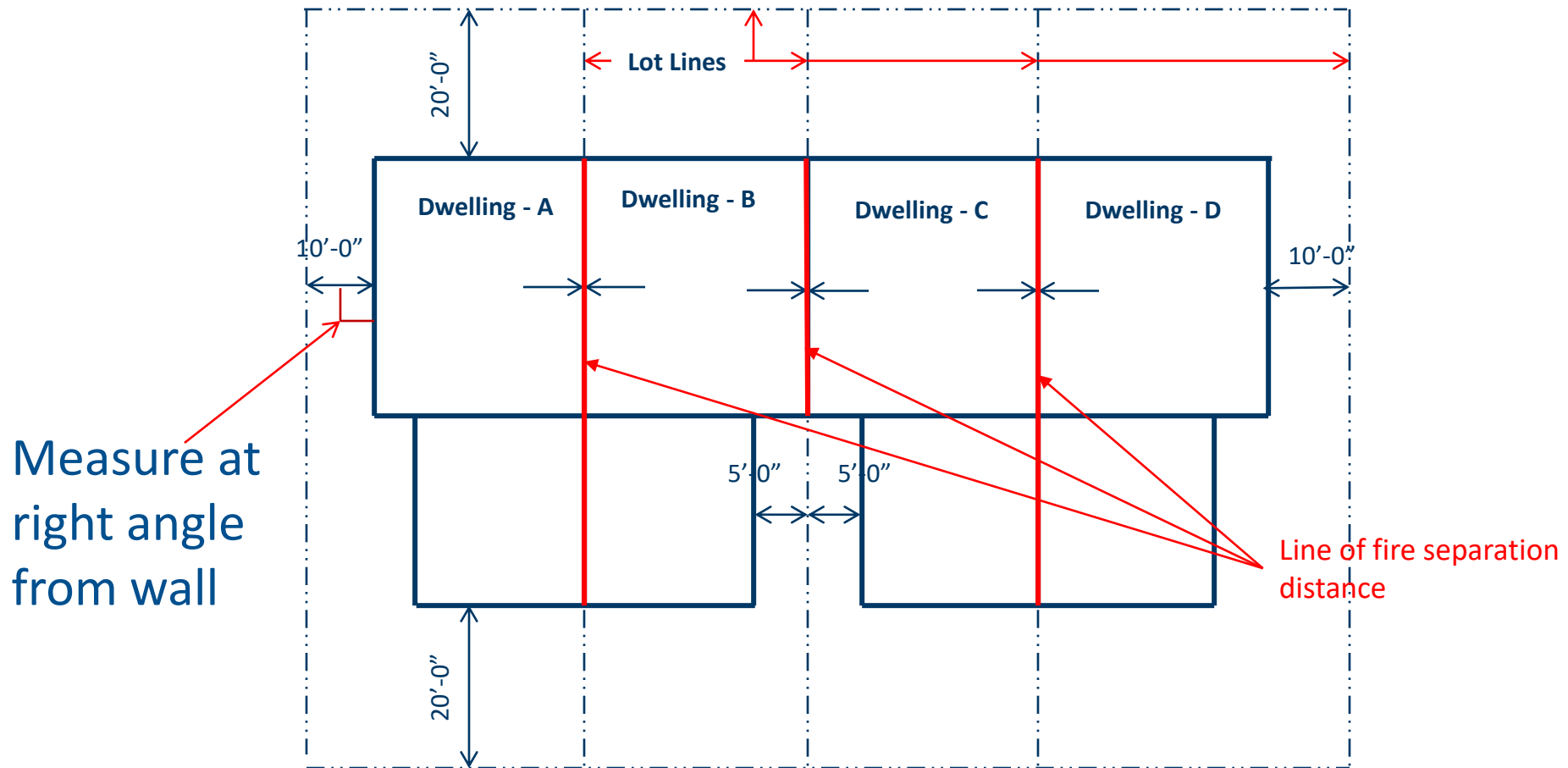
Fire separation distance.

The distance measured from the building face to one of the following:

- To the closest interior lot line; or
- To the centerline of a street, an alley or public way; or
- To an imaginary line between two buildings on the lot.

Distance measured at a right angle from the face of the wall.

Fire separation distance.



Fire separation distance.

**TABLE R302.1(1)
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263, or Section 703.3 of the <i>International Building Code</i> with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{a, b, c}	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

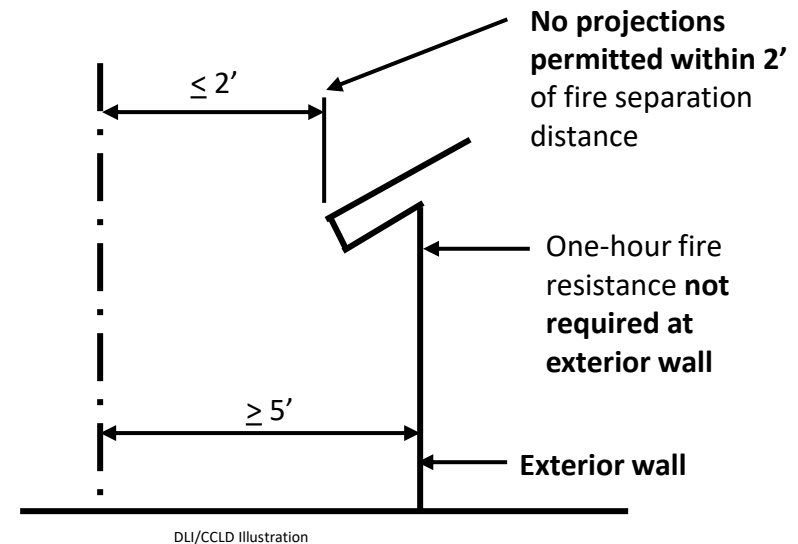
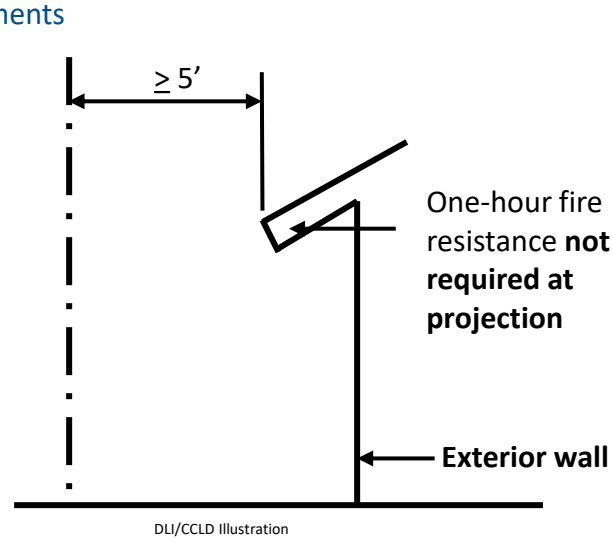
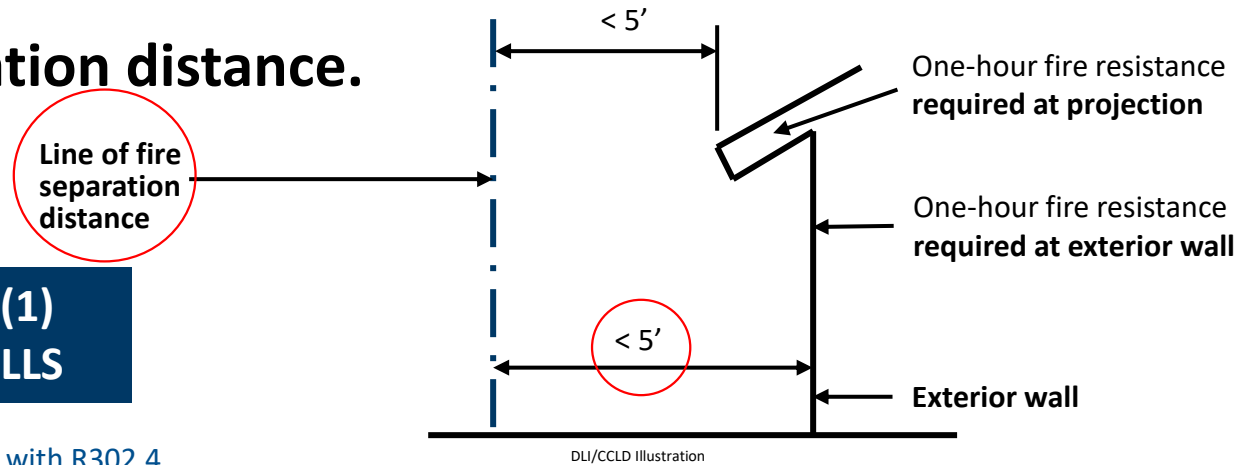
- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- c. One hour on the underside equates to one layer of $\frac{5}{8}$ -inch type X gypsum sheathing. Openings are not allowed.

Fire separation distance.

TABLE R302.1(1) EXTERIOR WALLS

Penetrations < 3', comply with R302.4

Penetrations > 3', no requirements



Example:

See Table R302.1(1)

[dwellings without fire sprinkler system]

Exterior Walls: 5' - 0"

- One-hour fire resistive exterior walls **NOT REQUIRED**

Projections: 3' - 8"

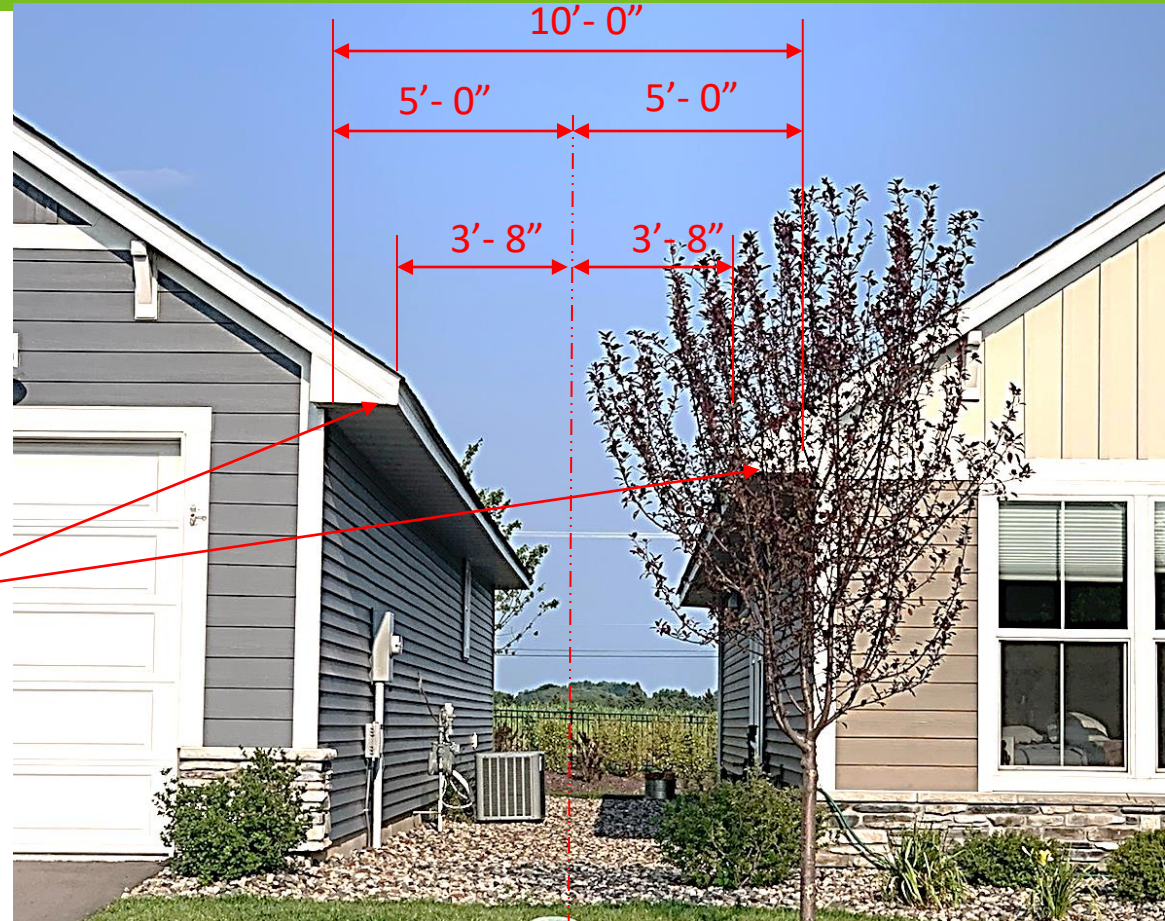
- < 5' - 0" and one-hour fire resistive protection **REQUIRED**

Openings in exterior walls: 5' - 0"

- **No limitations** to area of openings

Penetrations in exterior walls: 5' - 0"

- **No limitations** to area of openings



DLI/CCLD Photo

Lot line/
Line of fire separation distance

Fire separation distance.

TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263, or Section 703.3 of the <i>International Building Code</i> with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet ^a
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{b, c, d}	2 feet ^a
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet ^a
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet ^a

For SI: 1 foot = 304.8 mm.

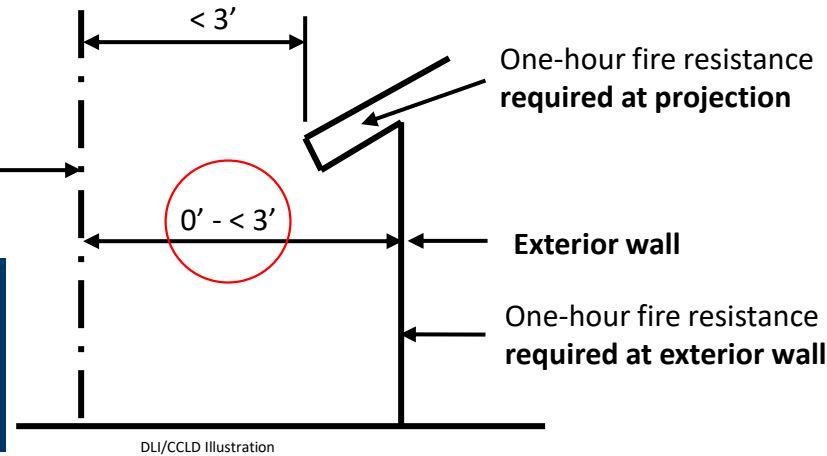
NA = Not Applicable.

- a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the fire separation distance for exterior walls not fire-resistance rated and for fire-resistance-rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- c. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- d. One hour on the underside equates to one layer of 3/8-inch type X gypsum sheathing. Openings are not allowed.

Fire separation distance.

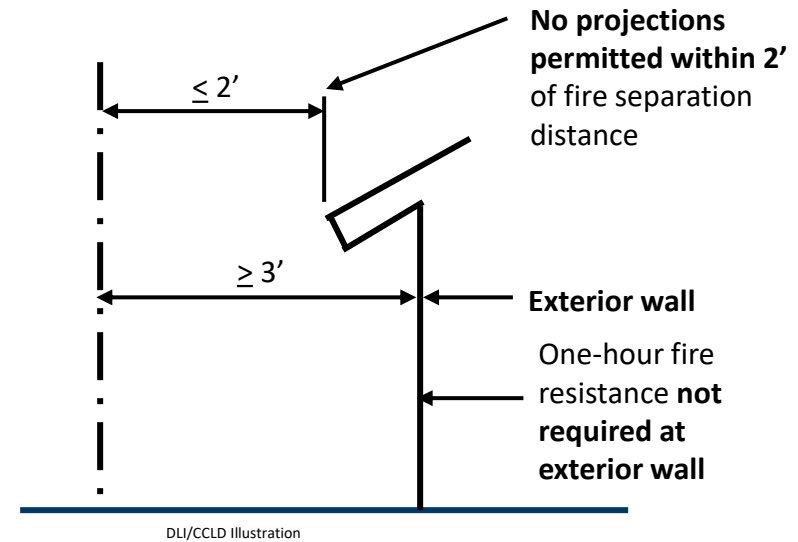
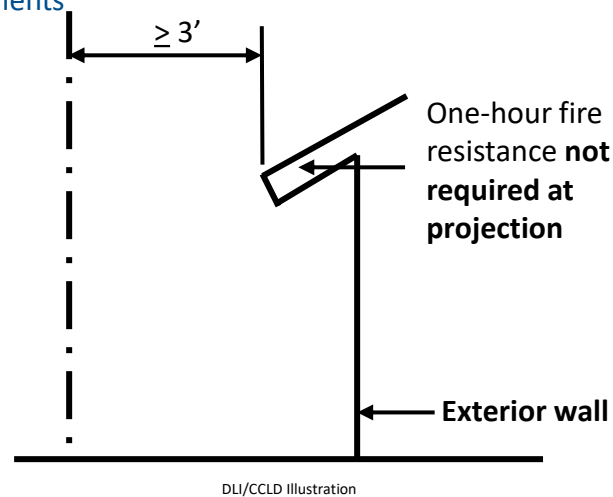
Line of fire separation distance

TABLE R302.1(2) EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS



Penetrations $< 3'$, comply with R302.4

Penetrations $> 3'$, no requirements



Example:

See Table R302.1(2)

[dwellings with fire sprinkler system]

Exterior Walls: 3' - 0"

- One-hour fire resistive exterior walls **NOT REQUIRED**

Projections: 1' - 8"

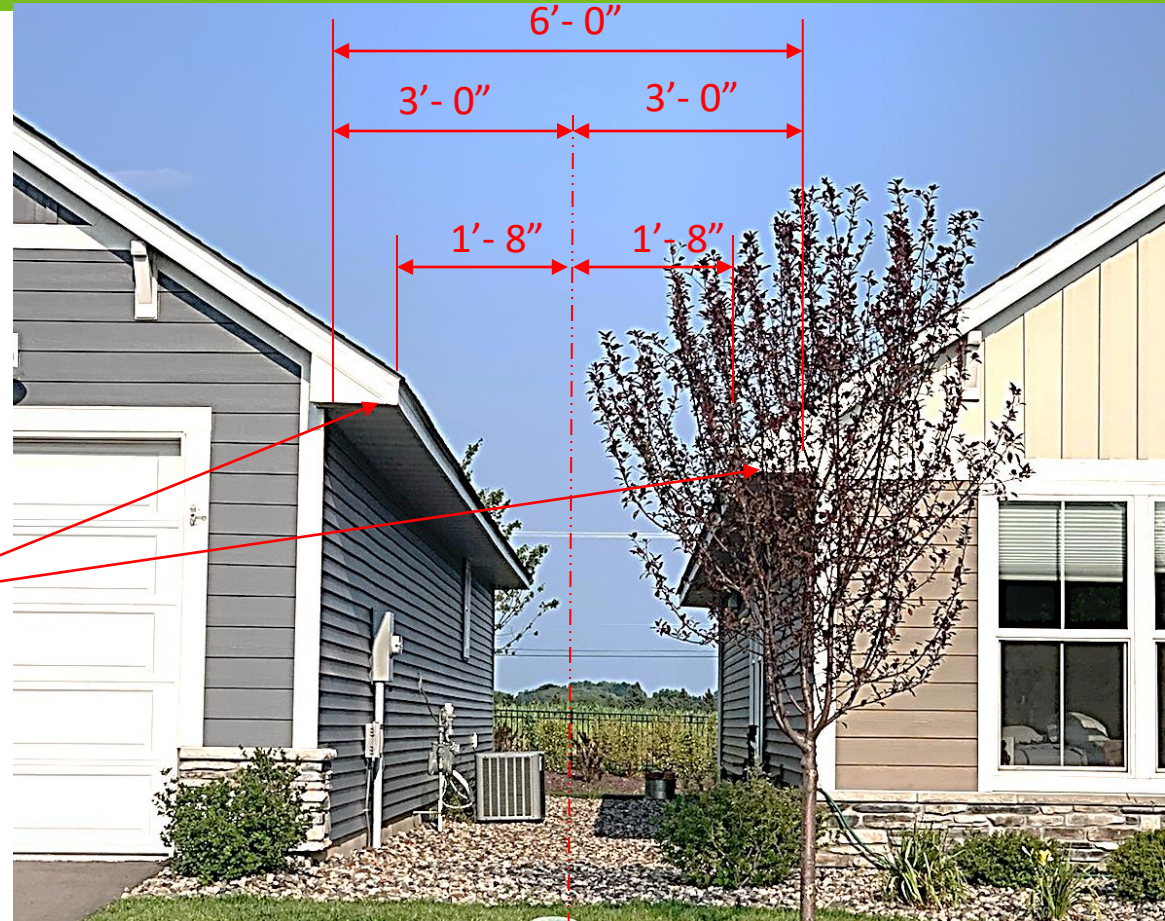
- < 3' - 0" and one-hour fire resistive protection **REQUIRED**

Openings in exterior walls: 3' - 0"

- **No limitations** to area of openings

Penetrations in exterior walls: 3' - 0"

- **No limitations** to area of openings



DLI/CCLD Photo

Lot line/
Line of fire separation distance

Exercise/Discussion

Which of the tables, Table R302.1(1) or Table R302.1(2) applies to the building plans provided?

**Table R302.1(1) or Table R302.1(2)?
Why?**

Answer:

IRC Table R302.1(1)

- **Two-unit townhouse**
- **Fire sprinklers not required**
- **R313.1 (see exception)**

Exercise/Discussion

- **Townhouse automatic fire sprinkler systems.** An automatic residential fire sprinkler system **shall be installed in townhouses.**

Exceptions:

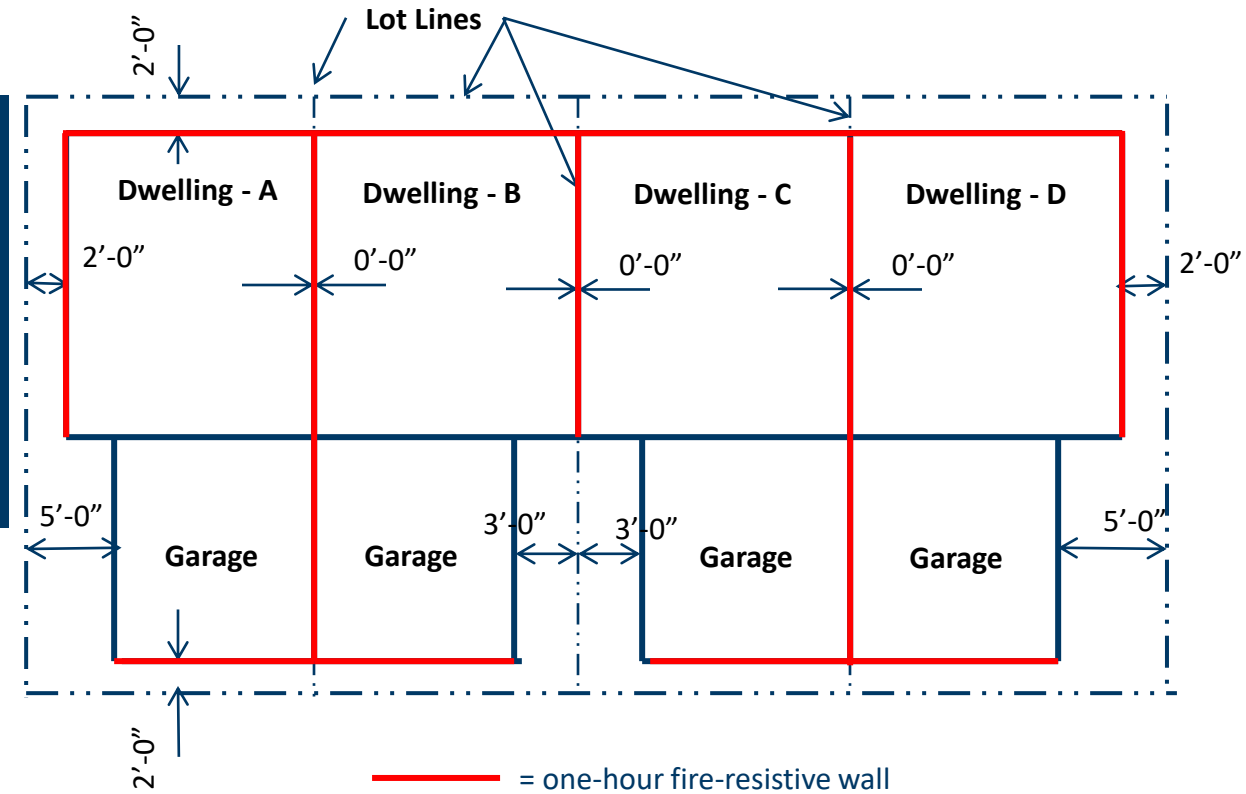
1. An automatic residential fire sprinkler system shall not be required to be installed in a **two-unit townhouse**, unless required by section R313.4.

Effective Monday, June 5, 2017, MR 1309.0313 was amended and published in the State Register establishing that neither one- and two-family dwellings, or two-unit townhouses, are required to have automatic fire sprinkler systems under the 2015 MN Residential Code (remains in effect for 2020 MRC)

Fire separation distance.

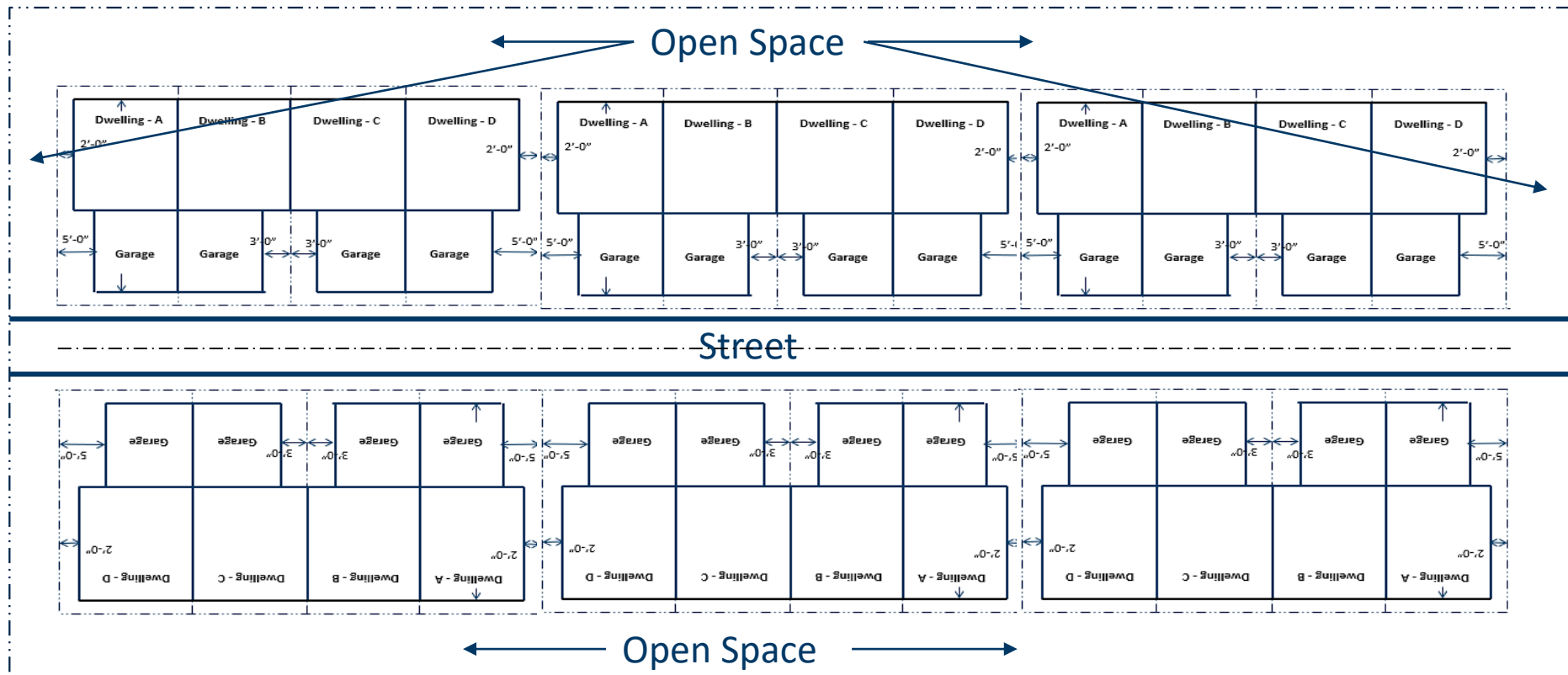
Exercise/Discussion

Which walls will require a fire-resistive rating?
Why?



Fire separation distance.

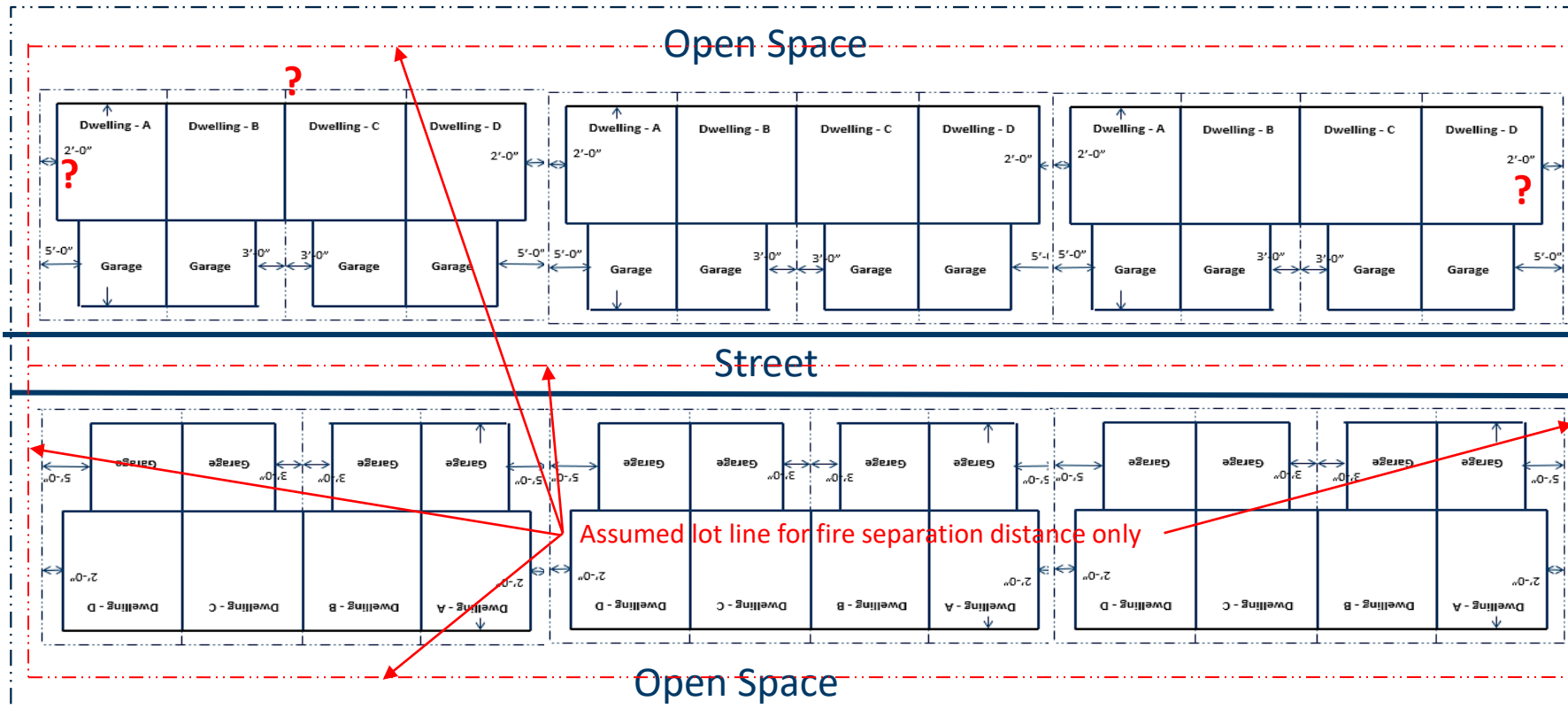
Exercise/Discussion



What if? Solution?

Fire separation distance.

Exercise/Discussion



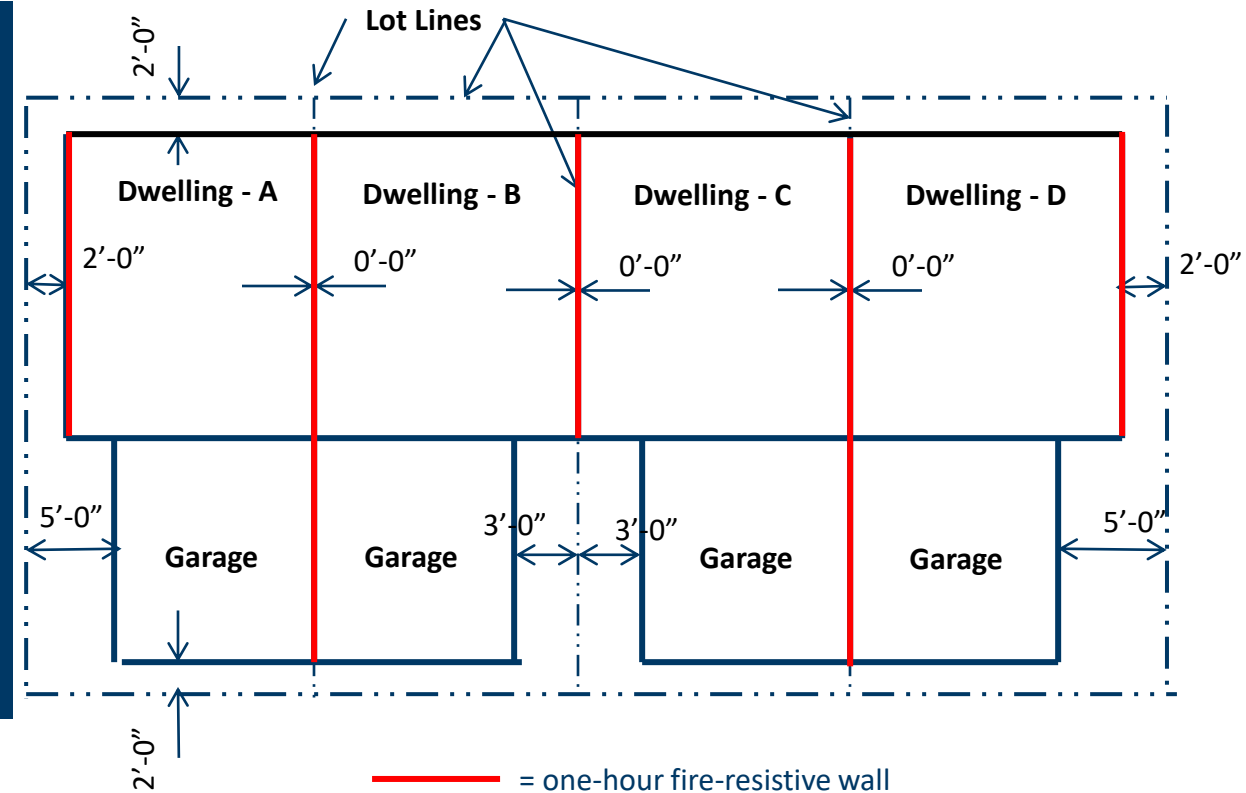
What if? Solution?

Fire separation distance.

Exercise/Discussion

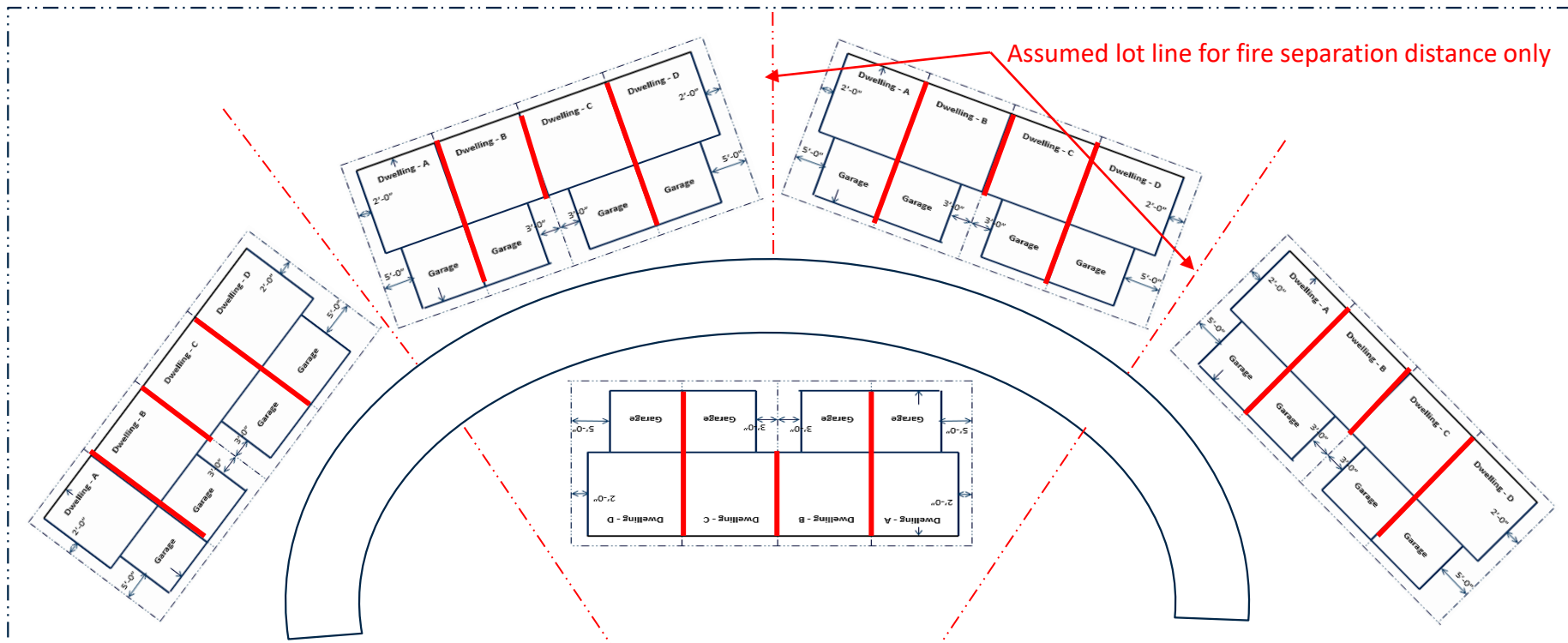
Based on the previous slide, which walls will require a fire-resistive rating?

Why?



Fire separation distance.

Exercise/Discussion



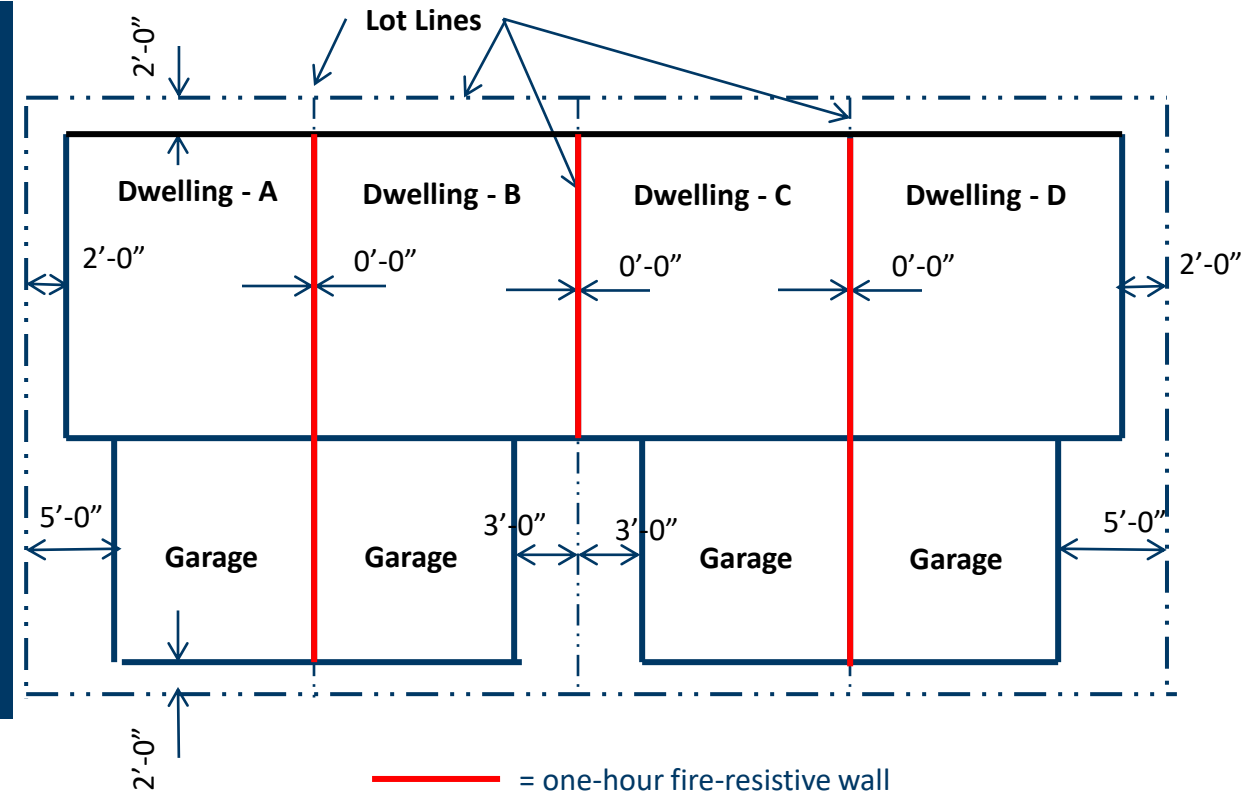
What if? Solution?

Fire separation distance.

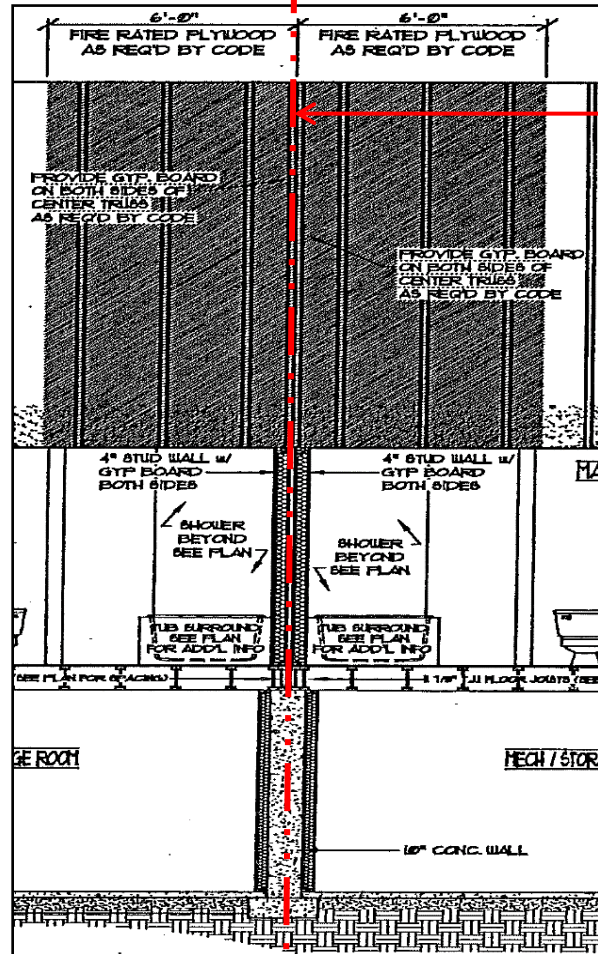
Exercise/Discussion

Based on the previous slide, which walls will require a fire-resistive rating?

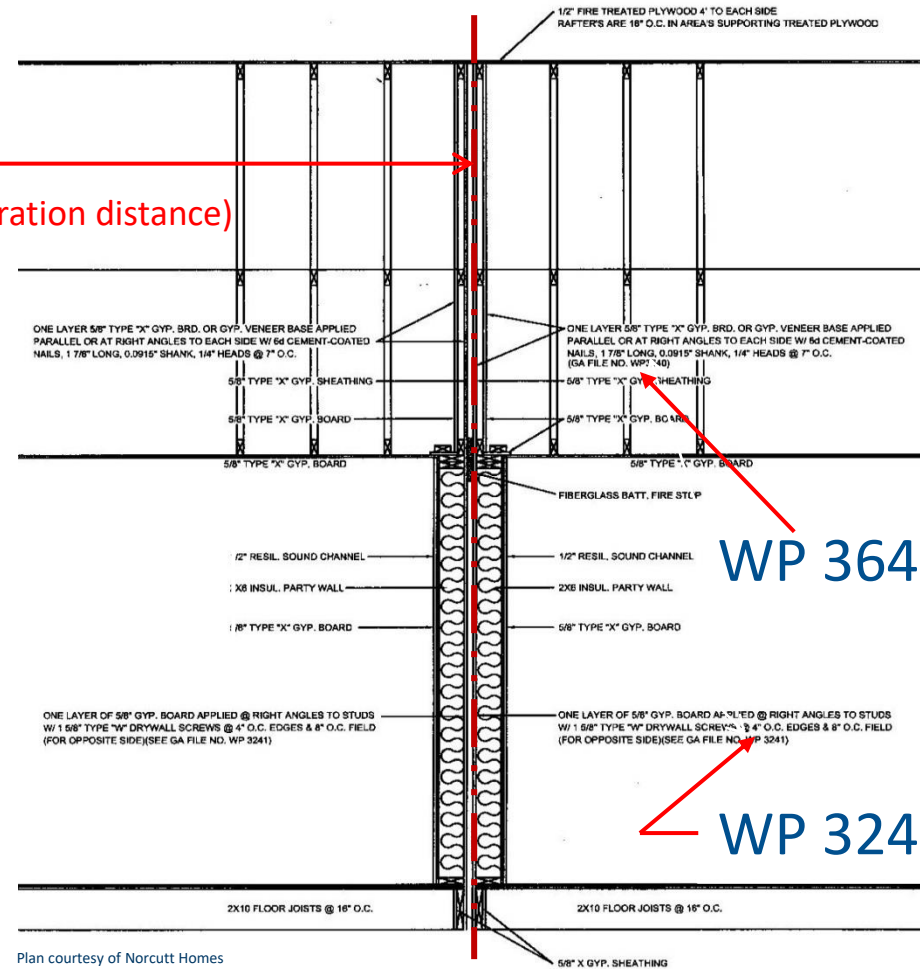
Why?



Fire separation distance.



Lot Line
(Line of fire separation distance)

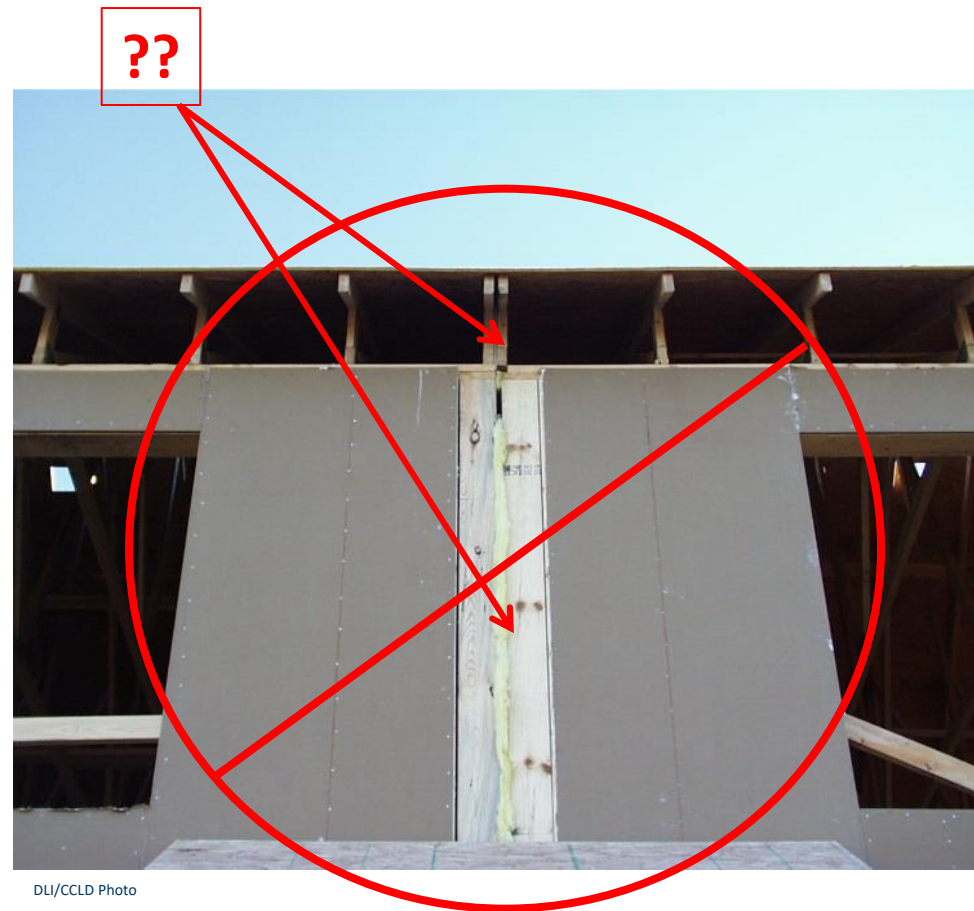


WP 3640

WP 3241

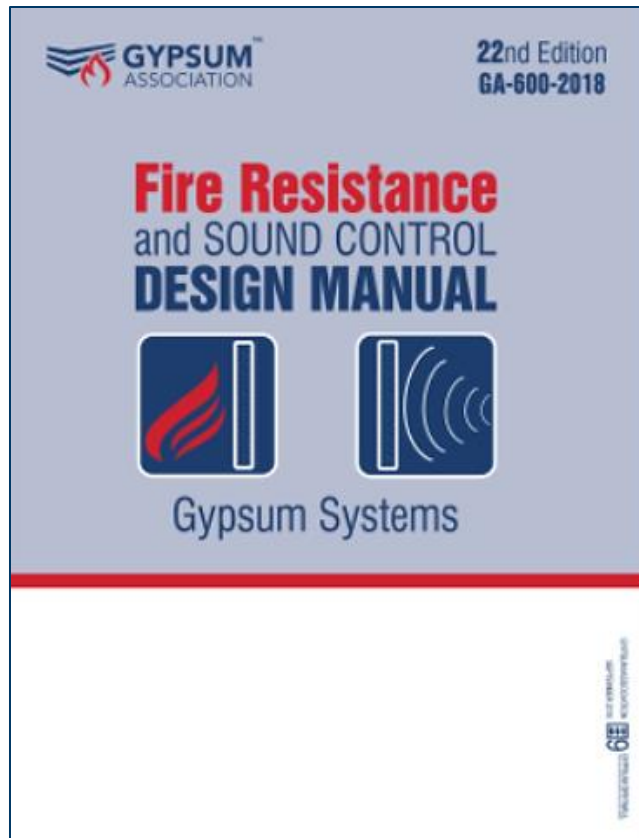
Fire separation distance.

The fire-resistance-rated wall assembly separating townhouses shall be continuous from the foundation to the underside of the roof sheathing, roof deck, or roof slab.

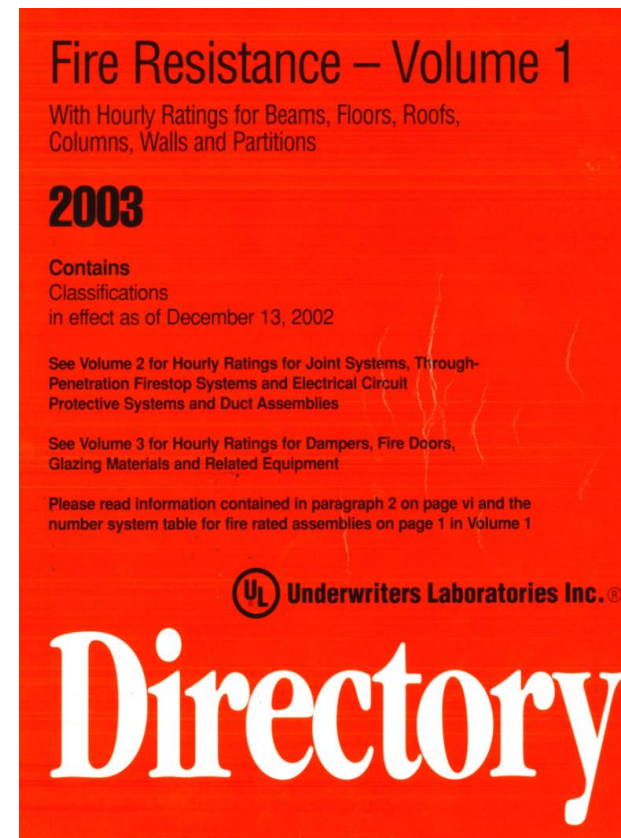


DLI/CCLD Photo

Resources to verify fire-resistance ratings



GA-600-2018 Fire Resistive Design Manual



Underwriters Laboratories Fire Resistance standard

www.ul.com/productspec

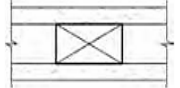
Townhouses

GA FILE NO. WP 3640 **GENERIC** **1 HOUR FIRE**

GYPSUM WALLBOARD, WOOD STUDS

One layer 5/8" type X gypsum wallboard or gypsum veneer base applied parallel or at right angles to each side of either 2 x 3 or 2 x 4 wood studs, turned flatwise, 24" o.c. with 6d cement-coated nails, 17/8" long, 0.0915" shank, 1/4" heads, 7" o.c.

Horizontal joints staggered not less than 12" on opposite sides. (NLB)



Thickness: 27/8"
Approx. Weight: 7 psf
Fire Test: UL, 9-12-96, UL Design U338

GA FILE NO. WP 3241 **PROPRIETARY*** **1 HOUR FIRE** **50 to 54 STC SOUND**

GYPSUM WALLBOARD, RESILIENT CHANNELS, MINERAL FIBER INSULATION, WOOD STUDS

Resilient channels 24" o.c. attached at right angles to ONE SIDE of 2 x 4 wood studs 16" or 24" o.c. with 1 1/4" Type S drywall screws. One layer 5/8" proprietary type X gypsum wallboard or gypsum veneer base applied parallel to channels with 1" Type S drywall screws 12" o.c. End joints backblocked with resilient channels. 3" mineral fiber insulation, 2.0 or 2.3 pcf, in stud space.

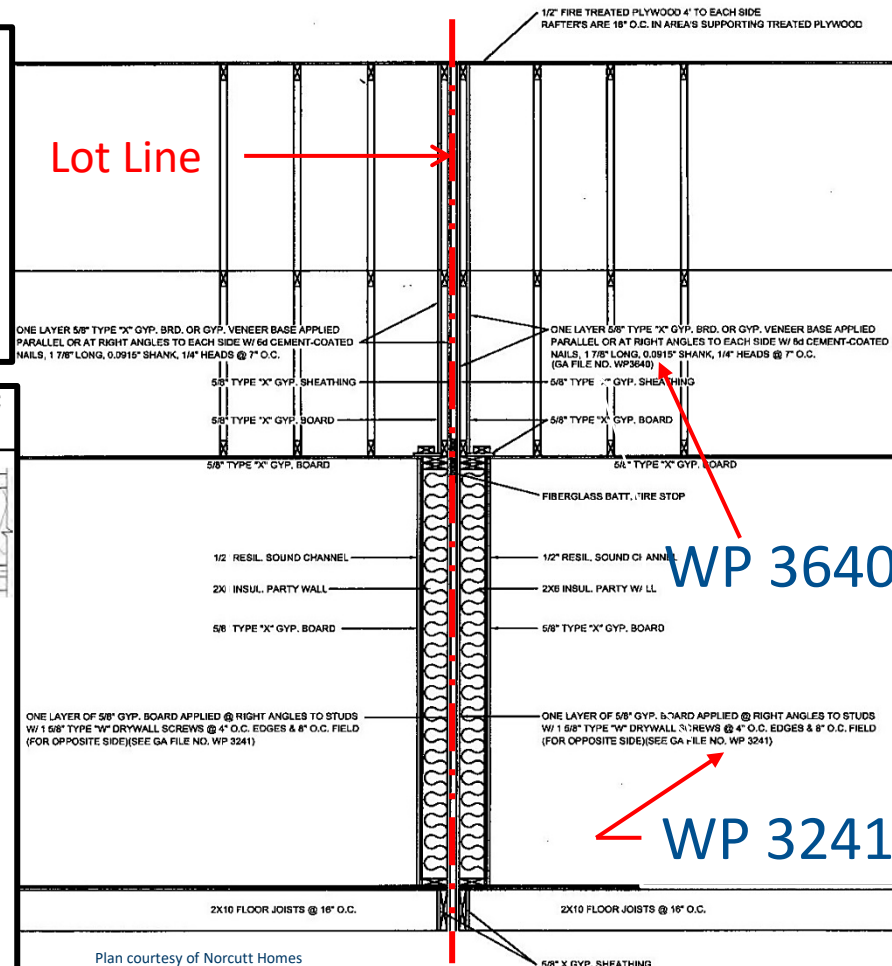
OPPOSITE SIDE: One layer 5/8" proprietary type X gypsum wallboard or gypsum veneer base applied at right angles to studs with 1 1/4" Type W drywall screws 12" o.c.

Vertical joints staggered 48" on opposite sides. Sound tested with studs 16" o.c. and open face of mineral fiber insulation blankets toward resilient channel-side of stud space. (LOAD-BEARING)

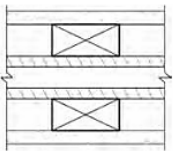
PROPRIETARY GYPSUM BOARD

CertainTeed Gypsum Inc.	-	5/8" CertainTeed® Type C Gypsum Board
CertainTeed Gypsum Canada Inc.	-	5/8" CertainTeed® Type C Gypsum Board
Georgia Pacific Gypsum LLC	-	5/8" ToughRock® Fireguard C® Gypsum Board
Lafarge North America Inc.	-	5/8" Firecheck® Type C Gypsum Board
National Gypsum Company	-	5/8" Gold Bond® Brand FIRE SHIELD C™ Gypsum Board
PABCO Gypsum	-	5/8" FLAME CURB® Super 'C'™
Temple-Inland	-	5/8" TG-C

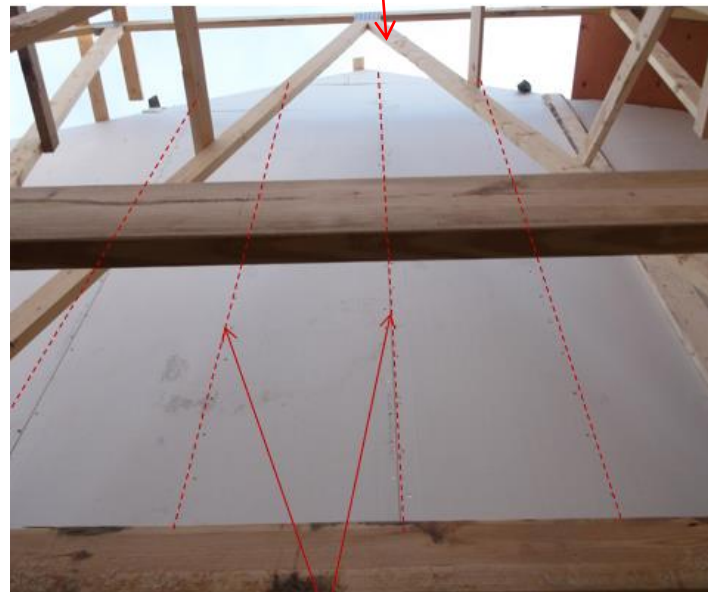
Thickness: 5 1/4"
Approx. Weight: 7 psf
Fire Test: Based on UL R3660-7, 11-12-87; UL R2717-61, 8-18-87; UL Design U311
Sound Test: Estimated



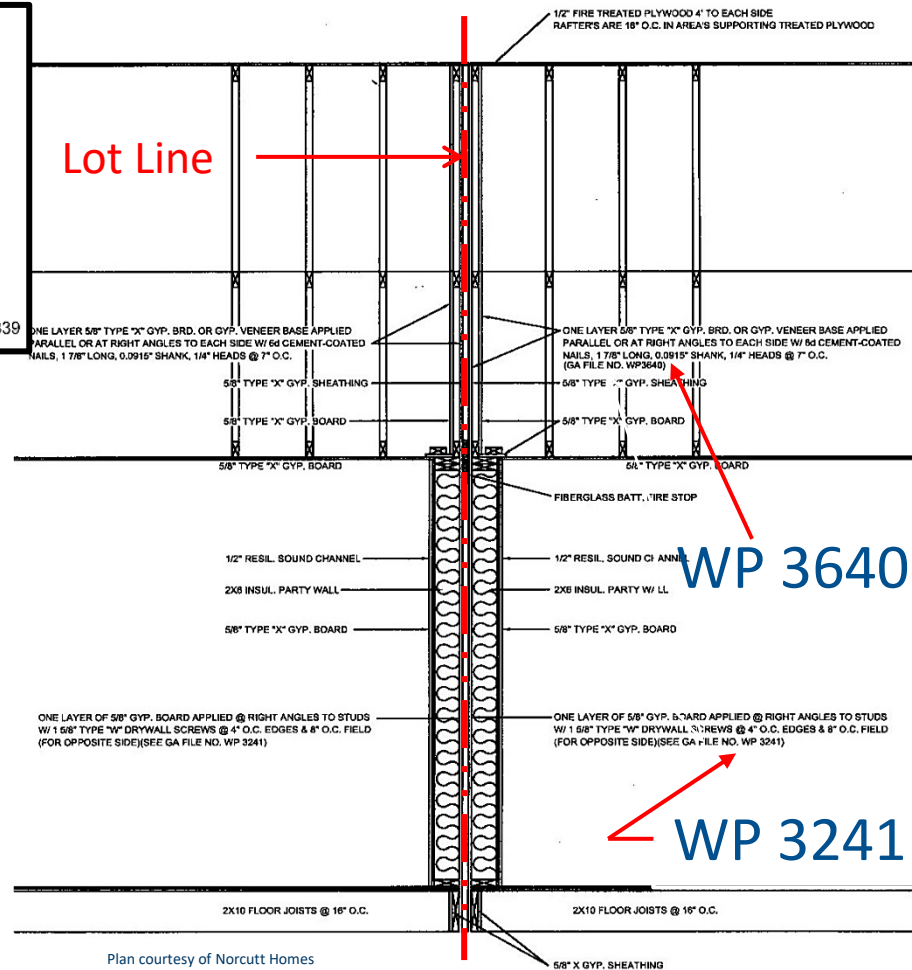
GA-600-2012 Fire Resistive Design Manual

GA FILE NO. WP 3642	GENERIC	1 HOUR FIRE
GYPSUM WALLBOARD, WOOD STUDS		
<p>One layer 5/8" type X gypsum wallboard or gypsum veneer base applied parallel or at right angles to ONE SIDE of either 2 x 3 or 2 x 4 wood studs, turned flatwise, 24" o.c. with 6d cement-coated nails, 1 7/8" long, 0.0915" shank, 1/4" heads, 7" o.c.</p>		
<p>Inner layer plywood applied with nails.</p>		
<p>Second wall duplicate of first wall and separated by 1" air space. (NLB)</p>		
		
<p>Thickness: 5 1/2" Approx. Weight: 10 psf Fire Test: UL, 9-12-96, UL Design U339</p>		

GA-600-2012 Fire Resistive Design Manual



DUI/CCLD Photo

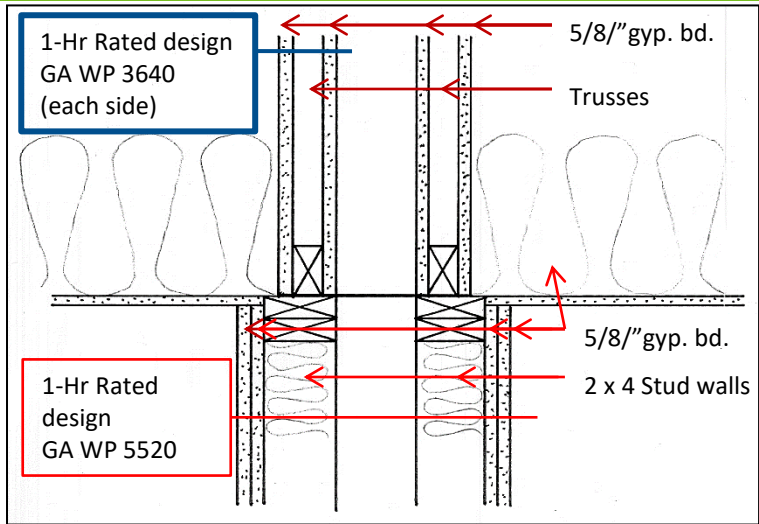


WP 3640

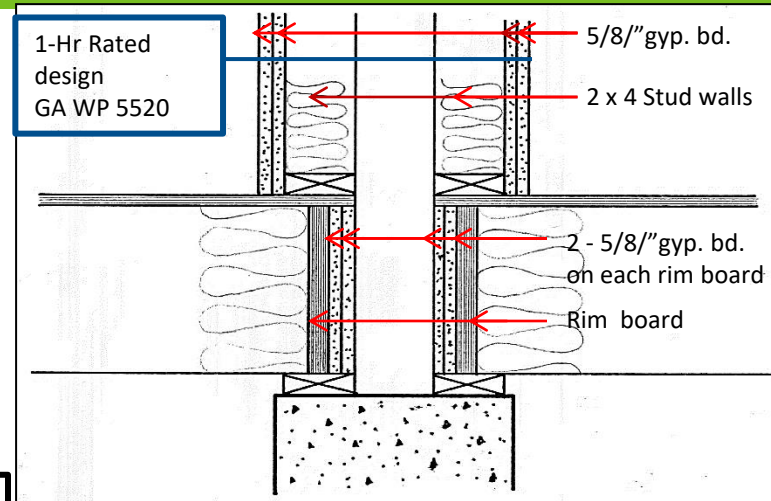
WP 3241

Plan courtesy of Norcutt Homes

Townhouses

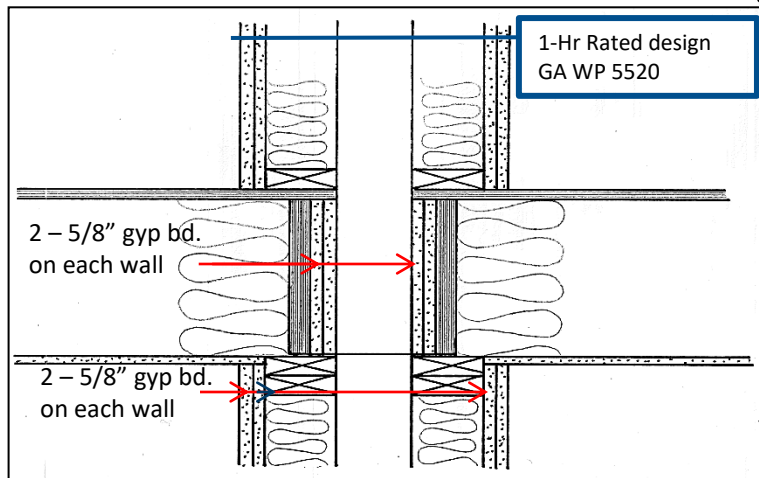


Common Wall at Attic

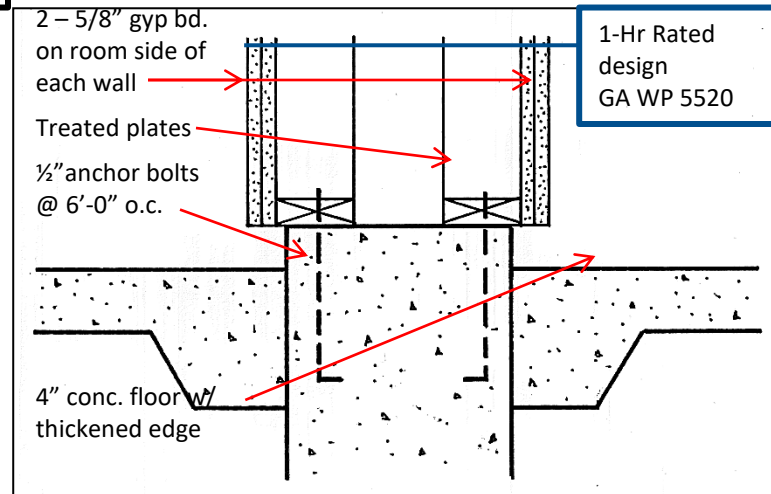


Common Wall at Foundation

Optional Designs



Common Wall at Second Floor

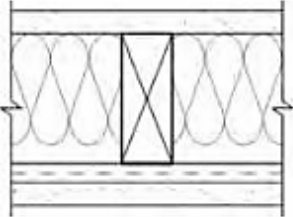
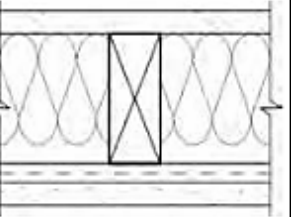


Common Wall at Foundation (Garage)

Fire separation distance.

Townhouses. (Cont.)

Exception: A common 1-hour fire-resistance-rated wall...

GA FILE NO. WP 3242	GENERIC	1 HOUR FIRE	50 to 54 STC SOUND
<p align="center">GYPSUM WALLBOARD, RESILIENT CHANNELS, MINERAL OR GLASS FIBER INSULATION, WOOD STUDS</p> <p>Resilient channels 16" o.c. attached at right angles to ONE SIDE of 2 x 4 wood studs 24" o.c. with 1 1/4" Type S drywall screws. One layer 5/8" type X gypsum wallboard or gypsum veneer base applied at right angles to channels with 1" Type S drywall screws 8" o.c. with vertical joints located midway between studs. 3" mineral or glass fiber insulation in stud space.</p> <p>OPPOSITE SIDE: One layer 5/8" type X gypsum wallboard or gypsum veneer base applied parallel or at right angles to studs with 6d cement coated nails, 1 7/8" long, 0.0915" shank, 15/64" heads, 7" o.c.</p> <p>Vertical joints staggered 24" on opposite sides. (LOAD-BEARING)</p>			
		<p>Thickness: 5 3/8"</p> <p>Approx. Weight: 7 psf</p> <p>Fire Test: Based on UL R14196, 05NK05371, 2-15-05, UL Design U309</p> <p>Sound Test: NRCC TL-93-098, IRC-IR-761, 3/98</p>	

Fire separation distance.

Townhouses. (Cont.)

Exception: A common 2-hour fire-resistance-rated wall...

GA FILE NO. WP 3825	PROPRIETARY*	2 HOUR FIRE	55 to 59 STC SOUND
GYPSUM WALLBOARD, WOOD STUDS			
<p>Base layer 5/8" type X gypsum wallboard applied at parallel to each side of 2 x 4 wood studs 24" o.c. with 1 1/4" Type S drywall screws 8" o.c. Face layer 5/8" type X gypsum wallboard applied parallel to each side with 2" Type S drywall screws 8" o.c.</p>			
<p>Joints staggered 24" each layer and side. Sound tested with resilient channels 24" o.c. on one side and and 3 1/2" glass fiber insulation in the stud cavity. (LOAD-BEARING)</p>			
<p>PROPRIETARY GYPSUM BOARD American Gypsum Company LLC 5/8" FireBloc® Type X</p>			
		<p>Thickness: 6 1/8" Approx. Weight: 13 psf Fire Test: UL R14196, 11NK09957, 7-22-11, UL Design U301 Sound Test: RAL TL11-164, 7-12-11</p>	

Fire separation distance.

Continuity.

The **fire-resistance-rated wall** assembly separating townhouses shall be continuous from the foundation to the underside of the roof sheathing, roof deck, or roof slab.

The fire-resistance rating shall extend the **full length of the wall** or assembly, including wall extensions through and separating attached enclosed accessory structures.

Fire separation distance.

Continuity.

The separation shall extend through enclosed soffits, overhangs, and similar projections.

??



Fire separation distance - Parapets.

R302.2.4 Parapets for townhouses. Parapets constructed in accordance with Section R302.2.5 shall be constructed for townhouses as an **extension of exterior walls or common walls** in accordance with the following:

1. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend **not less than 30 inches above the roof surfaces.**
2. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches above the lower roof, the parapet shall extend not less than 30 inches above the lower roof surface.

Fire separation distance - Parapets.

Exception:

A parapet is not required when the roof is covered with a minimum class C roof covering, and

The roof decking or sheathing is of noncombustible materials or approved fire-retardant-treated wood for a distance of 4 feet on each side of the wall or walls, or one layer of $\frac{5}{8}$ -inch type X gypsum board is installed directly beneath the roof decking or sheathing,...

and

There are no openings or penetrations in the roof within 4 feet of the common walls.

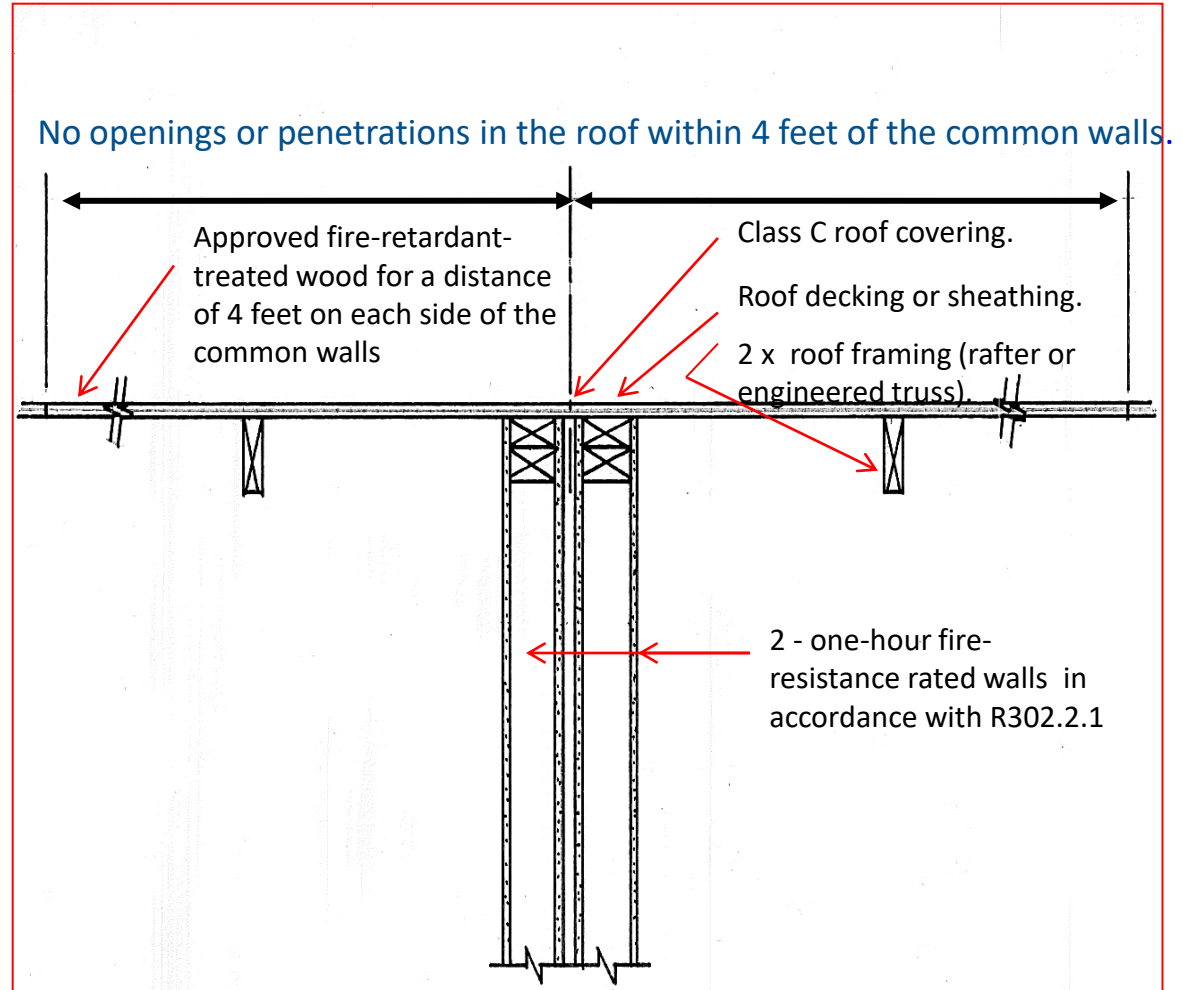
Parapets.



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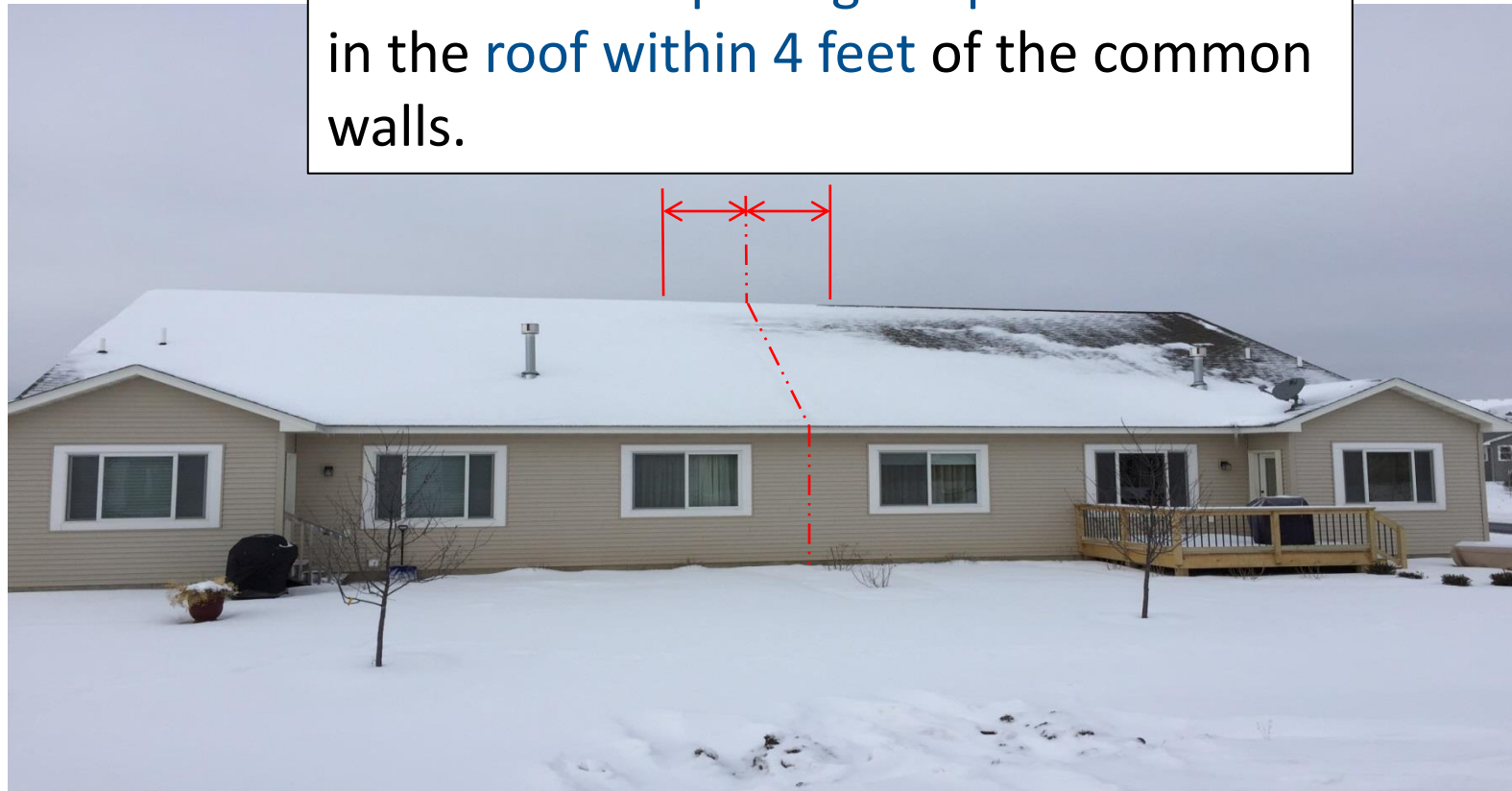
DLI/CCLD Photo



DLI/CCLD Illustration

Fire separation distance

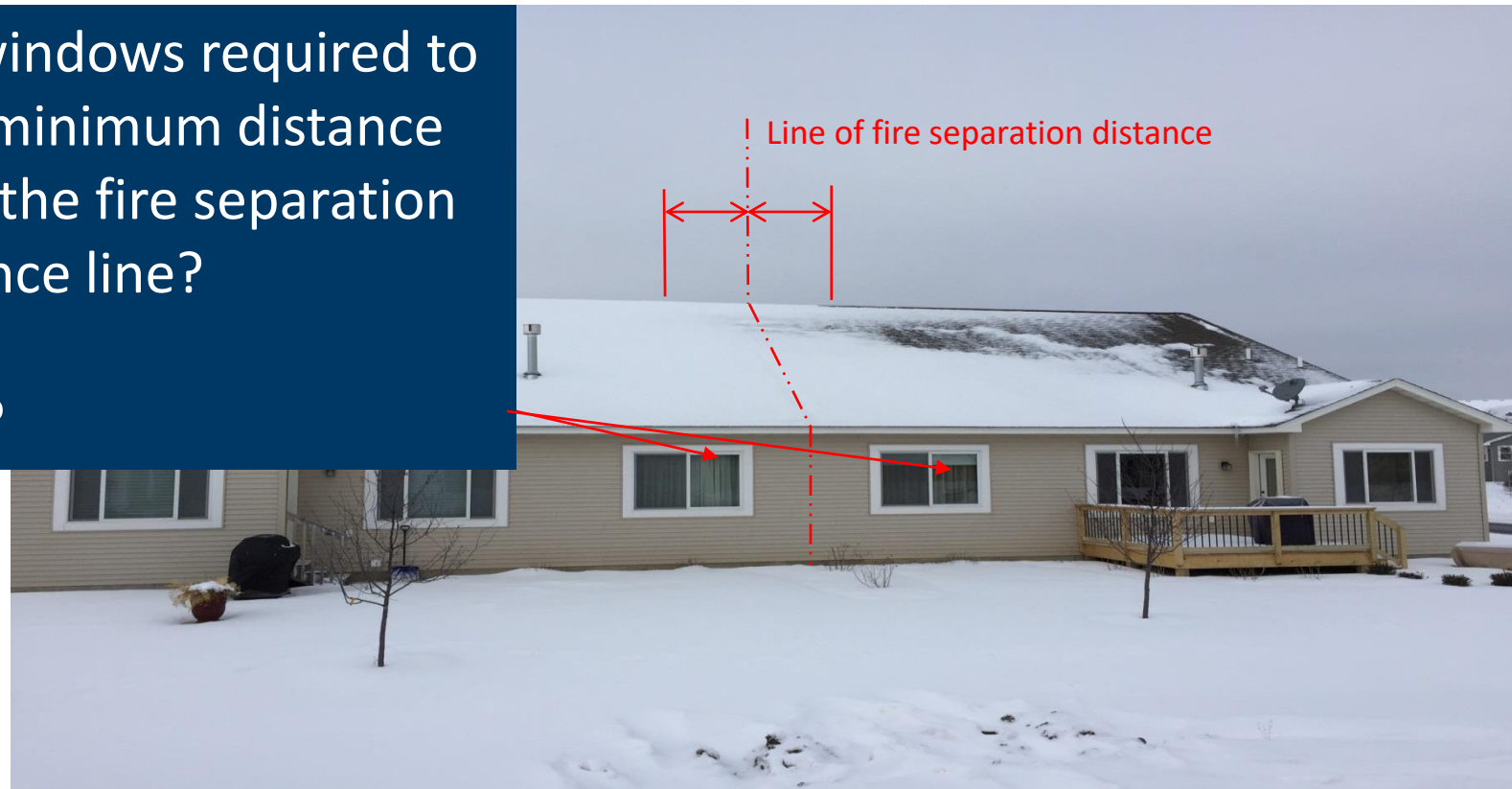
There are no openings or penetrations in the roof within 4 feet of the common walls.



Exercise/Discussion

Are windows required to be a minimum distance from the fire separation distance line?

Why?



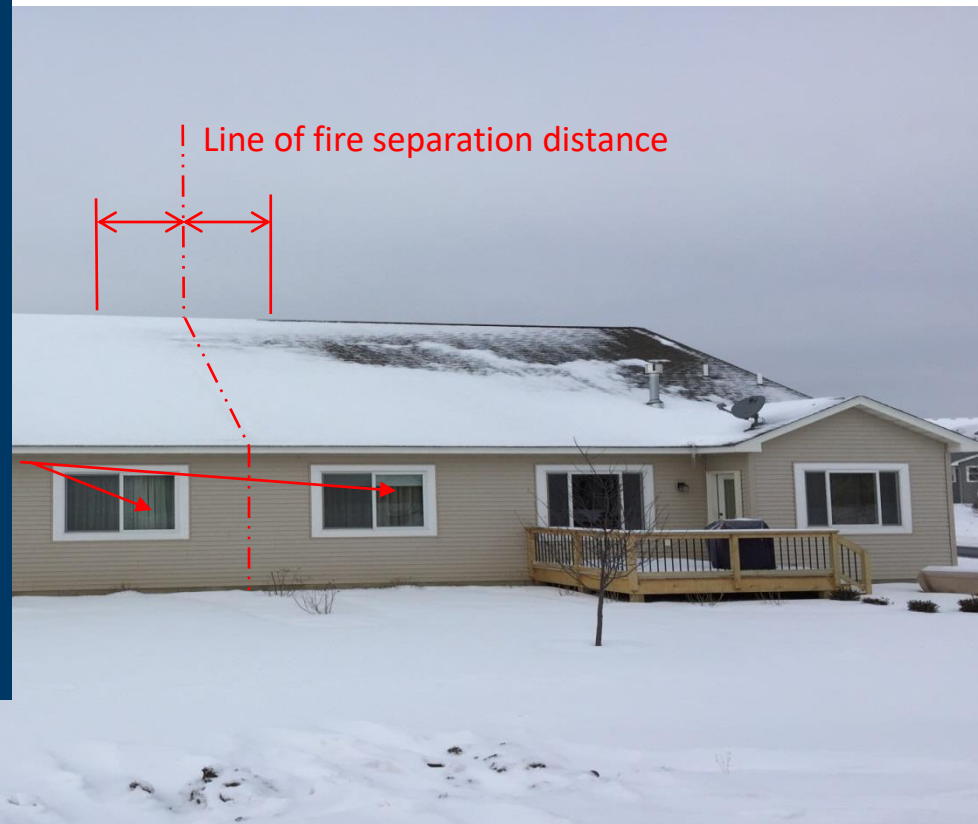
Exercise/Discussion

SECTION R302 FIRE-RESISTANT CONSTRUCTION

R302.1 Exterior walls. Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1(1); or dwellings equipped throughout with an automatic sprinkler system installed in accordance with Section P2904 shall comply with Table R302.1(2).

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.



Fire separation distance. Exercise/Discussion



Structural independence.

Each individual townhouse shall be structurally independent.

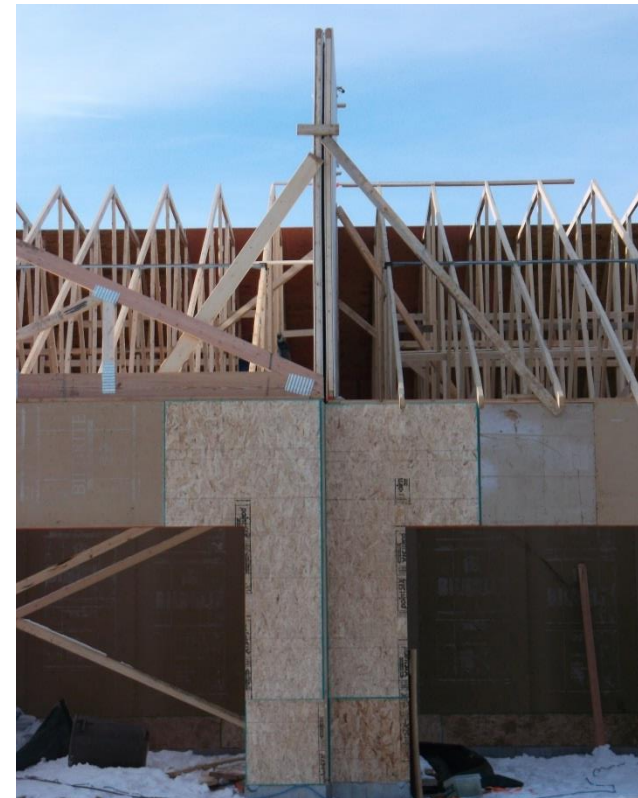
Exceptions: (see all exceptions)

- Townhouses separated by a common wall as provided in Section R302.2.

Structural independence.

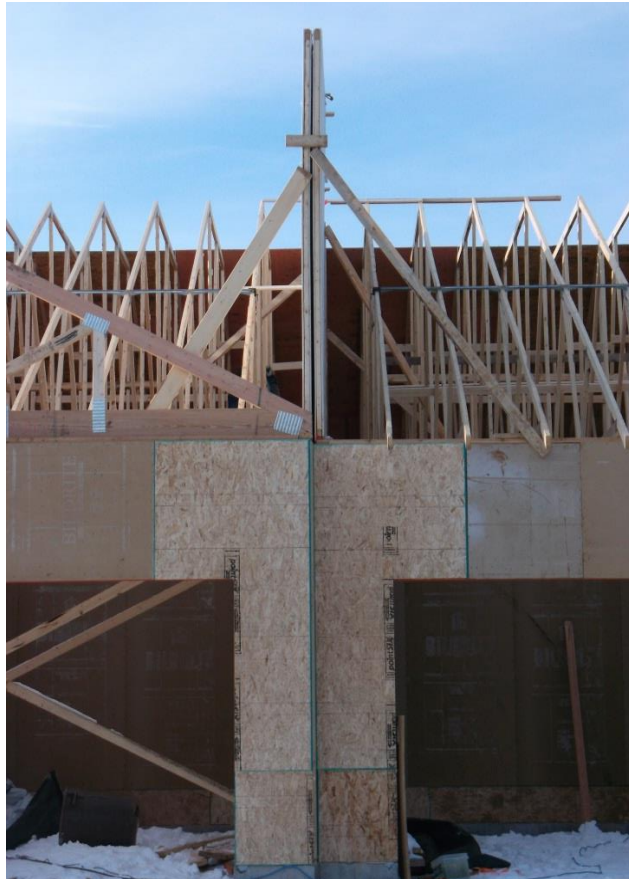


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DLI/CCLD Photo

Structural independence.



DLI/CCLD Photo

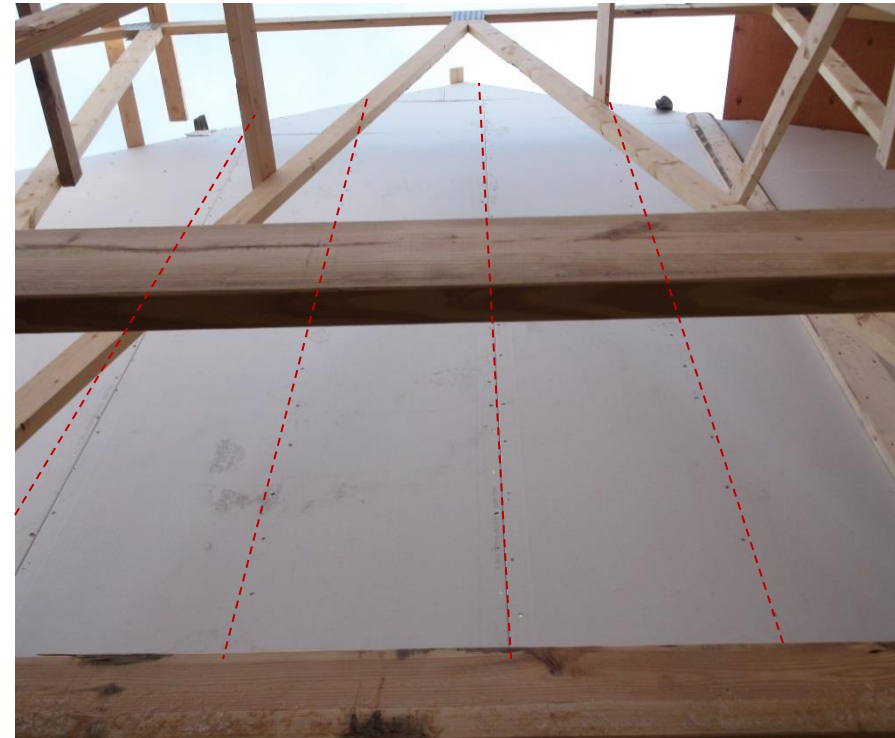


DLI/CCLD Photo

Structural independence.

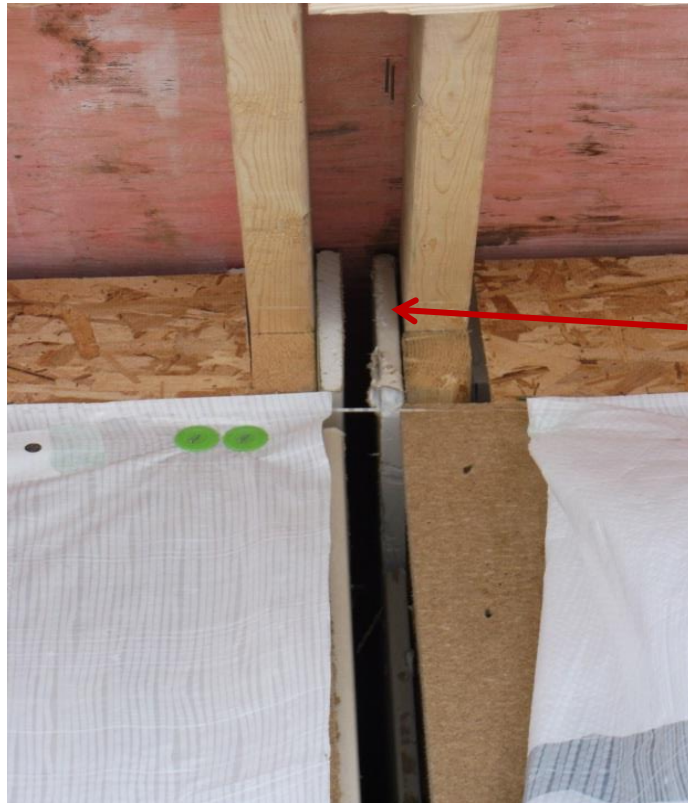


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DLI/CCLD Photo

Structural independence.



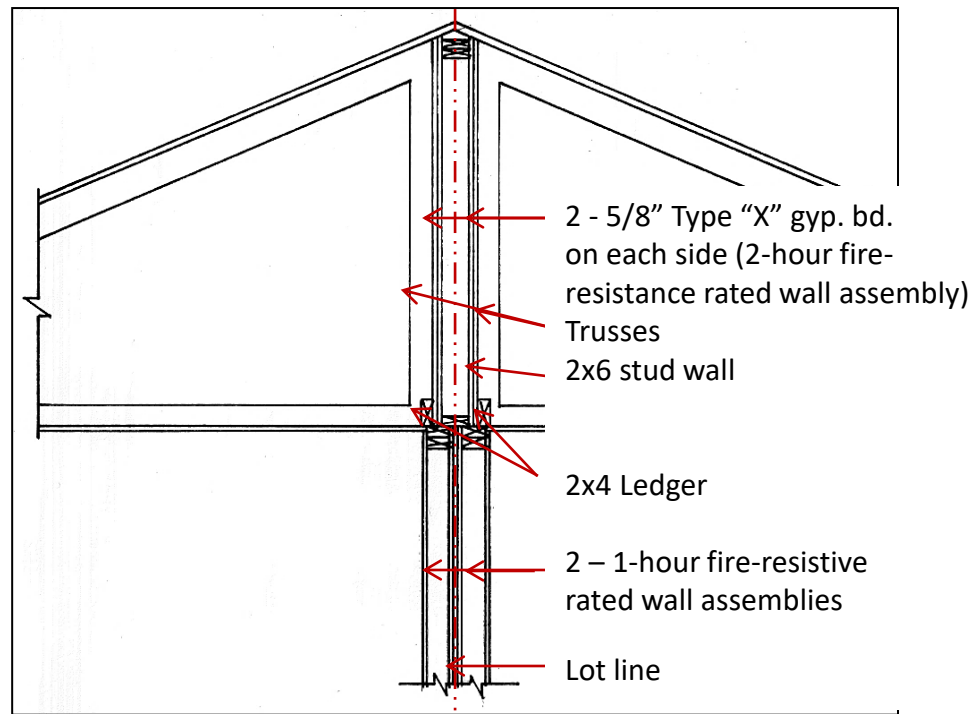
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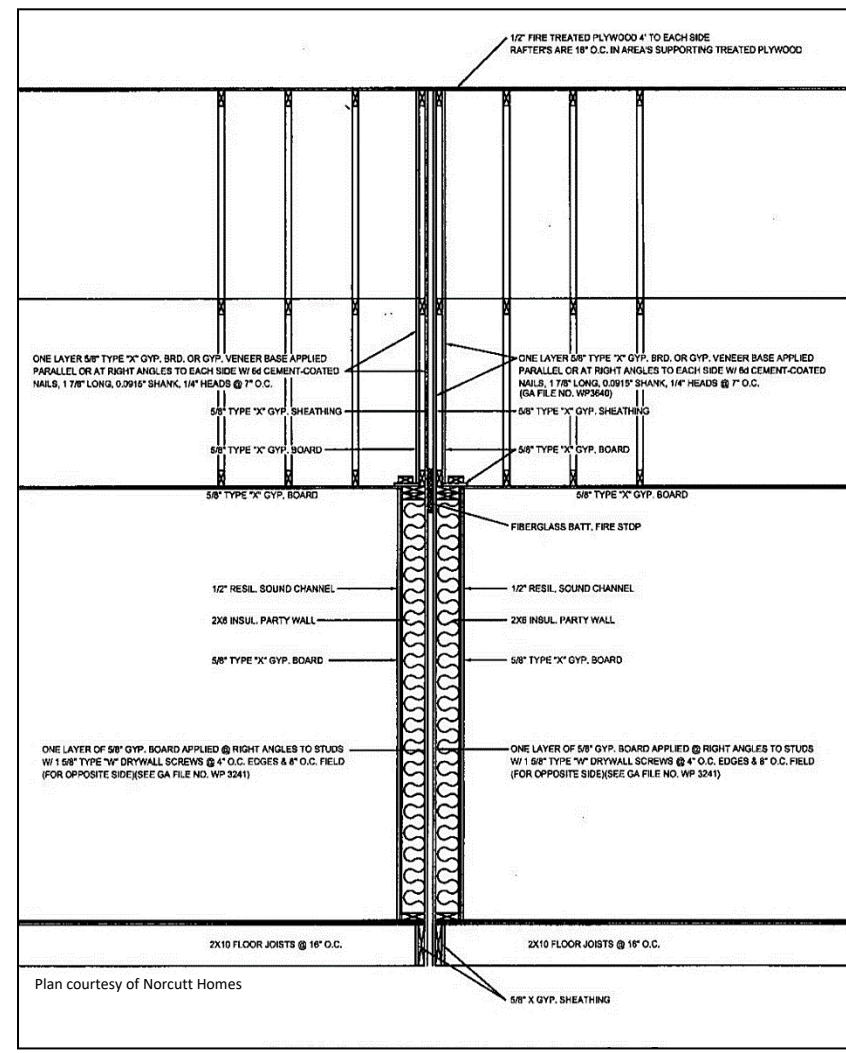
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Structural independence.



DLI/CCLD Illustration

Exercise/Discussion



Structural independence.

BEFORE



DLI/CCLD Photo

Structural independence.

AFTER



Photo provided by D. Schoepner

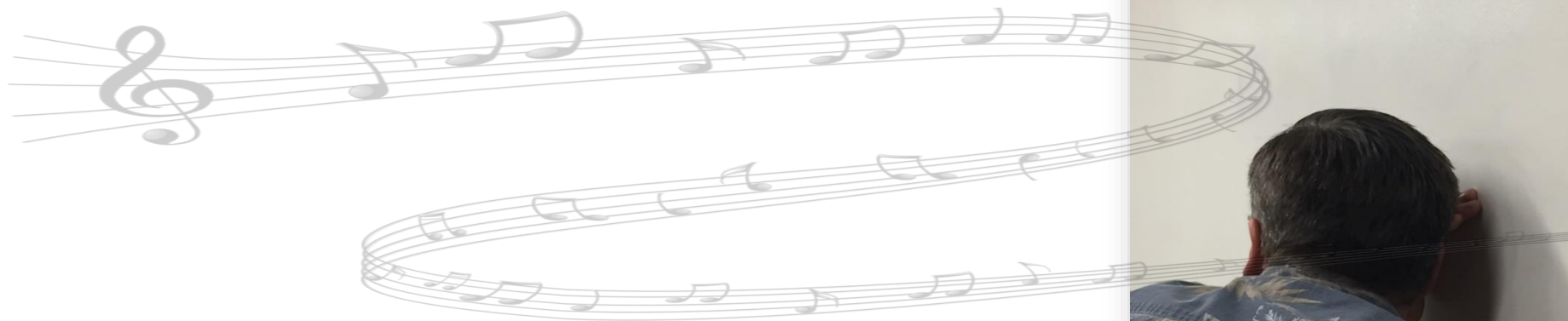


Photo provided by D. Schoepner

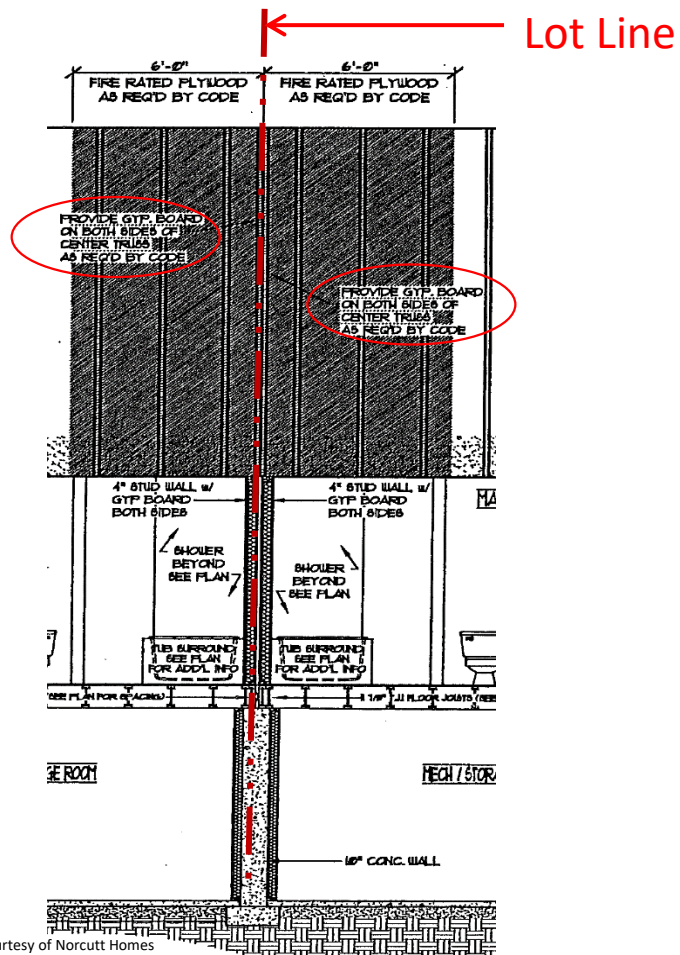
Code compliance performs when everyone does their job.

Sound transmission.

Townhouses constructed in accordance with Section R302.2 shall comply with the [sound transmission requirements of Appendix K](#).



Exercise/Discussion



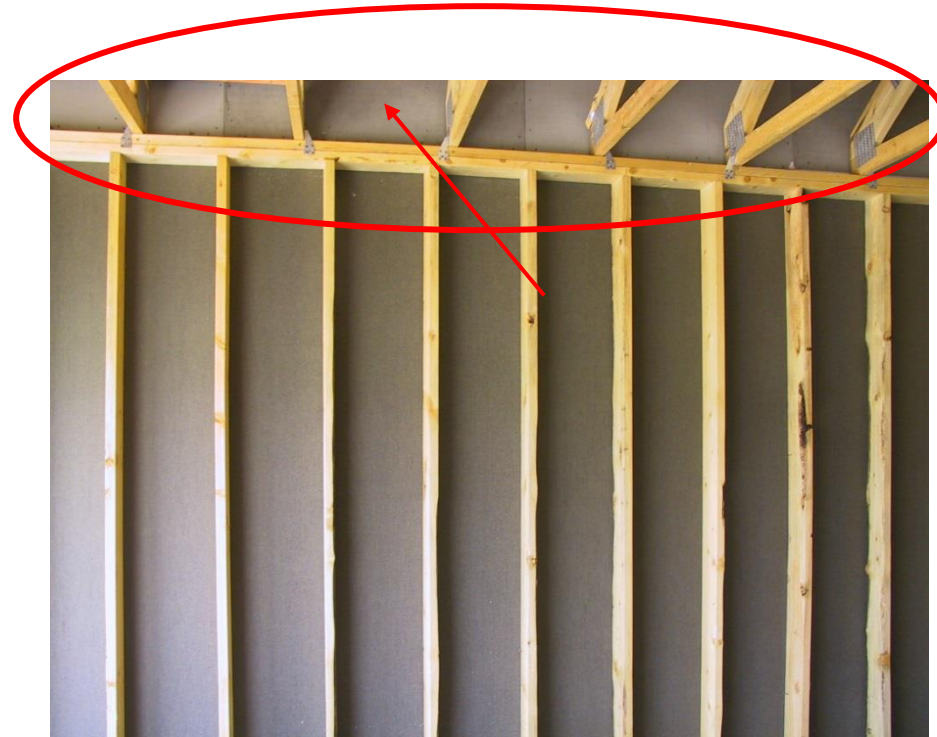
- Is there a listed design for:
 - the common wall?
 - attic separation?
 - rim joist?
 - foundation?
- Have the parapet requirements been met?
- Does the cross section appear to comply with structural independence?

Discuss: “as required by code”

Exercise/Discussion



DLI/CCLD Photo



DLI/CCLD Photo

Exercise/Discussion



DLI/CCLD Photo



DLI/CCLD Photo

Two-family dwellings



DLI/CCLD Photo

Two-family dwellings



DLI/CCLD Photo



DLI/CCLD Photo

Each of the photos represents a two-family dwelling on one lot. One dwelling with a horizontal separation and the other with a vertical separation.

Scope and definitions

Exercise/Discussion



DLI/CCLD Photo

**If a single-family dwelling (IRC-1) is converted to a two-family dwelling, is it still classified as an IRC-1 occupancy?
Why?**

Scope and definitions

Exercise/Discussion



DLI/CCLD Photo

What are some considerations before issuing a building permit to allow changing a one-family to a two-family dwelling?

Scope and definitions

Exercise/Discussion



DLI/CCLD Photo

What are some considerations...

- Zoning approval
- Comply with IRC-2 code requirements
- Means of egress and EERO
- Sanitation
- SAC charge
- Smoke and CO alarms
- STC ratings
- Fire separation between dwellings (walls, floors, penetrations...)
- Separate electrical systems
- Verify mechanical systems

Two-family dwellings.

Dwelling units in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating when tested in accordance with ASTM E 119, UL 263 or Section 703.3 of the International Building Code.

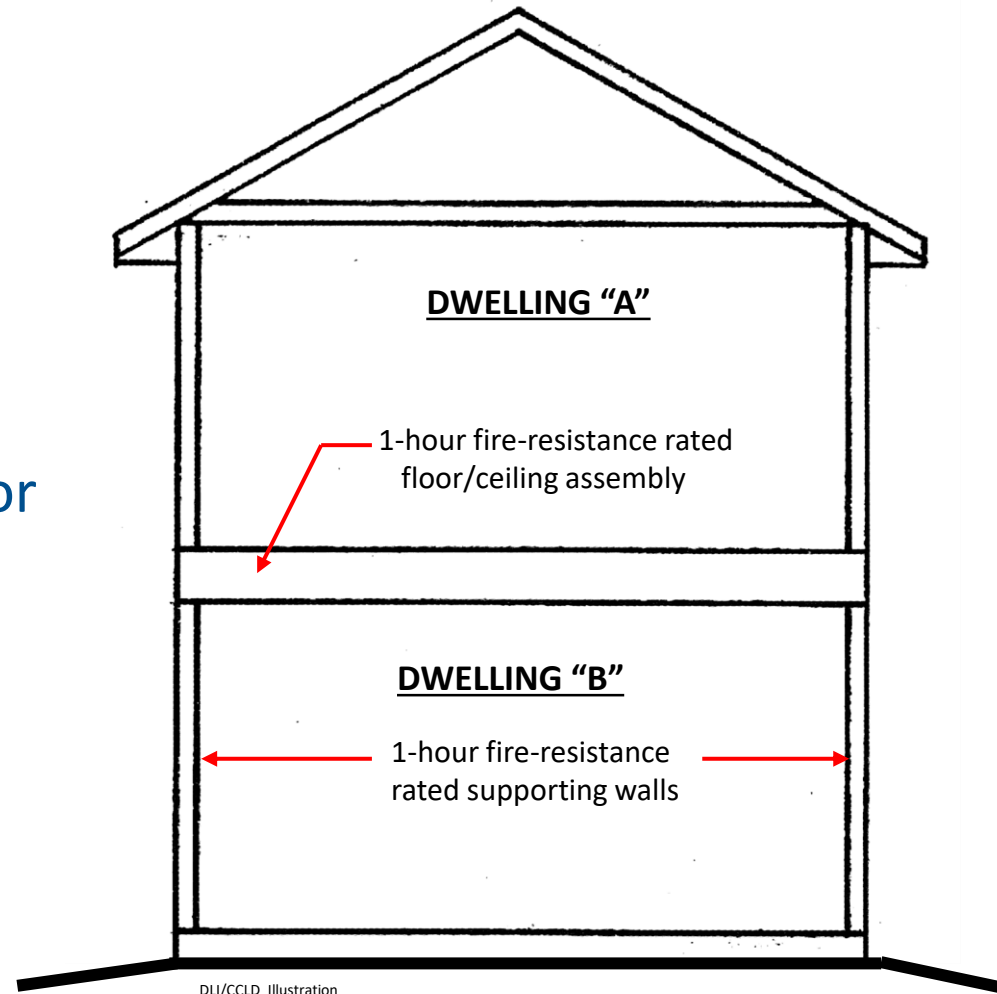
Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

(see exceptions)

Two-family dwellings

Supporting construction.

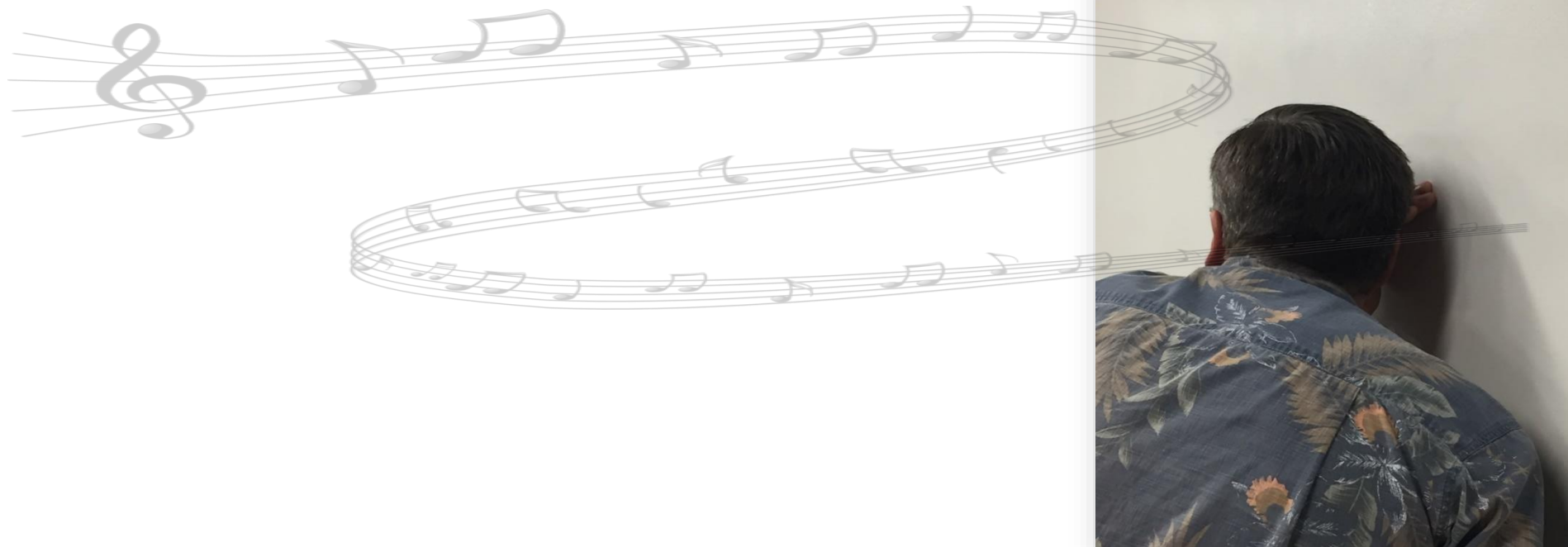
When floor assemblies are required to be fire-resistance rated by Section R302.3, the **supporting construction** of such assemblies shall have an **equal or greater fire-resistance rating**.



Two-family dwellings

Sound transmission.

Two-family dwellings constructed in accordance with Section R302.3 shall comply with the [sound transmission requirements of Appendix K](#).



Dwelling unit rated penetrations

Dwelling unit rated penetrations.

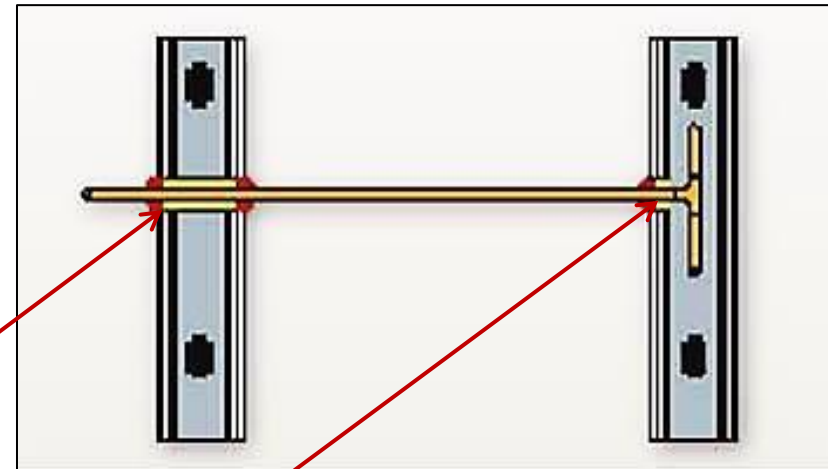
Penetrations of wall or floor/ceiling assemblies required to be fire-resistance rated in accordance with Section R302.2 or R302.3 shall be **protected** in accordance with this section.

Dwelling unit rated penetrations

Dwelling unit rated penetrations.

There are **two types of penetrations** to be considered:

- A **through penetration** passes entirely through a fire-resistance rated assembly.
- A **membrane penetration** passes through **one side** of fire-resistance rated assembly.

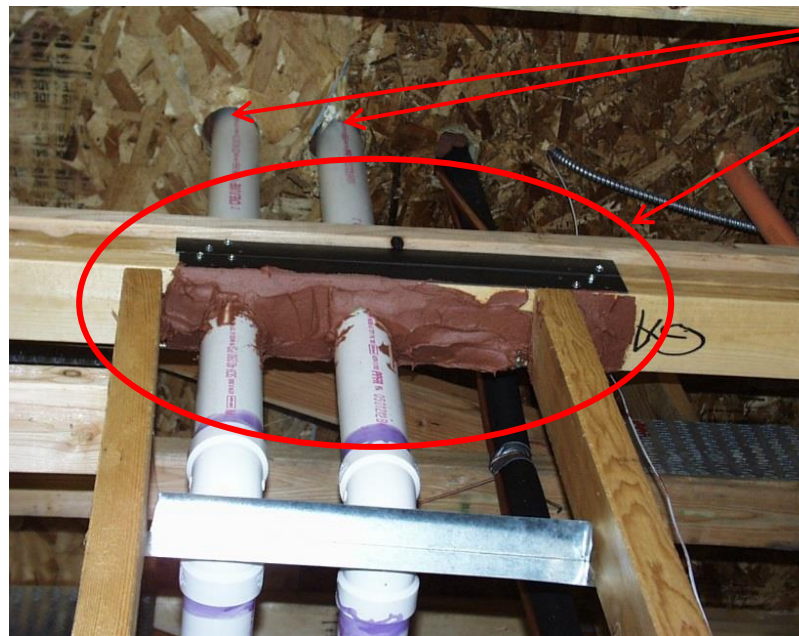


Courtesy of Hilti Firestop Systems Guide

Dwelling unit rated penetrations

Dwelling unit rated penetrations.

Penetrations of **wall** or **floor/ceiling assemblies** required to be fire-resistance rated in accordance with Section R302.2 or R302.3 **shall be protected** in accordance with this section.



DLI/CCLD Photo

Dwelling unit rated penetrations



DLI/CCLD Photo

UL SYSTEM NO. F-C-2030
PLASTIC PIPE THROUGH WOOD FLOOR/CEILING ASSEMBLY
 F-RATING = 1-HR. OR 2-HR.
 T-RATING = 0-HR., 3/4-HR., 1-HR., 1-1/2-HR. OR 2-HR.

BOTTOM VIEW

SECTION A-A

FC2030j_022604

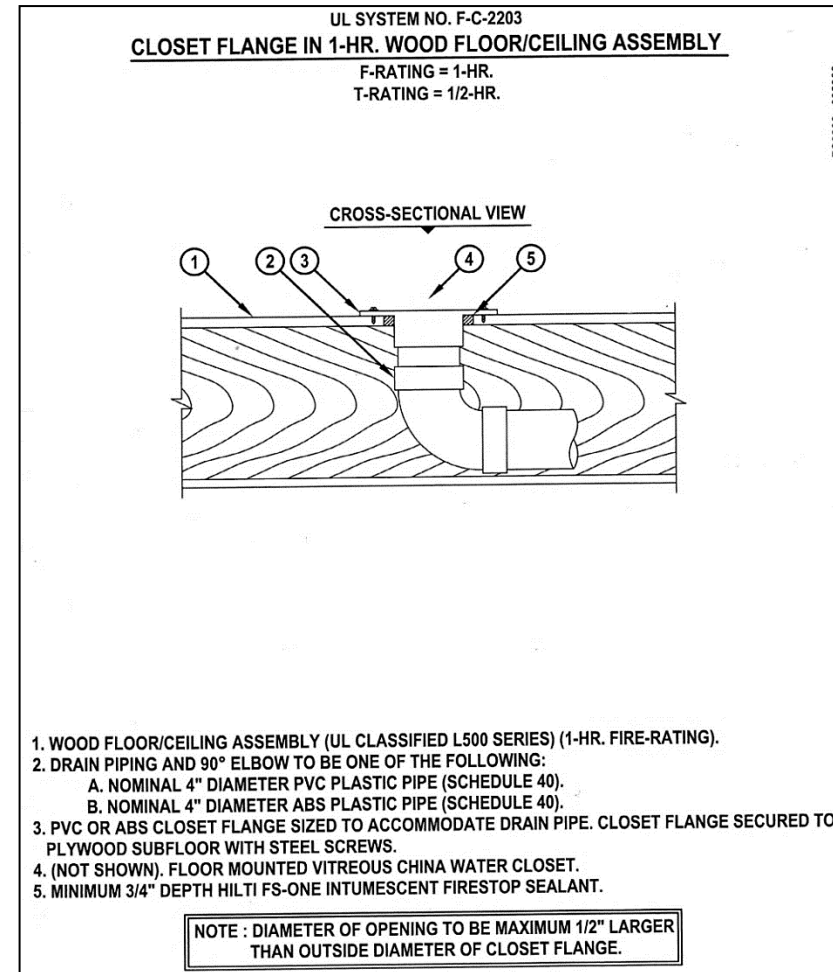
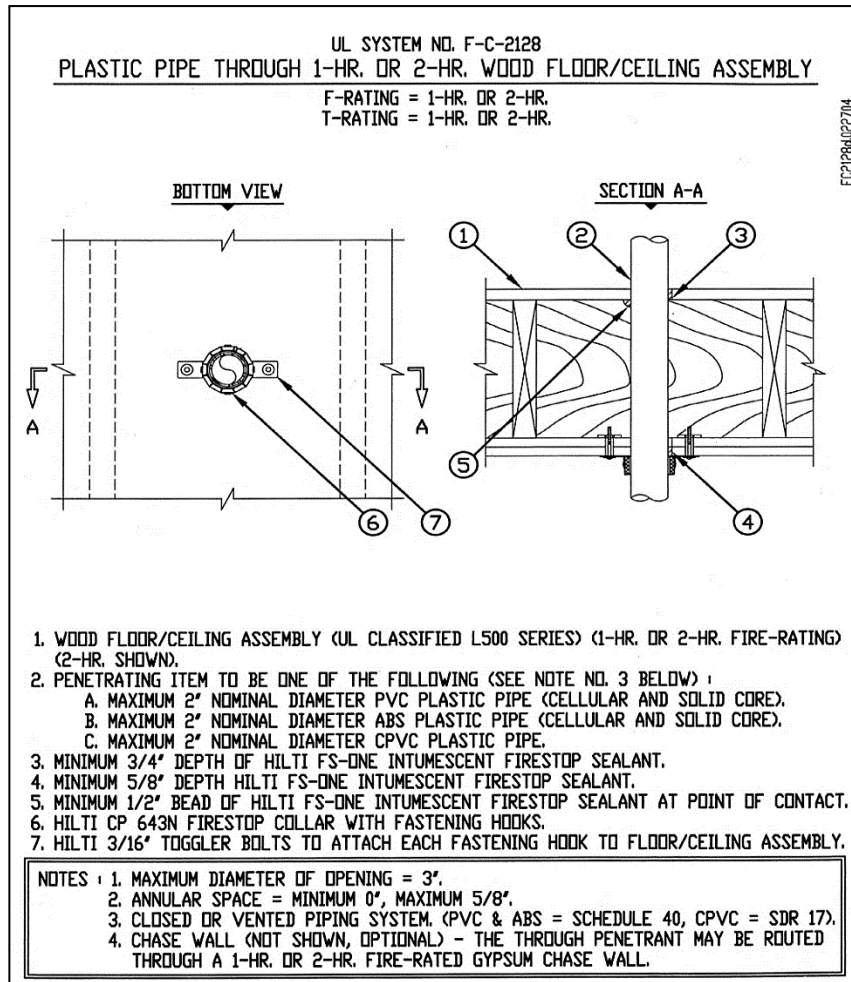
1. WOOD FLOOR/CEILING ASSEMBLY (UL CLASSIFIED L500 SERIES) (1-HR. OR 2-HR. FIRE-RATING) (2-HR. SHOWN).
2. LUMBER OR PLYWOOD SUBFLOOR WITH FINISH FLOOR OF LUMBER, PLYWOOD, OR FLOOR TOPPING MIXTURE.
3. WOOD TOP PLATE.
4. GYPSUM WALL ASSEMBLY (1-HR. OR 2-HR. FIRE-RATING) (2-HR. SHOWN).
5. PENETRATING ITEM TO BE ONE OF THE FOLLOWING (ALSO SEE NOTE NO. 2 BELOW) :
 A. MAXIMUM 4" NOMINAL DIAMETER PVC PLASTIC PIPE (CELLULAR AND SOLID CORE).
 B. MAXIMUM 4" NOMINAL DIAMETER ABS PLASTIC PIPE (CELLULAR AND SOLID CORE).
 C. MAXIMUM 4" NOMINAL DIAMETER FRPP PLASTIC PIPE.
 D. MAXIMUM 4" NOMINAL DIAMETER CPVC PLASTIC PIPE.
6. HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT INSTALLED TO THE MAXIMUM EXTENT POSSIBLE.
7. HILTI CP 643N FIRESTOP COLLAR WITH FASTENING HOOKS (SEE TABLE BELOW).
8. 3/4" WOOD SCREWS AND WASHERS TO ATTACH EACH FASTENING HOOK.

NOMINAL PIPE DIAMETER	PRODUCT DESCRIPTION	NO. OF FASTENING HOOKS	MAXIMUM HOLE SIZE
1-1/2"	CP 643 50/1.5" N	2	2-1/2"
2"	CP 643 63/2" N	2	2-5/8"
3"	CP 643 90/3" N	3	4"
4"	CP 643 110/4" N	3	5"

NOTES : 1. ANNULAR SPACE = MINIMUM 0", MAXIMUM 1/2".
 2. CLOSED OR VENTED PIPING SYSTEM. (PVC, ABS, FRPP=SCHEDULE 40, CPVC=SDR 17).

Hilti Firestop Systems Guide

Dwelling unit rated penetrations



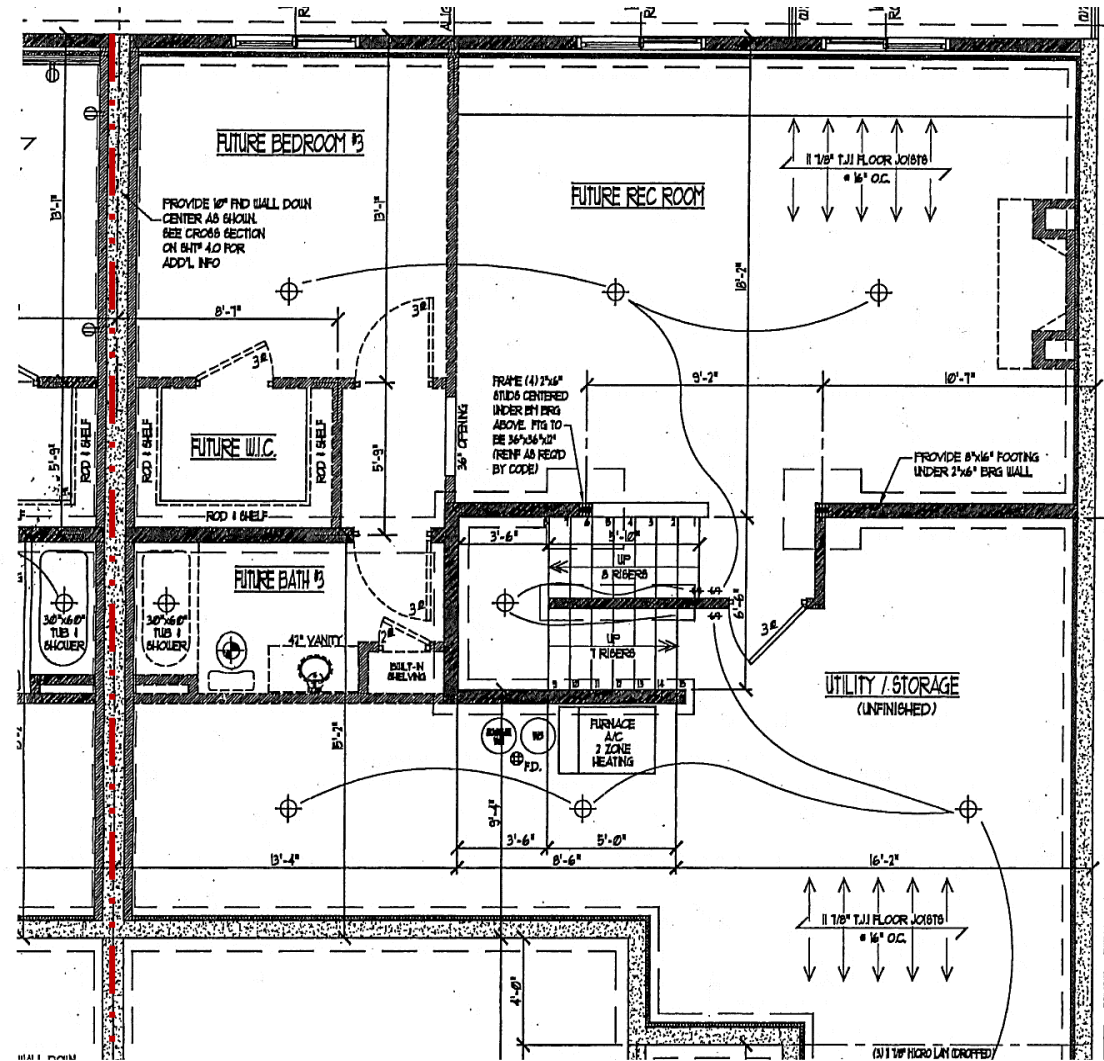
Dwelling unit rated penetrations

Exercise/Discussion

Does this plan
require rated
penetration
protection?

Why or Why Not?

Lower Level/Fdn Plan - "B"



Plan courtesy of Norcutt Homes

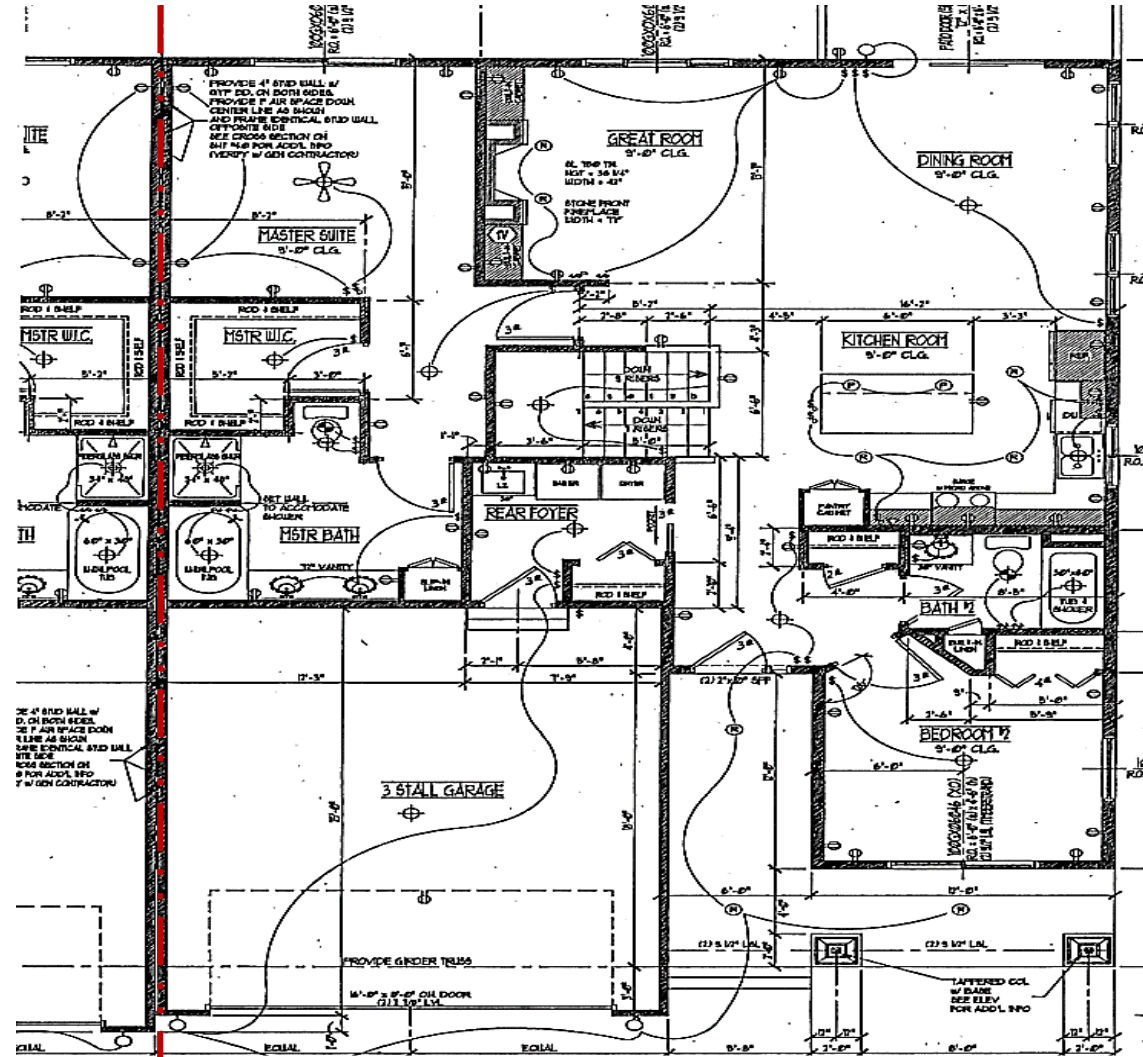
Dwelling unit rated penetrations

Exercise/Discussion

Does this plan
require rated
penetration
protection?

Why or Why Not?

Main Level Plan - "B"



Dwelling unit rated penetrations

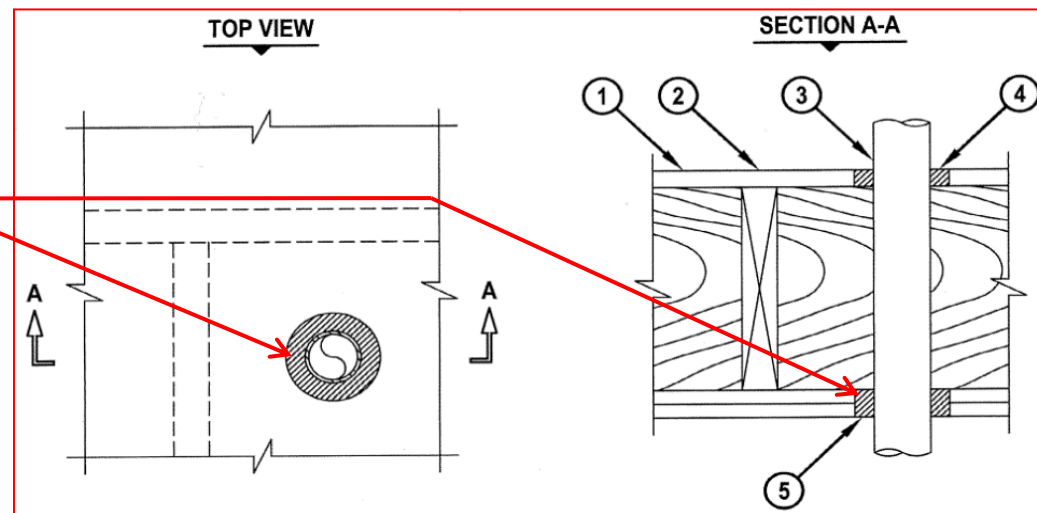
Through penetrations.

Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

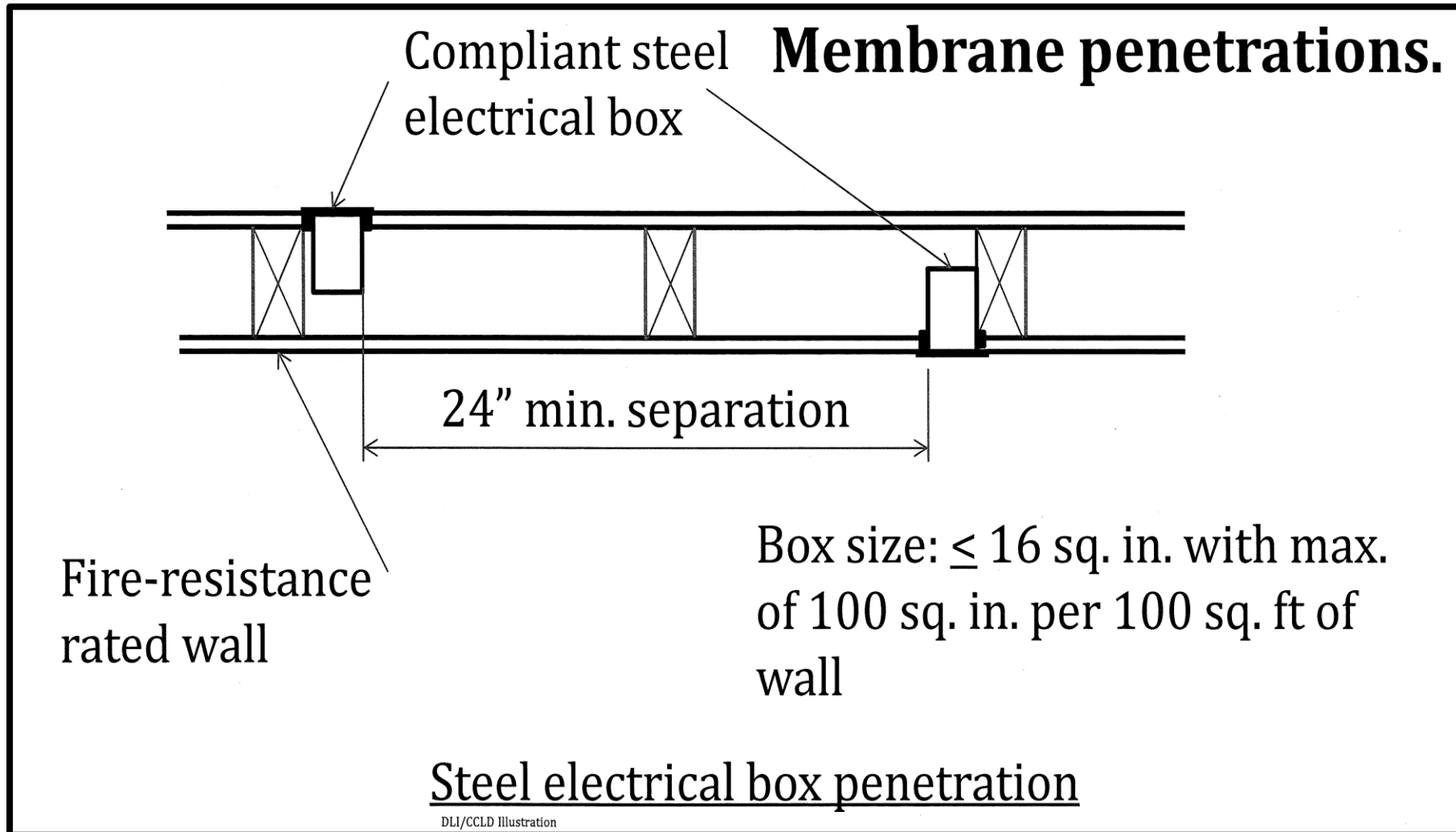
Exception: Where the penetrating items are **steel, ferrous or copper pipes, tubes or conduits**, the annular space shall be protected as follows:

Annular Space

See full text and exception



Dwelling unit rated penetrations



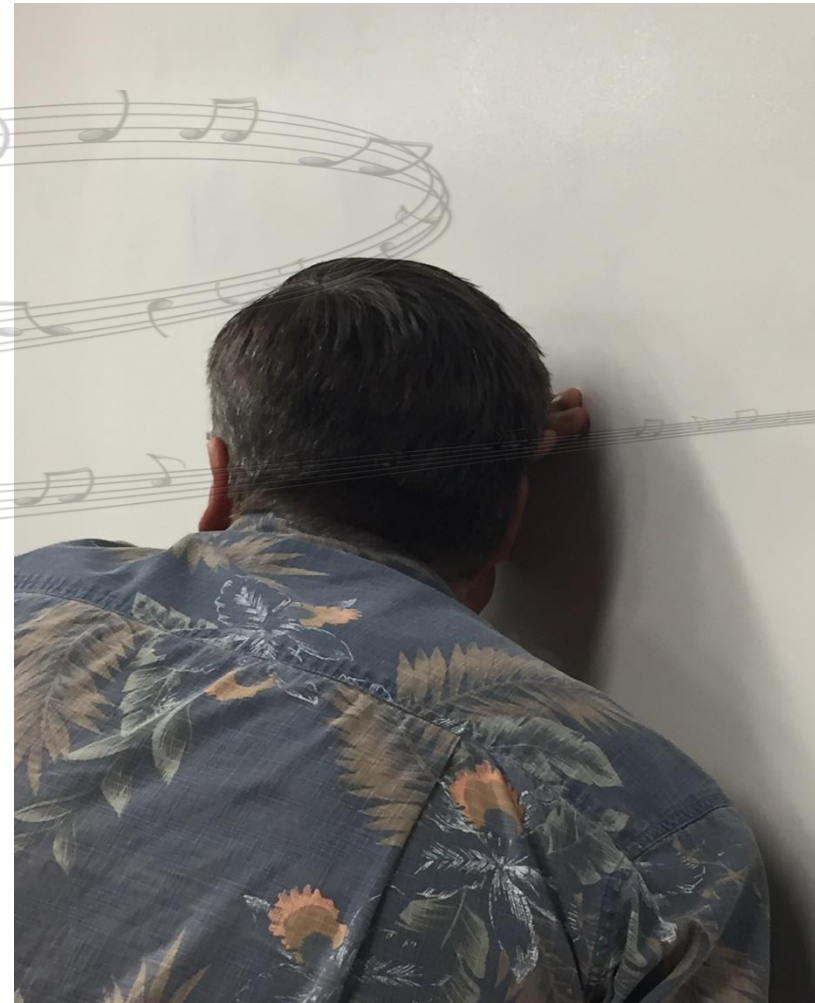
Sound transmission

General.

Wall and floor-ceiling assemblies separating dwelling units, including those separating adjacent townhouse units,

shall provide air-borne sound insulation for walls, and

both air-borne and impact sound insulation for floor-ceiling assemblies.



General information.

- **Air-Borne Sound:**
 - Sound traveling through air in a structure.
- **Impact Sound:**
 - **Structural-borne Sound (Impact Sound):**
 - The sound created when a building surface is struck by an object.
 - Sound that has traveled through a structure as vibration in solid material.

General information.

STC = Sound Transmission Class rating

Minimum Air-borne sound and Structural-borne sound = 45

STC

People Reaction Measurement

If the STC = 35

Clearly hear conversation

If the STC = 45

Conversation is muddled

If the STC = 55

Won't hear conversation; but will still hear loud sounds such as raised voices, bass music, or television.

General information.

Air is the basic medium for sound transmission

Close off air leak paths allowing noise to go through or around the system using an acoustic sealant

A 1/4" perimeter crack surrounding a 96 sq. ft. wall represents an approximate 1 sq. ft. hole.

General information.

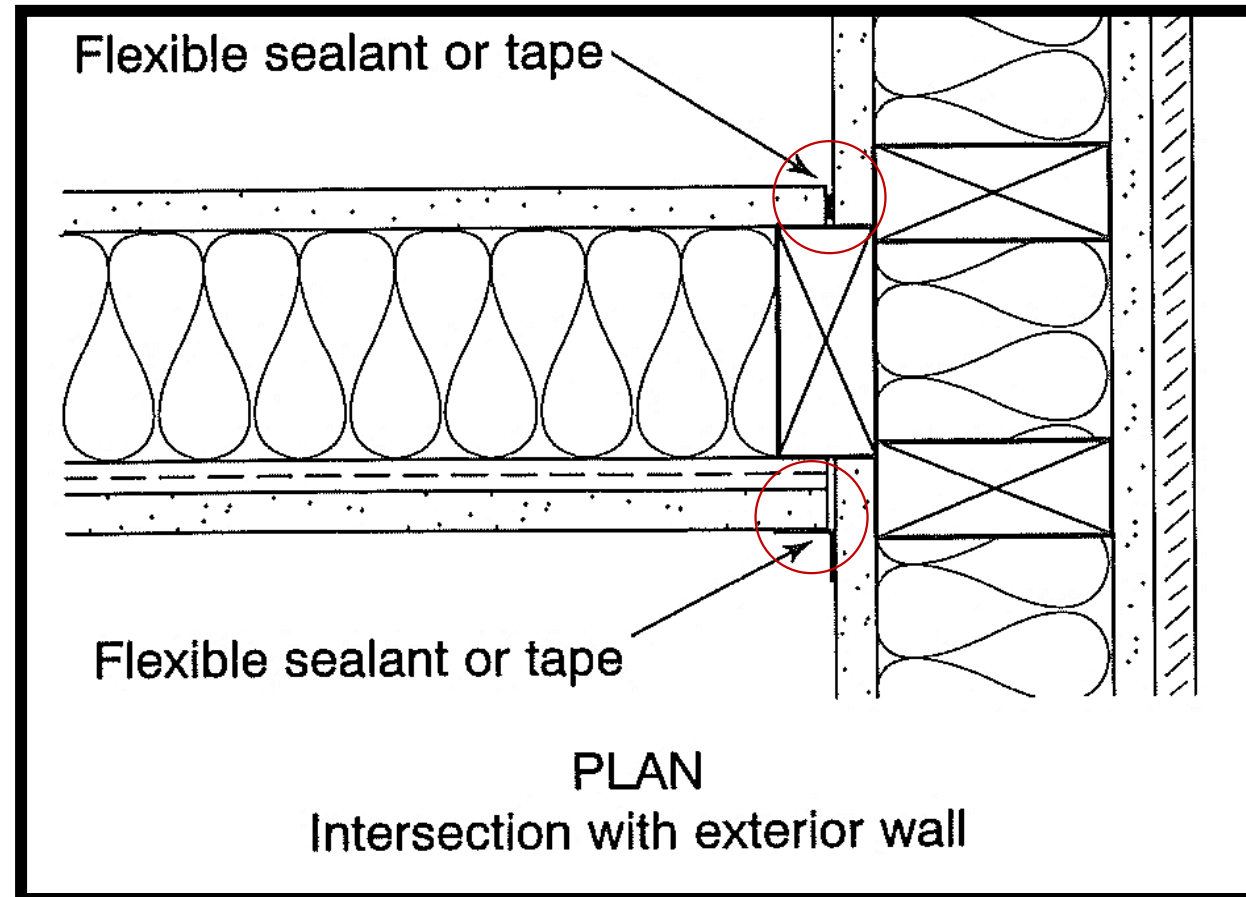
All I need is to select a high STC wall and the job is done, right?

The devil is in the details. Sealing all gaps, cracks and penetrations with acoustical caulk is critical in achieving the design STC rating. Just remember the saying,

“If it's airtight, it's sound tight.”

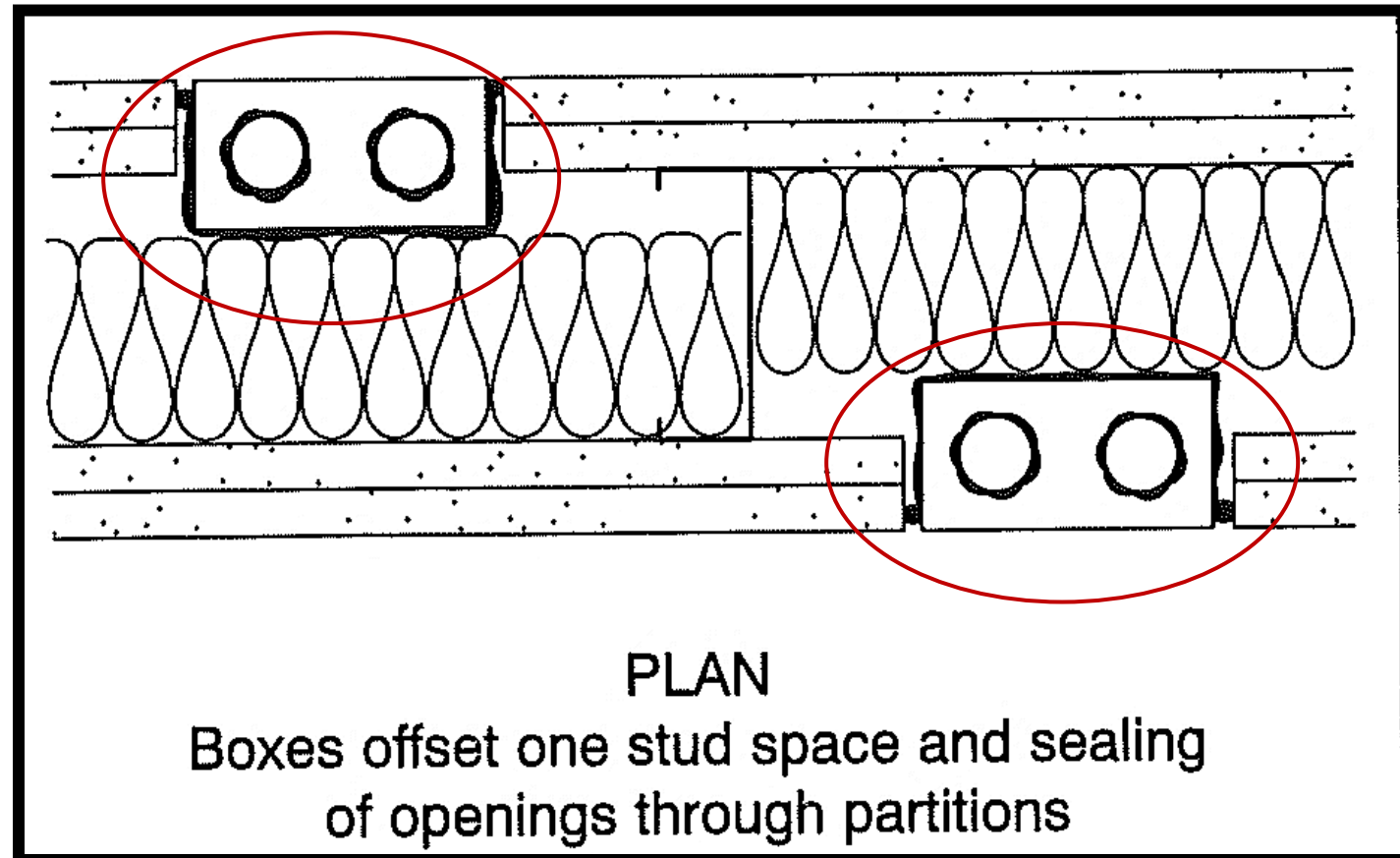
Acoustical caulk is a permanently flexible sealant that is designed and tested for this application.

General information.



GA-600-2012 Fire Resistive Design Manual Illustrations

General information.



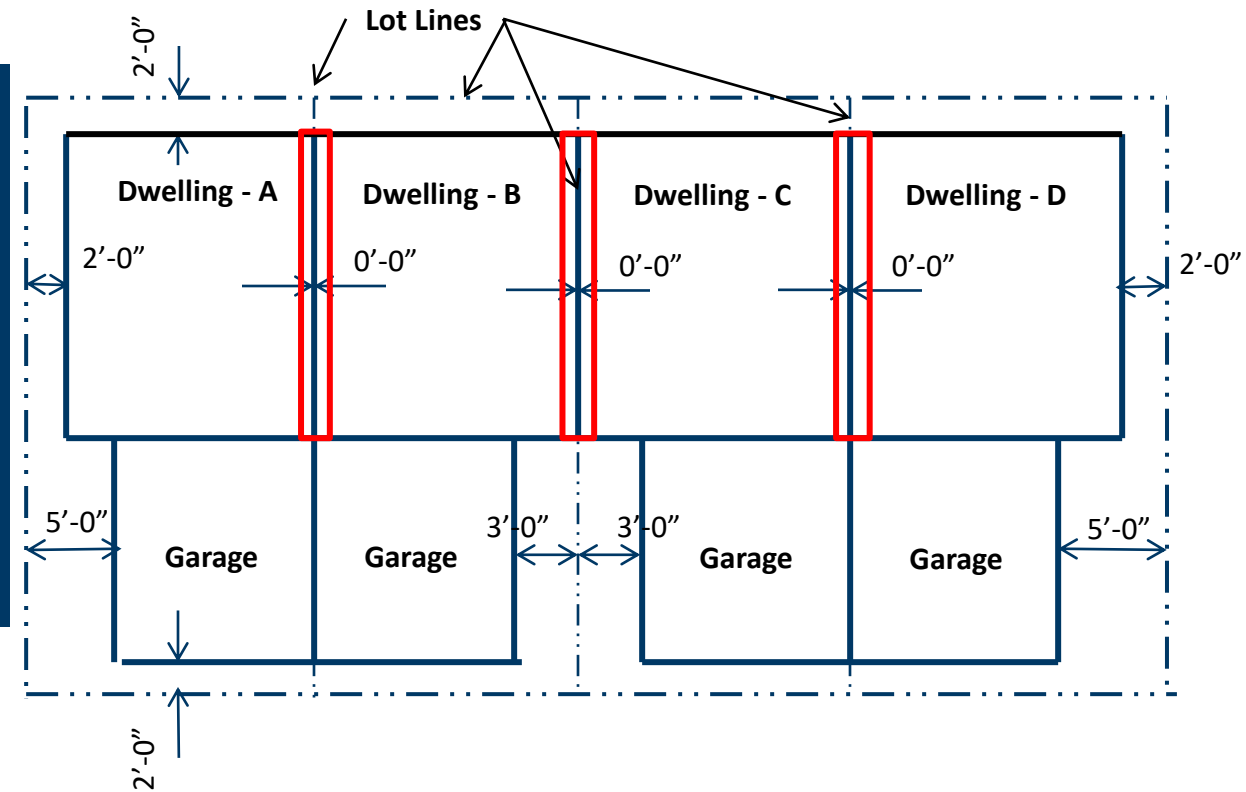
GA-600-2012 Fire Resistive Design Manual Illustrations

Sound transmission.

Exercise/Discussion

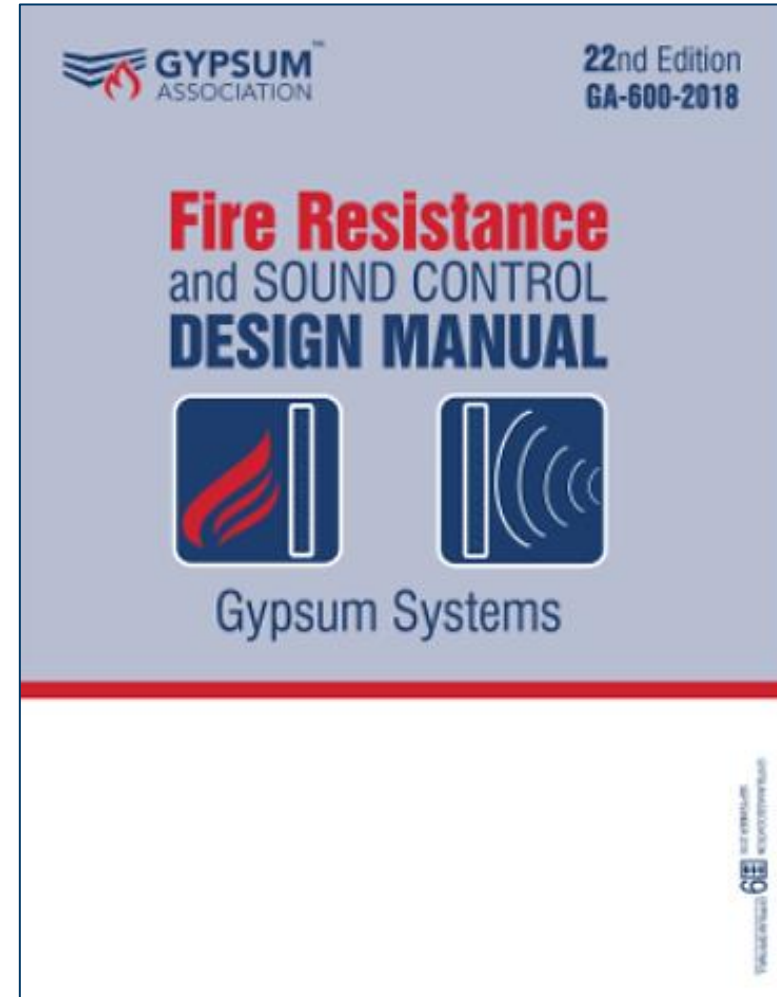
Which walls will require a sound transmission rating?

Why?



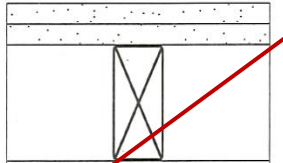
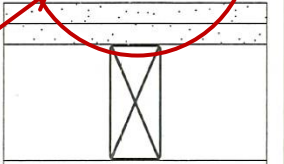
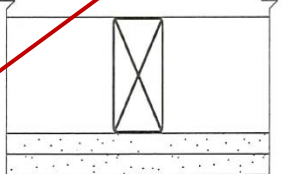
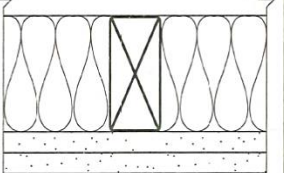
General information.

Resource to verify STC ratings



GA-600-2018 Fire Resistive Design Manual

Sound transmission

GA FILE NO. WP 3820	GENERIC	2 HOUR FIRE	55 to 59 STC SOUND
<p align="center">GYPSUM WALLBOARD, WOOD STUDS</p>			
<p>Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied at right angles to each side of double row of 2 x 4 wood studs 16" o.c. on separate plates 1" apart with 6d coated nails, 17/8" long, 0.085" shank, 1/4" heads, 24" o.c. Face layer 5/8" type X gypsum wallboard or gypsum veneer base applied at right angles to each side with 8d coated nails, 23/8" long, 0.100" shank, 1/4" heads, 8" o.c.</p>			
<p>Joints staggered 16" each layer and side. Sound tested with 3 1/2" glass fiber insulation stapled to studs in stud spaces on one side and with nails for base layer spaced 6" o.c. Horizontal bracing required at mid-height. (LOAD-BEARING)</p>			
<p align="center">STC >45 - OK</p>		<p>Thickness: 10 3/4" Approx. Weight: 13 psf Fire Test: See WP 4135 (FM WP 360, 9-27-74) Sound Test: NGC 3056, 4-7-70</p>	

GA-600-2003 Fire Resistive Design Manual

Automatic fire sprinklers

October 13, 2015

The Minnesota Court of Appeals issued an opinion which stated the adopted Minnesota Residential Code rule that requires the installation of automatic sprinkler systems is **invalid** for the construction of all **new two-family dwellings and one-family dwellings over 4,500 square feet**.

May 17, 2017

Minnesota Legislature requires Department of Labor and Industry to establish that **one- and two-family dwellings and two-unit townhouses are not required to have automatic fire sprinkler systems**. (Effective June 5, 2017)

Automatic fire sprinklers

AUTOMATIC FIRE SPRINKLER SYSTEMS.

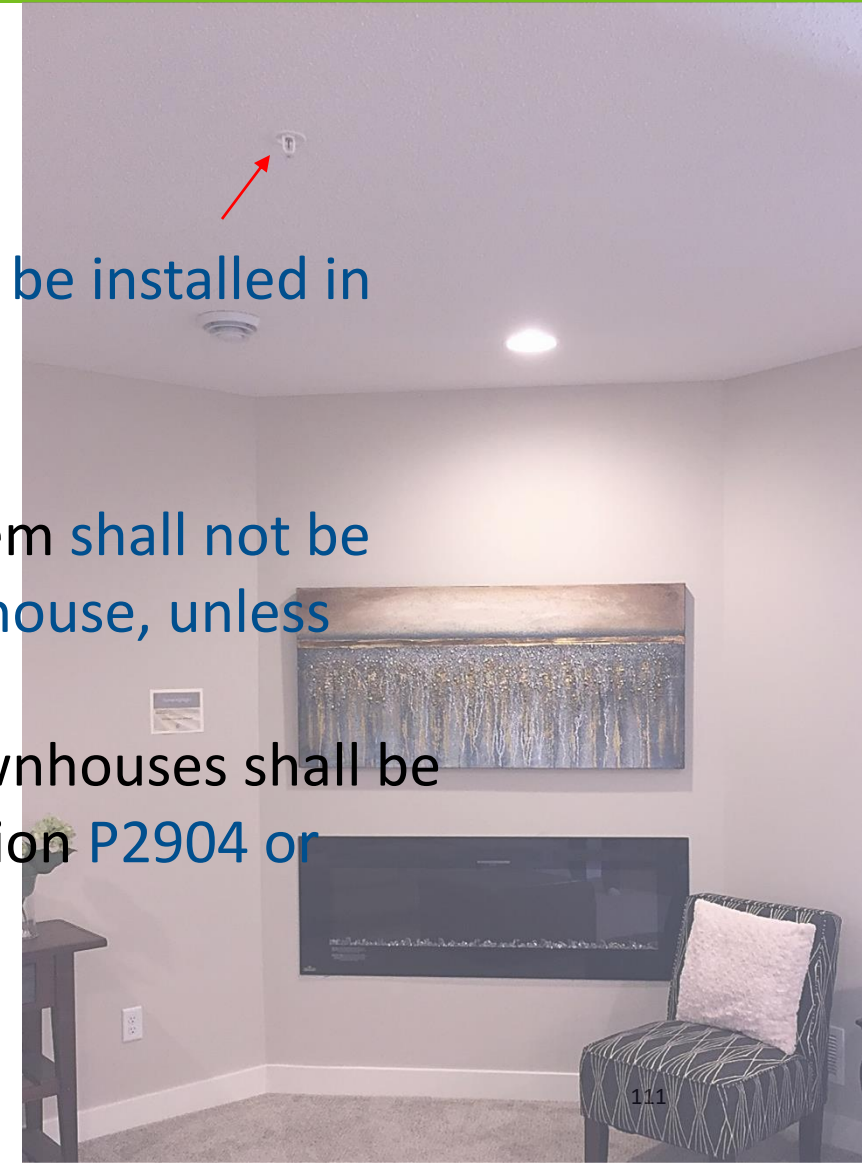
Townhouse

An automatic residential fire sprinkler system shall be installed in townhouses.

Exceptions:

An automatic residential fire sprinkler system shall not be required to be installed in a two-unit townhouse, unless required by section R313.4.

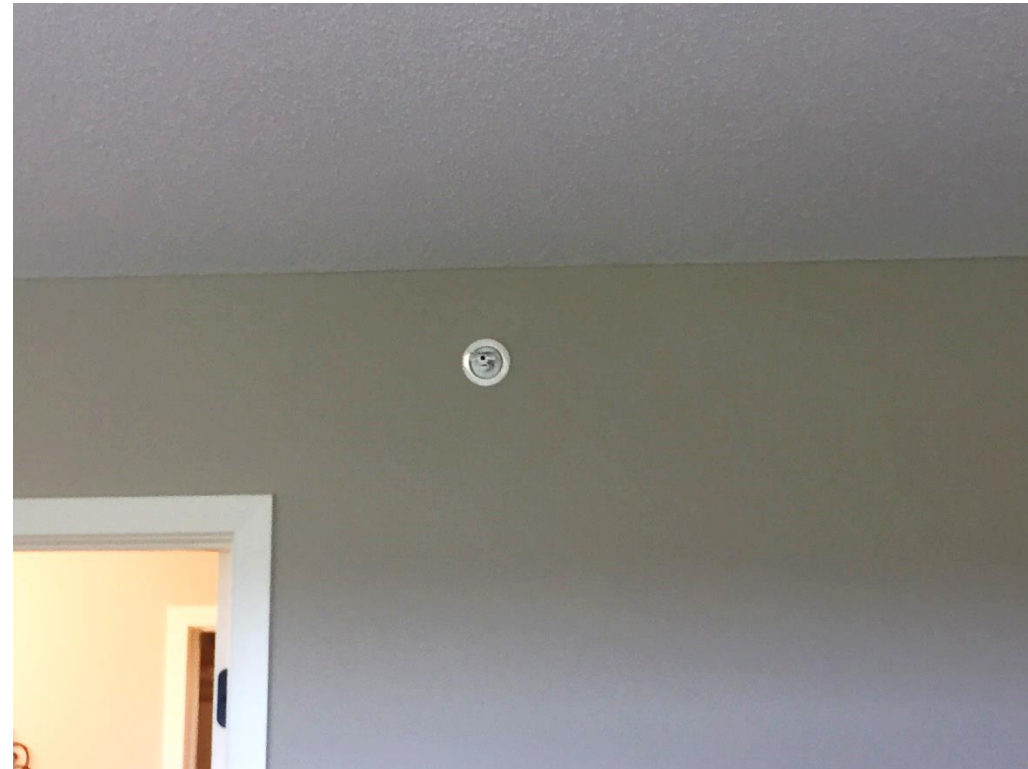
Automatic residential fire sprinkler systems for townhouses shall be designed and installed in accordance with IRC section P2904 or NFPA 13D.



Automatic fire sprinklers

AUTOMATIC FIRE SPRINKLER SYSTEMS.

Attached garages are required to have one dry head sprinkler located within 5 lineal feet of each door installed in the common wall separating the dwelling unit and the attached garage;



Door between townhouse unit and garage

DLI/CCLD Photo

Automatic fire sprinklers

AUTOMATIC FIRE SPRINKLER SYSTEMS.

Attached covered patios, covered decks, covered porches, and similar structures are required to have automatic sprinklers with a minimum of one dry head for every 20 lineal feet of common wall between the dwelling unit and the covered patio, covered deck, covered porch, or similar structure.

Exception: Attached roofs of covered patios, covered decks, covered porches, or similar structures that do not exceed 40 square feet of floor area.

AUTOMATIC FIRE SPRINKLER SYSTEMS.

One- and two-family dwellings

- An automatic residential fire sprinkler system shall **not** be required to be installed **in one- and two-family dwellings**, unless **required by section R313.4**.
- Automatic residential fire sprinkler systems shall be **designed and installed** in accordance with IRC section **P2904** or **NFPA 13D**.

Automatic fire sprinklers

AUTOMATIC FIRE SPRINKLER SYSTEMS.

When an automatic sprinkler system is required in **two-family dwellings**, it shall be installed in accordance with IRC section **P2904** or **NFPA 13D**.

Automatic sprinkler systems required in **two-family dwellings** and **townhouse buildings** shall be installed in accordance with the following:

Automatic fire sprinklers

State-licensed facilities.

One- and two-family dwellings and townhouse buildings containing facilities required to be licensed or registered by the state of Minnesota

Shall be provided with an automatic sprinkler system required by the applicable licensing provisions of that agency or according to this part, **whichever is more restrictive.**

Automatic fire sprinklers

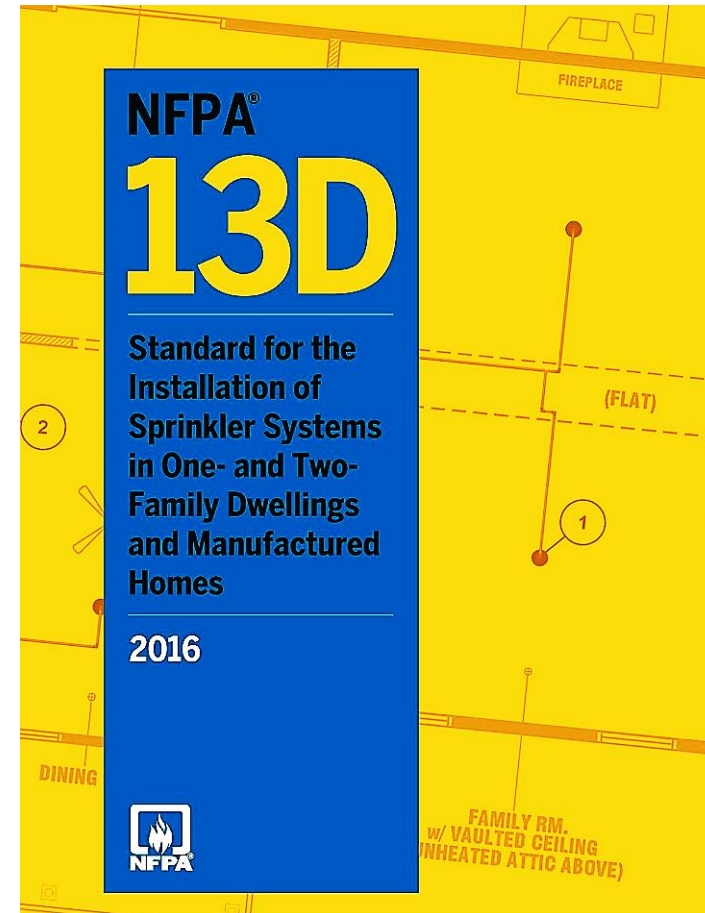
General information.

NFPA 13D or Section P2904

One- and two-family dwellings, and townhouses.

Designed for life safety only.

Typically the same water supply as domestic.



NFPA 13D Standard

Automatic fire sprinklers

IRC-1 Single-family dwellings

Fire sprinklers **not** required unless by R313.4



IRC-2 Two-family dwellings

Fire sprinklers **not** required unless by R313.4



IRC-3 Townhouses (two unit)

Fire sprinklers **not** required unless by R313.4



IRC-3 Townhouses (three or more)

Fire sprinklers **required**





Q & A



THE END

Photo by R. Lockrem