Code Requirements for Type IIIB Residential Construction

Don E. Contois, P.E.

Company Overview

- R.W. Sullivan Engineering (RWS) was established in 1945 and currently has 95 employees.
- RWS is a full service engineering firm offering integrated services in the following disciplines:

R.W. Sullivan Engineering
Code Group

Comprehensive Code Services

- Building, Fire, Life Safety, Accessibility
- Plan Review
- Existing Building Surveys
- Variances and Appeals
- National and International Experience

R.W. Sullivan Engineering
Code Group

Beyond the Code

- Revit
- Sustainability and LEED
- Special Inspections
- Construction Fire Safety Plans
- Hazardous Materials
- Structural Fire Resistance

Agenda

- Type IIIB Construction
  - Permitted materials
  - Structural Fire Resistance Ratings
  - Height and Area Limitations
- Residential Requirements
  - Fire Resistance Rated Separations
  - Ceiling Penetrations
  - Dryer Exhaust
  - Elevator

Type IIIB Construction

- Interior framed using standard wood (780 CMR 602.3)
- Exterior walls must be of noncombustible materials or fire retardant treated wood (780 CMR 602.3)
- Combustible exterior wall finishes permitted up to 40’ (780 CMR 1406.2.1)
  - Sheathing must be noncombustible or fire retardant treated wood
- Compliance with NFPA 285 generally required for walls containing a combustible vapor barrier or foam plastic insulation (780 CMR 1403.5 & 2603.5.5)

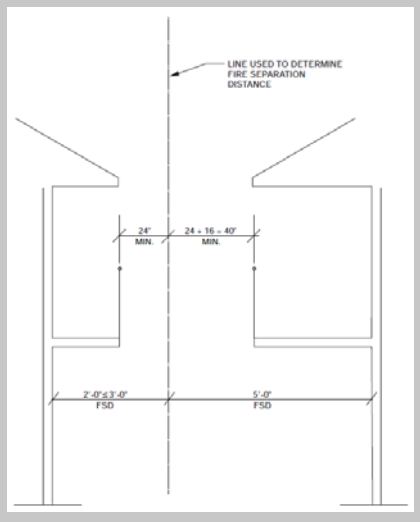
Exterior Wall Projections

- Can be any approved material (780 CMR 705.2.2)
- Combustible projections within 5 feet of the lot line must be 1 hour rated construction, Type IV construction, or fire-retardant-treated wood (705.2.3).
- Minimum distance of projection to lot line must comply with Table 705.2

TABLE 705.2 MINIMUM DISTANCE OF PROJECTION

FIRE SEPARATION DISTANCE (FSD)	MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD
0 feet to 2 feet	Projections not permitted
Greater than 2 feet to 3 feet	24 inches
Greater than 3 feet to less than 30 feet	24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof
30 feet or greater	20 feet

Exterior Wall Projections



Structural Fire Ratings

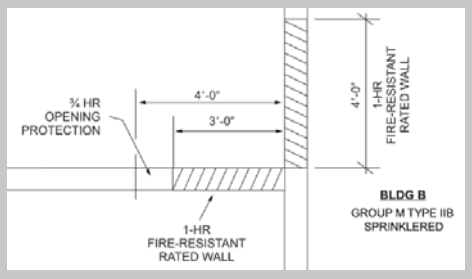
- Per 780 CMR Table 601, the majority of the structure will not require a fire resistance rating:
  - Primary Structural Frame: 0 hours
  - Bearing Exterior Walls: 2 hours
  - Bearing Interior Walls: 0 hours
  - Nonbearing Exterior Walls: Based on FSD
  - Nonbearing Interior Walls: 0 hours
  - Floor Construction: 0 hours
  - Roof Construction: 0 hours

Fire Walls

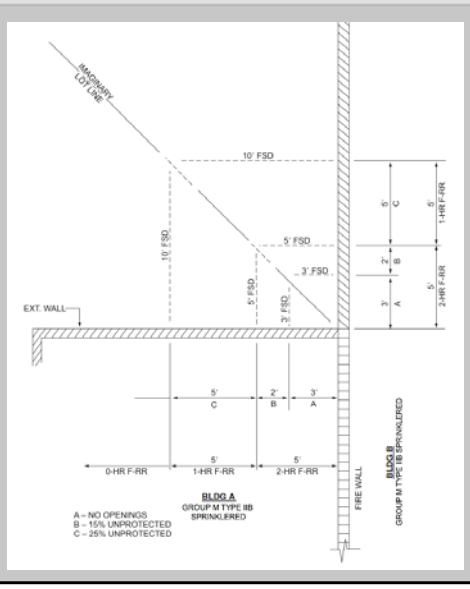
- Shall have a fire-resistance rating of 3 hours (780 CMR Table 706.4).
- Shall extend 18 inches beyond the exterior wall or comply with one of the following:
  - Terminate at the interior surface of combustible exterior sheathing provided the exterior wall has a 1 hour fire resistance rating on both sides of the fire wall for 4 feet.
  - Terminate at the interior surface of a noncombustible exterior sheathing provided the sheathing extend not less than 4 feet on on both sides of the fire wall or the building is protected by an automatic sprinkler system.

Fire Walls at Exterior Walls

- When a fire wall intersects with an exterior wall at an angle of less than 180 degrees; a 1 hour fire resistance rating shall extend 4 feet on each of the fire wall or an imaginary lot line shall be drawn at the fire wall (780 CMR 706.5.1).



Fire Walls at Exterior Walls



Fire Walls Vertical Extension

- Shall extend from the foundation to 30 inches above adjacent roof (780 CMR 706.6).
  - Walls can terminate at the underside of a combustible roof deck provided; there is no openings in the roof with in 4 feet, the roof is Class B, and the deck is constructed of fire retardant treated wood for a distance of 4 feet on both sides

Supporting Construction

- Although the structure may not require a rating, supporting construction of the following example elements must have the same rating as the assembly supported (780 CMR 704.1):
  - Shafts
  - Elevator Machine Room
  - Trash Chute Rooms
  - Horizontal Exits
- The supporting construction of corridor walls and dwelling unit separations walls do not require a fire resistance rating (780 CMR 708.4 & 711.2.4.3 Exc.)

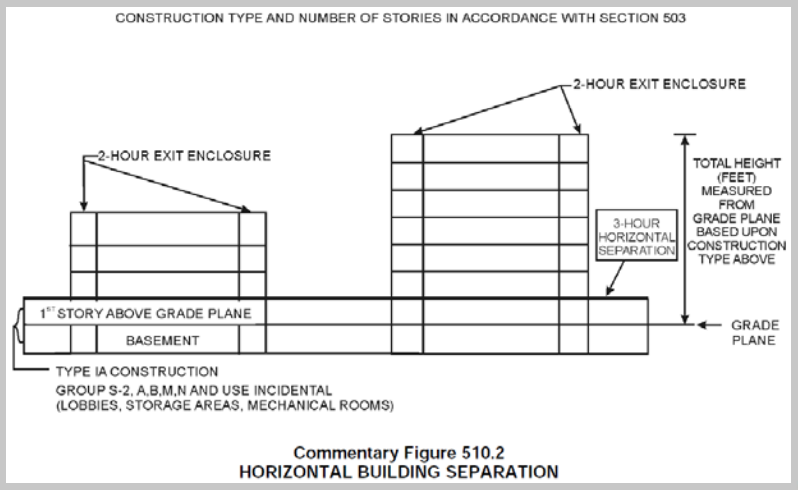
Height and Area Limitations

- Per 780 CMR Tables 504.3, 504.4, and 506.2, the following height and area limitations apply:
  - Height: 5 st. and 75 ft.
  - Area: 48,000 sf / floor and 144,000 sf aggregate (does not include open frontage increase)
- More restrictive limits could apply for mixed uses such as assembly and retail spaces

Podium Construction

- The number of stories can be measured above a 3 hour fire resistance rated horizontal assembly (780 CMR 510.2)
  - Type IA construction required below the podium
  - Uses above the podium limited to A < 300 occupants in each occupancy, B, M, R, or S
  - No limit on the number of stories below the podium as long as overall height in feet measured from grade plane complies

Podium Construction



Commentary Figure 510.2
HORIZONTAL BUILDING SEPARATION

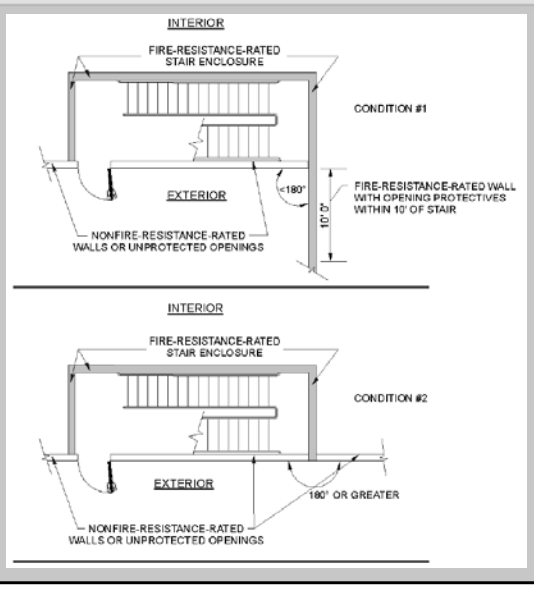
Residential Fire Rated Separations

- Dwelling Unit Separations: ½ hour (780 CMR 708.3 Exc. 2 & 711.2.4.3 Exc.)
- Corridors: ½ hour (780 CMR Table 1020.1)
  - Requires smoke/draft control doors passing UL 1784 (780 CMR 716.5.3.1)

Shaft Separations

- Mechanical Shafts (780 CMR 713.4)
  - Connecting 4+ stories: 2 hours
  - Connect < 4 stories: 1 hour
  - Exterior walls no rating (780 CMR 713.6)
- Exit Enclosures (780 CMR 1023.2)
  - Connecting 4+ stories: 2 hours
  - Connect < 4 stories: 1 hour
  - Exterior walls of stair or building: 1 hour where exposed by the building exterior wall at an angle < 180 degrees (780 CMR 1023.7)

Exit Stair Exterior Walls



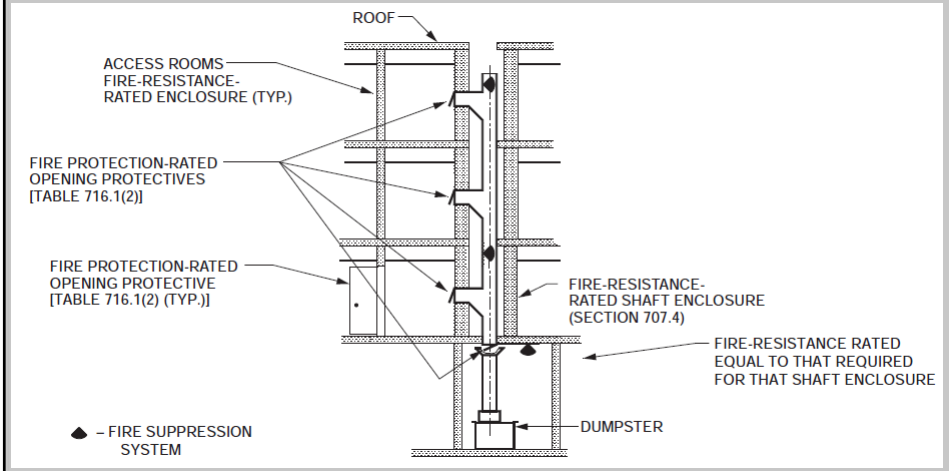
Trash Enclosures

- Trash Collection Room: smoke resistant (780 CMR Table 509)
  - Walls to fire rated ceiling or deck above
  - Self-closing doors
- Trash Chute (713.13.1)
  - Connecting 4+ stories: 2 hours
  - Connect < 4 stories: 1 hour
  - Doors must be rated, self-closing, and cannot open directly into a corridor

Trash Chute Rooms

- Chute Access Room: 1 hour (780 CMR 713.13.3)
  - Must be accessible with turning space and door clearances
- Chute Termination Room: same rating as chute (780 CMR 713.13.4)
  - No protection required at the bottom of the chute

Trash Chute Ratings



Other Spaces

- Electrical Rooms: no rating if protected with sprinklers
- Emergency Electrical: no rating if protected with sprinklers
- BDA Equipment: 2 hours
- Mechanical Rooms: smoke resistant (780 CMR Table 509)
- Laundry Rooms: smoke resistant (780 CMR Table 509)

Duct Penetrations

- Shafts – fire / smoke damper at all penetrations (780 CMR 717.5.3)
  - Fire dampers not required where subducted with a continuously operating fan on generator (Exc. 1)
  - Smoke dampers not required for kitchen, dryer, and bathroom exhaust where subducted with a continuously operating fan on generator (Exc. 2)
- Corridors:
  - No fire damper in walls (780 CMR 717.5.4 Exc. 1)
  - Smoke damper in walls (780 CMR 717.5.4.1)
    - Not required where duct has no openings to the corridor
  - Corridor damper in ceilings (780 CMR 717.5.4.1)
    - Not required where corridor walls are continuous to the deck above
- Dwelling Unit Separation Walls: no fire damper in a fully ducted system (780 CMR 717.5.4 Exc. 4)
  - Fully ducted does not permit any flex duct

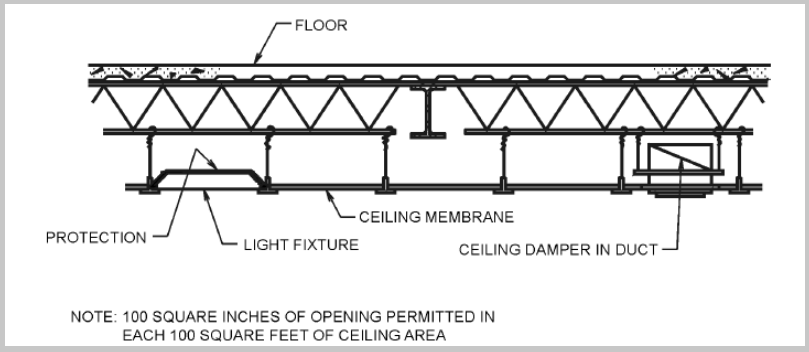
Duct Penetrations

- Horizontal Assemblies:
  - Duct connecting 2 floors can be protected with firestopping and fire damper at the floor line (780 CMR 717.6.1)
  - Must be in a shaft enclosure when connecting 3 stories or more (780 CMR 717.6.1)
  - 4 stories can be connected if the duct meets all of the following (780 CMR 717.6.1 Exc.):
    - Steel duct that only opens into a single unit
    - Duct riser is in a cavity of the wall
    - Duct enters the cavity of the wall below the ceiling
    - Wall penetration and wall header is firestopped

Ceiling Penetrations

- Duct penetrating ceiling of fire rated assembly must be protected with a ceiling radiation damper (780 CMR 717.6.1)
  - Only exception is where the duct penetration is included and protected as part of the listed assembly
- Recessed lights must be protected with a listed firestop system (780 CMR 714.5.2)
  - Exception where the fixture is included and protected as part of the listed assembly
- Alternative: Provide soffit or ceiling below the fire rated ceiling to avoid needing to protect penetrations

Ceiling Penetrations



Dryer Exhaust

- Dampers are not permitted (IMC 504.2)
  - Must comply with exceptions of IMC and IBC to avoid dampers
- Options:
  - Run exhaust duct completely within unit below the fire rated ceiling to the exterior wall
  - Penetrate the wall below the ceiling and then travel up into and within the floor cavity to the exterior wall
  - Subduct into a common shaft that meets IMC 504.10

Common Dryer Exhaust Shaft

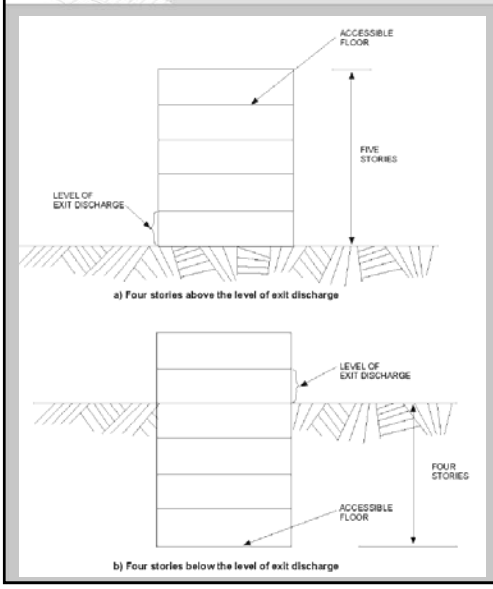
504.10 Common exhaust systems for clothes dryers located in multistory structures. Where a common multistory duct system is designed and installed to convey exhaust from multiple clothes dryers, the construction of the system shall be in accordance with all of the following:

1. The shaft in which the duct is installed shall be constructed and fire-resistance rated as required by the *International Building Code*.
2. Dampers shall be prohibited in the exhaust duct. Penetrations of the shaft and ductwork shall be protected in accordance with Section 607.5.5, Exception 2.
3. Rigid metal ductwork shall be installed within the shaft to convey the exhaust. The ductwork shall be constructed of sheet steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) and in accordance with SMACNA *Duct Construction Standards*.
4. The ductwork within the shaft shall be designed and installed without offsets.
5. The exhaust fan motor design shall be in accordance with Section 503.2.
6. The exhaust fan motor shall be located outside of the airstream.
7. The exhaust fan shall run continuously, and shall be connected to a standby power source.
8. Exhaust fan operation shall be monitored in an *approved* location and shall initiate an audible or visual signal when the fan is not in operation.
9. Makeup air shall be provided for the exhaust system.
10. A cleanout opening shall be located at the base of the shaft to provide *access* to the duct to allow for cleaning and inspection. The finished opening shall be not less than 12 inches by 12 inches (305 mm by 305 mm).
11. Screens shall not be installed at the termination.
12. The common multistory duct system shall serve only clothes dryers and shall be independent of other exhaust systems.

Elevator Opening Protection

- Elevators opening into the corridor must be protected with smoke curtains, lobbies, or pressurization since elevator doors cannot pass UL 1784 (780 CMR 701.2)

Elevator on Generator



- Required for any building with a floor 4 stories above or below the level of exit discharge (780 CMR 1009.2.1)
  - Exception where the building is divided by a horizontal exit

Thanks For Attending

- Don E. Contois, P.E.
  - Email: dec@rwsullivan.com
  - Direct Line: 617-337-9312