

fire protection planning report



BUILDING CONSTRUCTION INFORMATION FROM THE CONCRETE AND MASONRY INDUSTRIES

NO. 16U OF A SERIES

Guide to UBC Requirements for Concrete and Masonry Area Separation Walls

Introduction

Properly designed and constructed area separation walls provide an effective means of stopping or controlling the spread of fire for a designated period of time. Areas separated by them are considered separate buildings. The insurance industry acknowledges this by applying rates individually to each building area when the area separation walls used in the compartmentation are constructed of concrete or masonry.

Area separation walls must meet rating requirements specified in the *Uniform Building Code* (hereafter referred to as UBC or "the code") in accordance with ASTM E 119 test procedures.⁽¹⁾ Structural and other requirements of the code must also be considered in designing area separation walls, but these are outside the scope of this report. The requirements that follow will generally focus only on the fire-related provisions for concrete and masonry area separation walls, based on the 1985 edition of the UBC.⁽²⁾

Purpose

The purpose of this report is to provide building officials and the design community with information on the code requirements germane to concrete and masonry area separation walls.

The report addresses the following items:

1. Characteristics common to all area separation walls
2. Fire-rating requirements for area separation walls and their components (parapets, opening protectives, and so forth)
3. Orientation of wall configurations that qualify as area separation walls

Common Characteristics of Area Separation Walls

In general, area separation walls share the following characteristics:



Concrete, clay-brick, and concrete masonry (top, middle, bottom) area separation walls provide excellent barriers for containing the spread of fire from one side of the wall to another.

1. Areas divided by them are considered separate buildings
2. The number needed in a structure is generally governed by height and area restrictions based on occupancy and type of construction
3. All openings must be protected by appropriate fire-rated assemblies.

What Is an Area Separation Wall?

An area separation wall is the UBC version of the commonly-referred-to "fire wall" in other parts of the country. They are considered equivalent building elements mainly due to the recognition that they divide a single building into two or more separate buildings. Walls meeting the general requirements described below, and those for parapets and openings, qualify as area separation walls.

1. Area separation walls shall be not less than four-hour fire-resistive construction in Types I, II-F.R., III, and IV buildings and two-hour fire-resistive construction in Types II One-hour, II-N, or V buildings
2. Area separation walls shall extend to the outer edges of horizontal projecting elements such as balconies, roof overhangs, canopies, marquees, or architectural projections
3. Where an area separation wall separates portions of a building having different heights, such wall may terminate at a point 30 in. above the lower roof level, provided the exterior wall for a height of 10 ft above the lower roof is of one-hour fire-resistive construction with openings protected by assemblies having a three-fourths-hour fire-protection rating. This case is shown in Fig. 1

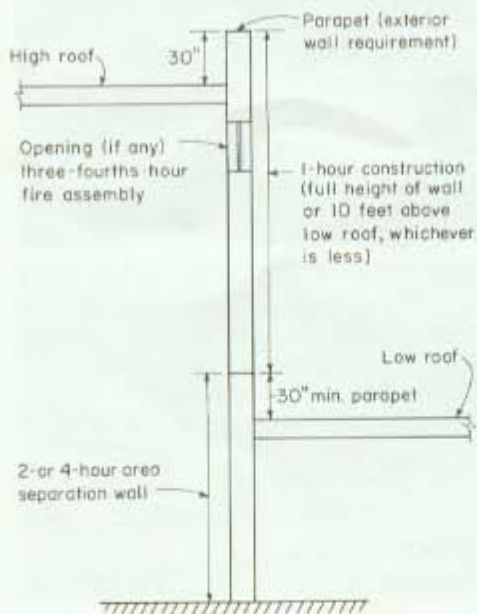


Fig. 1. UBC area separation wall requirements for unequal building heights.

Exceptions to the general requirements are provided in Section 505(e) of the code. In addition, special occupancy provisions are specified in Chapters 6 through 12. Wall openings and parapet requirements are handled as separate sections later in this report.

Fire-Resistance Requirements of Area Separation Walls

Fire-resistance requirements of area separation walls are based strictly on building construction type. Qualified walls meeting all other requirements must attain ratings as specified in item 1 above. For the purpose of determining the degree of fire resistance afforded, construction materials shall be assumed to have fire-resistance ratings in accordance with Section 4302 of the code.

When Are Area Separation Walls Required?

Allowable area limits determine the number of area separation walls required in a structure. These values are specified in Table No. 5-C of the code and may be modified by Section 506 and footnotes to the table.

Areas larger than those prescribed by Table No. 5-C or its modified values, for a given type of construction, must be divided by area separation walls into smaller compartments that meet the allowable area requirements.

Area Separation Wall Components

In designing area separation walls, important aspects to consider are the number of walls needed, fire resistance rating requirements, and the design and protection of integral wall components. Three of these components—parapets, openings, and penetrations—are discussed below.

Parapets

A parapet is that part of any wall entirely above the roof line (see photos, front page). Its function is to prevent the spread of fire across the roof from one building to another.

Parapet requirements for area separation walls are given below:

1. Area separation walls shall extend from the foundation to a point at least 30 in. above the roof
2. Parapets of area separation walls shall have noncombustible faces for the uppermost 18 in., including counterflashing and coping materials

Exceptions are listed in Section 505(e) of the code.

Openings

The total width of all openings in area separation walls shall not exceed 25% of the length of the wall in each story. All openings shall be protected by a fire assembly

having a three-hour fire-protection rating in four-hour fire-resistive walls and 1½-hour fire-protection rating in two-hour fire-resistive walls.

A fire assembly is defined by the code as the assembly of a fire door, fire windows, or fire damper, including all required hardware, anchorage, frames, and sills. Specifications for fire assemblies and their associated hardware are contained in Section 4306 of the code.

Penetrations

Firestopping of penetrations of area separation walls shall be provided and be of an approved material securely installed and capable of maintaining its integrity when subjected to test temperatures prescribed in UBC Standard No. 43-1 for the specific wall. Permissible penetrations into or through area separation walls include

1. Copper or ferrous pipes or conduits if properly fire-stopped with approved materials per the above paragraph and Chapter 43 of the code
2. Openings for steel electrical outlet boxes not exceeding 16 sq in. in area, provided the area of such openings does not aggregate more than 100 sq in. for any 100 sq ft of wall area. Outlet boxes on opposite sides of walls shall be separated by a horizontal distance of 24 in.
3. Penetrations or openings larger than those in item 2 above, if they are qualified by tests conducted in accordance with the provisions of Section 4302(b) of the code

Wall Configurations That Qualify As Area Separation Walls

Section 505(e) of the UBC specifies a number of requirements that must be met for walls to be considered area separation walls. Figs. 2-4⁽³⁾ provide examples of wall configurations meeting such requirements on an item-by-item basis. Item numbers in the figures correspond to those in the code.

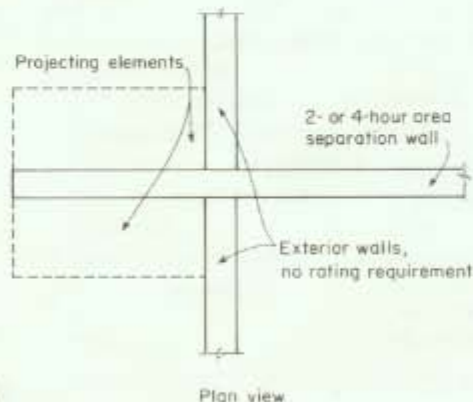


Fig. 2a. Item 2. Projecting elements. Exterior walls rated less than one hour.

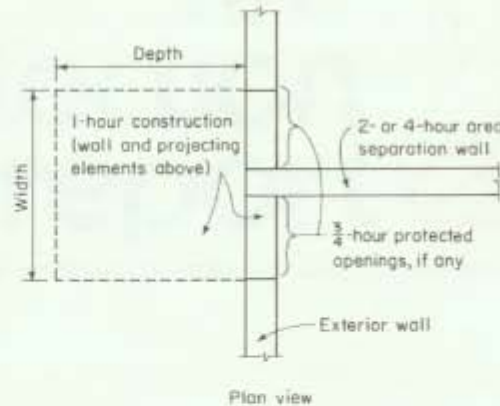


Fig. 2b. Item 2. Exception. Projecting element with no concealed space. Exterior walls rated less than one hour.

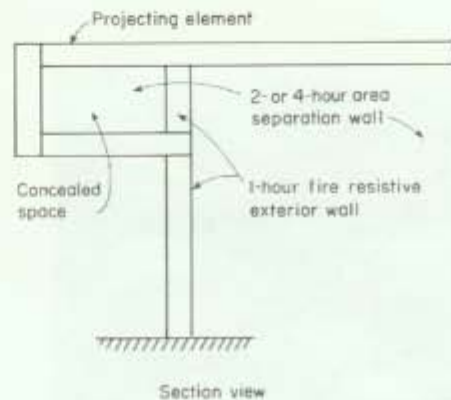


Fig. 2c. Item 2. Exception. Projecting element with concealed space. Exterior walls rated not less than one hour.

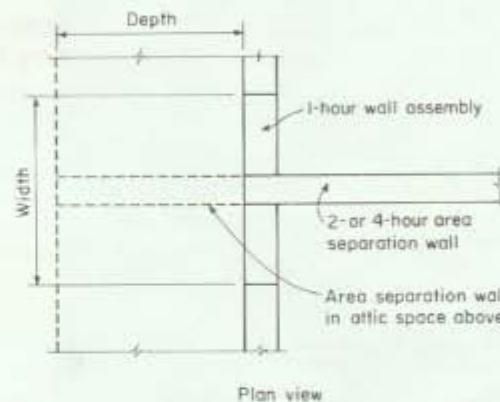


Fig. 2d. Item 2. Exception. Plan view of Fig. 2c.

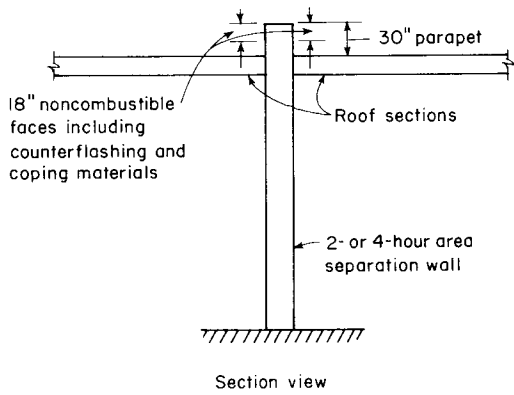


Fig. 3a. Items 3 and 4. Parapet requirements.

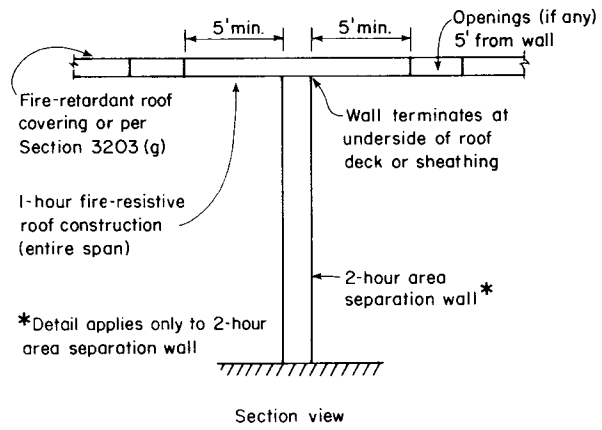


Fig. 3d. Item 3. Parapet exceptions 2B, C, and D. Roof-ceiling framing elements perpendicular to walls.

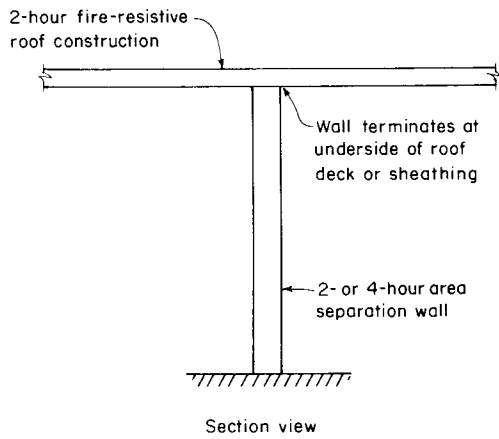


Fig. 3b. Item 3. Parapet exception 1.

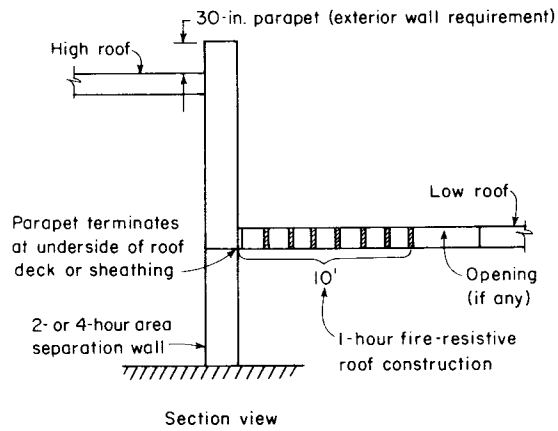


Fig. 4a. Item 5. Exceptions A and C. Unequal building heights. Roof-ceiling framing elements parallel to walls.

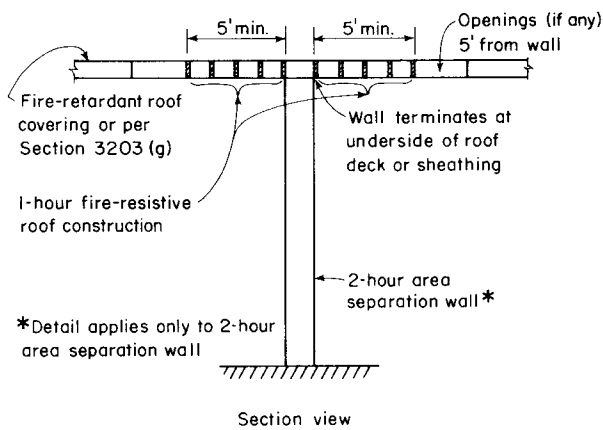


Fig. 3c. Item 3. Parapet exceptions 2A, C, and D. Roof-ceiling framing elements parallel to walls.

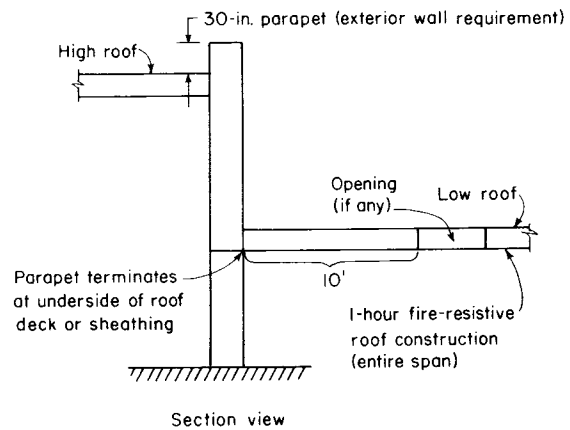
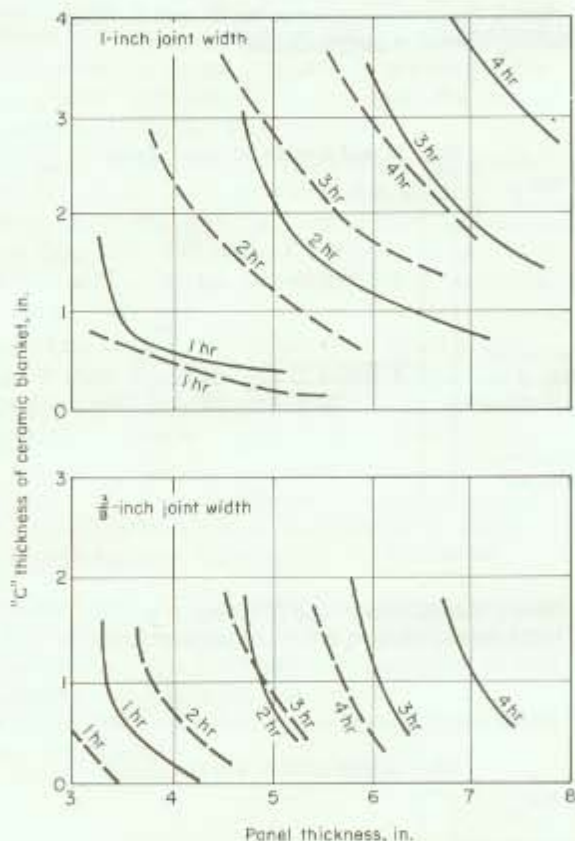


Fig. 4b. Item 5. Exceptions B and C. Unequal building heights. Roof-ceiling framing elements perpendicular to walls.

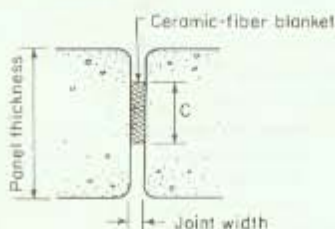
Concrete and Masonry Wall Joints

The rules that govern joint selection for interior concrete and masonry walls also apply to concrete and masonry area separation walls. Although this discussion is beyond the scope of the report, a number of good industry publications are available on the subject.^(4,5,6,7)

Where tilt-up construction is utilized for area separation walls, joints between panels should be protected as shown in Fig 5.⁽⁸⁾ The figure specifies the minimum thickness of ceramic-fiber blanket* required between wall panels to provide fire-resistance ratings from one to four hours. Ratings are based on joint widths of $\frac{3}{8}$ in.



1-inch maximum regardless of opening rating



- Carbonate or siliceous aggregate concrete
- - - Sand-lightweight or lightweight concrete

Fig. 5. Determination of joint thickness between precast concrete wall panels.

and 1 in. for a variety of panel thicknesses. Direct interpolation of the curves can be made for joint widths between $\frac{3}{8}$ in. and 1 in.

Summary

This report contains sections from the UBC specifically pertinent to concrete and masonry area separation walls. The text may be applicable to area separation walls constructed of other materials but should not be assumed as such. In retrospect, the key points regarding concrete and masonry area separation walls can be summarized as follows:

1. The function of an area separation wall is to contain effectively the most severe anticipated fire for the duration of the assembly's rating period such that the fire does not spread from one side of the wall to the other.
2. Three characteristics of code-required area separation walls are
 - a. Areas on opposite sides of them are considered separate buildings
 - b. The number required in a structure is generally governed by allowable height and area limits, based on occupancy and type of construction
 - c. All openings must be protected by approved fire-rated assemblies
3. A quality of area separation walls distinguishing them from other wall assemblies is the superior degree of fire resistance afforded them, coupled with specific orientation requirements for their use.

*Ceramic-fiber blanket—a mineral wool insulation material made of alumina-silica fibers and weighing 4 to 10 lb per cubic foot.

References

1. ASTM Designation E 119-83, *Standard Methods of Fire Tests of Building Construction and Materials*, Section 4, Vol. 4.07, American Society for Testing and Materials, Philadelphia, Pennsylvania, 1985.
2. *Uniform Building Code*, International Conference of Building Officials, Whittier, California, 1985.
3. Sheedy, Paul, "Area Separation Walls," *Building Standards*, September-October, International Conference of Building Officials, Whittier, California, 1979.
4. *Differential Movement—Cause and Effect*, BIA Technical Notes on Brick Construction, No. 18, Brick Institute of America, McLean, Virginia, July 1984.
5. *Control of Wall Movement with Concrete Masonry*, NCMA-TEK 3, National Concrete Masonry Association, Herndon, Virginia, 1972.
6. *Design of Concrete Masonry for Crack Control*, NCMA-TEK 53, National Concrete Masonry Association, Herndon, Virginia, 1973.
7. *Building Movement and Joints*, EB086B, Portland Cement Association, Skokie, Illinois, 1982.
8. "Appendix P—Calculated Fire Resistance," *Standard Building Code*, Southern Building Code Congress International, Inc., Birmingham, Alabama, 1985, page 475.

Organizations represented on the Concrete and Masonry Industry Firesafety Committee

BIA	Brick Institute of America
CRSI	Concrete Reinforcing Steel Institute
ESCSI	Expanded Shale Clay and Slate Institute
NCMA	National Concrete Masonry Association
NRMCA	National Ready Mixed Concrete Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

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Concrete and Masonry Industry Firesafety Committee

5420 Old Orchard Road, Skokie, Illinois 60077-1083