DEPARTMENT OF GENERAL SERVICES
BUREAU OF CAPITAL OUTLAY MANAGEMENT
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BCOM Newsletter

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Glass Block Assemblies in Fire Rated Walls

Glass block (a.k.a. glass unit masonry) continues to be an attractive alternative to traditional glazing panels used in window openings and full-height walls for a variety of reasons. It tends to be relatively cost effective and provides a greater degree of security / privacy while allowing light to be transmitted into the space. Glass block window openings also typically result in lower maintenance costs since they have mortared joints in lieu of caulked joints that are prone to leak and require periodic replacement. While there are many advantages, glass block also has limitations; specifically, where, how, and how much of it can be used. This article is intended to assist designers in understanding glass block limitations, primarily as they pertain to fire rated construction, and to provide a brief overview of the related code requirements.

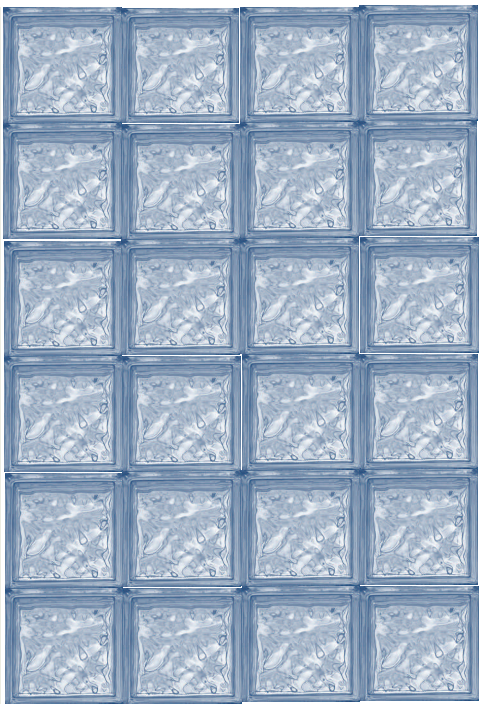
There are only a few places where glass block is specifically addressed in the Virginia Construction Code (2012). Section 2110.1.1 provides some basic limitations on just where it can be used.

2110.1.1 Limitations

Solid or hollow *approved* glass block **shall not be used** in fire walls, party walls, fire barriers, fire partitions or smoke barriers, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other *approved* joint materials. **Wood strip framing shall not be used in walls required to have a fire-resistance rating** by other provisions of this code.

Exceptions

1. Glass-block assemblies having a fire protection rating of **not less than 3/4 hours shall be permitted as opening protectives** in accordance with Section 716 in **fire barriers**, **fire partitions** and **smoke barriers** that have a required fire-resistance **rating of 1 hour or less** and do not enclose exit stairways, exit ramps or exit passageways.
2. Glass-block assemblies as permitted in Section 404.6, Exception 2 (enclosure of atriums).



The first obvious takeaway is that glass block is prohibited in fire walls, party walls, and load-bearing construction, in all cases. For openings within walls such as these, a different solution must be used. The Exceptions permit glass block to be used as opening protectives within interior fire rated wall assemblies such as fire barriers per VCC 707, fire partitions per VCC 708, and smoke barriers per VCC 709, as long as such walls are rated for 1 hour or less and do not enclose certain critical egress elements. Exterior walls, though not included in this Exception, are also permitted to have glass block opening protectives provided the wall is not load-bearing or fire rated for more than 2 hours (refer to the discussion on NFPA 80 below). Table 705.8 in the VCC provides the maximum area of openings permitted in exterior walls based on fire separation distance and whether or not the openings, or a portion thereof, are required to be protected. VCC Section 2110.1.1 Exception 2 is a unique atrium provision that allows a glass block wall assembly to be used in a specific application that would otherwise be required to consist of a fire barrier wall. The remaining discussion will focus on glass block that is utilized as an opening protective in fire rated wall assemblies as permitted in VCC Section 2110.1.1 Exception 1.

The code requirements for fire-protection-rated glazing can be found in VCC 716.6. For example, Table 716.6 indicates that a fire window assembly in a 1 hour rated exterior wall must have a minimum rating of 45 minutes and shall be marked with "OH-45" or "W-60". Important: the W-60 designation is for fire-resistance-rated glazing described in VCC 716.2 that has been tested in accordance with ASTM E 119 or UL 263 (i.e. part of a listed wall assembly). Note that in this case, the rating duration for fire-resistance-rated glazing matches that of the wall assembly containing the opening. The majority of glass block products on the market today have not been tested as part of a full scale fire rated wall assembly; though, the code has made provision for such an assembly to be used as test data becomes available. Whether the glass block is used as an opening protective or as a tested wall assembly, a product listing must be provided that indicates the applicable test standards for the project-specific application in all cases.

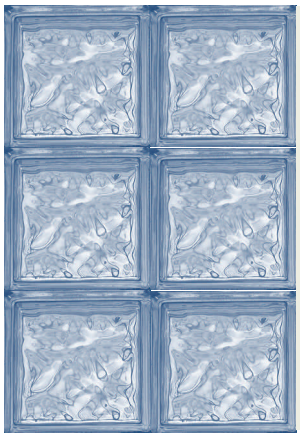


TABLE 716.3 MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E 119 or UL 263	W	Meets wall assembly criteria.
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D H T	Meets fire door assembly criteria Meets fire door assembly "Hose Stream" test. Meets 450°F temperature rise criteria for 30 minutes
	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly

VCC 716.6 states that fire rated glazing shall also comply with NFPA 80 (2010) – *Standard for Fire Doors and Other Opening Protectives*. Chapter 18 of NFPA 80 is dedicated to glass block assemblies, as shown on the next page, and contains testing criteria, maximum opening dimensions, and wall assembly fire rating limitations. As in all cases, the VCC takes precedence should there be any conflicting information with the referenced standards.

NFPA 80 Glass Block Assemblies – Chapter 18
18.1 General. This chapter shall cover the installation of glass block assemblies.
18.1.1 Testing. Glass block assemblies shall be tested in accordance with NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, or ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*, for the required fire protection rating of the opening.
18.1.2 Labeled. Only labeled glass block assemblies shall be used.
18.1.3 Size. Glass block assemblies shall be permitted for the protection of openings not exceeding 120 ft^2 (11.15 m^2), with neither the width nor the height exceeding 12 ft (3.66 m).
18.2 Installation
18.2.1 Glass block assemblies shall be installed in accordance with their individual listings.
18.2.2 Unless prohibited by the applicable code, fire protection glass block shall be permitted to be installed in interior wall assemblies having a fire resistance rating of 1 hour or less and in exterior wall assemblies having a fire resistance rating of 2 hours or less.

Putting the code pieces together, the conclusion is that glass block is indeed a viable option for use as a protected opening in a variety of interior and exterior fire rated applications, and within certain parameters. However, some wall types remain off-limits. Note that in cases where glass block is used in an unprotected opening, the maximum percentage of allowable area per Table 705.8 would still apply at exterior walls, but beyond that, the glass block installation is solely governed by the material referenced design standards (i.e. ACI 530 Chapter 7 – Glass Unit Masonry) and other applicable non-fire-related codes and standards.

The designer always has the option to take advantage of the provision found in VCC 716.4 which permits the fire protection rating for glazing panels to be determined by other approved methods. BCOM does not discourage the use of alternate methods but cautions designers to carefully consider the level of technical expertise necessary to produce such verification, which must bear the seal of a registered design professional.

If glass block is a desirable feature for your current or future building project, a thorough understanding of these code requirements will help to ensure that it is successfully implemented. Please contact your BCOM fire safety reviewer to discuss specific applications of these and other code provisions as necessary.

Position Opening

Electrical Review Engineer

Position # EE025

The Bureau of Capital Outlay Management seeks a qualified licensed engineer to perform tasks related to Electrical Engineering review of building plans and specifications. The successful applicant holds:

1) a bachelor's degree in engineering with emphasis in electrical engineering
2) a professional engineering license in Virginia
3) a valid driver's license.

In addition the applicant shall have knowledge and experience in the application of the Virginia Uniform State Building Code, the National Electric Code, the Virginia Energy Conservation Code, and other applicable state regulations.

Submit application through: http://jobs.virginia.gov

Cost Review Checklists

Cost reviews are required for pool-funded projects and for change orders requiring authorization by the Governor's Designee. In order to experience a smooth and timely BCOM Cost Review, it is helpful to submit a complete Cost Submittal. Below you will find checklists for the various types of Cost Reviews.

CAPITAL BUDGET REQUESTS (CBR) COST REVIEWS:

BCOM is tasked with reviewing CBRs as part of the effort in establishing the Governor's budget for consideration by the General Assembly. There is typically a limited timeframe available for the completion of these cost reviews. The CBR submittal both establishes the "Legislative Intent" as well as a preliminary budget amount for the project. For these reasons, it is critically important that the CBR submittal include the following:

- Need is established
- Built environment needs are defined:
  - Gross square footage of new and renovated areas (DGS-30-219 Area Calculation Worksheet)
  - Parking requirements
  - DGS-30-199 CR-3, Project Planner (may be used)
  - Funding requirements (General Funds and Non-General Funds)

SCHEMATIC PHASE COST REVIEWS:

The Schematic Phase is essential to confirming that the project design is consistent with the Legislative Intent and that the project team has a clear understanding of the project cost targets and methodology for establishing those targets. In addition, the Schematic Phase provides the opportunity to ensure that the Cost Reviewer has a clear understanding of the project's constraints and particular programmatic items. The Schematic Cost Review can be completed while the BCOM Technical Review is being done essentially adding no time to the project's schedule provided that a complete cost review submittal is received concurrent with the technical submittal. To receive a timely Schematic Cost Review, it is important to include the following in your Cost Review Submittal:

- Design narrative
- A/E Estimate:
  - On form DGS-30-224 Building Cost Summary (BCS), in "Uniformat" format
  - Amounts include escalation to bid date
  - General Requirements and OH&P breakout page on BCS form is filled-out
  - Design contingency is 10% or less
  - Construction contingency is 3% or less
  - Allowances are less than $50,000
- DGS-30-198 CR-2, Cost Review Questionnaire form completed
- FF&E is conceptually outlined

PRELIMINARY PHASE COST REVIEWS:

Like the Schematic Phase, the Preliminary Phase Cost Review occurs at the same time as the BCOM Technical Review. Upon completion of the Preliminary Cost Review, the project may be recommended by DGS to the Six -Year Capital Outlay Plan Advisory Committee (6-PAC) for funding. To receive a timely Preliminary Cost Review, it is important to include the following in your Cost Review Submittal:

- Reconciled estimates (include both the Owner's Independent Estimate and the updated A/E Estimate) in accordance with the CPSM
  - On form DGS-30-224 Building Cost Summary (BCS), in "Uniformat" format
  - Each line item on the BCS should include the required escalation. (Escalation should not be lump sum for the estimate.)
  - General Requirements and OH&P breakout page on BCS form is filled-out
  - Design contingency is 5% or less
  - Construction contingency is 3% or less
  - Allowances are less than $50,000
  - General Requirements and OH&P breakout page on BCS form is filled-out
- DGS-30-198 CR-2, Cost Review Questionnaire form
- FF&E is itemized
- VE (or Value Analysis) DGS-30-212 VE-1, Summary of Value Engineering Recommendations

FF&E PHASE COST REVIEWS:

Typically fixtures, furnishings & equipment (FF&E) are funded in one of two ways. One way is to include FF&E in the project pool. The other way is for the FF&E to be funded as a part of an FF&E pool in a subsequent appropriations act. The Funding Report will indicate both the FF&E amount and whether the FF&E is included or excluded. A listing of Project Pools stating whether they include or exclude FF&E can be found on the BCOM website.

- Even if a Funding Report has been issued for a project and includes an FF&E amount, agencies should continue to submit CBR's for the FF&E portion of a project if the FF&E funding has not been authorized by the General Assembly.

APPEAL PROCESS COST REVIEWS:

If bids come in higher than expected, or if other circumstances necessitate the need for additional funding, agencies should:

- Refer to the instructions for the Appeal Process for a timely Appeal Review.

CONSTRUCTION AND A/E CHANGE ORDER COST REVIEWS:

Recent updates to the CO-11 and CO-11ae forms provided transmittal checklists for Change Orders that require approval by the Governor's Designee. To receive a timely Change Order Cost Review:

- Refer to the transmittal checklist details within the following forms:
  DGS-30-092 CO-11, Change Order (Construction)
  DGS-30-100 CO-11ae, A/E Contract Change Order