NATIONAL CONCRETE MASONRY ASSOCIATION
Sustainable Concrete Products for Structures and Hardscapes

13750 Sunrise Valley Drive
Herndon, VA 20171-4662
703.713.1900
Fax: 703.713.1910
www.ncma.org

TO: Marina deSouza; Canadian Concrete Masonry Producers Association

FROM: Jason Thompson; Vice President Engineering, National Concrete Masonry Association

RE: Calculated Fire Resistance Examples using Concrete Masonry Assemblies

The National Building Code of Canada provides several compliance paths for determining the fire resistance rating of concrete masonry assemblies. Often, the most direct and least expensive means of verifying the fire rating of concrete masonry assemblies is through *Appendix D, Fire-Resistance Ratings*, of the NBC.

Appendix D of the NBC contains the following table that correlates the fire resistance rating of a concrete masonry assembly to the equivalent thickness of the concrete masonry unit and the type of concrete (aggregate) used in the production of the unit.

Table D-2.1.1.
Minimum Equivalent Thicknesses(1) of Unit Masonry and Monolithic Concrete Walls Loadbearing and Non-Loadbearing, mm

Type of Wall	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Solid brick units (80% solid and over), actual overall thickness	63	76	90	108	128	152	178
Cored brick units and hollow tile units (less than 80% solid), equivalent thickness	50	60	72	86	102	122	142
Solid and hollow concrete masonry units, equivalent thickness							
Type S or N concrete(2)	44	59	73	95	113	142	167
Type $L_1$20S concrete	42	54	66	87	102	129	152
Type L_1 concrete	42	54	64	82	97	122	143
Type $L_2$20S concrete	42	54	64	81	94	116	134
Type L_2 concrete	42	54	63	79	91	111	127
Monolithic concrete and concrete panels, equivalent thickness							
Type S concrete	60	77	90	112	130	158	180
Type N concrete	59	74	87	108	124	150	171
Type L40S or Type L concrete	49	62	72	89	103	124	140

Notes to Table D-2.1.1.:
(1) See definition of equivalent thickness in D-1.6.
(2) Hollow concrete masonry units made with Type S or N concrete shall have a minimum compressive strength of 15 MPa based on net area, as defined in CSA A165.1, "Concrete Block Masonry Units."

If, for example, a hollow concrete masonry unit was produced using an expanded shale aggregate (corresponding to a Type L_1 concrete), then the minimum equivalent solid thickness for this concrete masonry unit to reach a 2 hour fire resistance rating would be 97 mm according to Table D-2.1.1. Because this concrete masonry unit is hollow, we would subsequently need to

NATIONAL CONCRETE MASONRY ASSOCIATION
Sustainable Concrete Products for Structures and Hardscapes

13750 Sunrise Valley Drive
Herndon, VA 20171-4662
703.713.1900
Fax: 703.713.1910
www.ncma.org

determine the equivalent solid thickness of the unit (rather than the specified thickness of the unit) to assess the calculated fire resistance rating. To do so we would multiply the specified thickness of the unit by the unit's percent solid. If this unit was a conventional 190 mm concrete masonry unit having a percent solid of 59%, then the equivalent solid thickness of the unit would be calculated as follows:
(190 mm) x (0.59) = 112.1 mm

In this case the equivalent thickness of the unit is 112 mm, which exceeds the minimum equivalent thickness of 97 mm for a 2 hour fire resistance rating.

Alternatively, Table D-2.1.1 can also be used to determine the minimum percent solid a given concrete masonry unit would need to be to achieve a targeted fire resistance rating. If we had a 190 mm unit produced using granite aggregate (corresponding to a Type S concrete), the minimum equivalent thickness of this unit would need to be 113 mm to achieve a 2 hour fire resistance rating. To determine the minimum percent solid, we divide the minimum equivalent thickness by the specified thickness of the unit:
(113 mm) / (190 mm) = 59.5%

In this case, the minimum percent solid required to achieve a 2 hour fire resistance rating is 59.5%.

The fire resistance of a concrete masonry assembly can also be increased when the cells of hollow concrete masonry units are filled with grout or other approved fill materials or when approved finishes (such as gypsum wall board or stucco) are added to the concrete masonry assembly. Appendix Section D-1.7.4 of the NBC provides additional sample calculations for the determination of the fire resistance rating of concrete masonry assemblies when such conditions occur.

Certainly let me know if there are any additional questions.

Jason Thompson
Vice President of Engineering
National Concrete Masonry Association