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ABSTRACT:

Did you just severely restrict, or eliminate competition by including a UL design number for fire resistive masonry partitions? Unknowingly, perhaps. Learn what options are available to meet code requirements for fire resistive concrete masonry units. It is easy to open competition and allow local producers to furnish fire resistive units, even without a UL Mark.

FILING:

UniFormat™
B2010 - Exterior Walls
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KEYWORDS:

Fire Resistance, Fire Rating, CMU, Concrete Masonry Units, Concrete Block, UL, IBC

REFERENCES:

ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units

International Building Code, 2009 edition.

NCMA TEK 7-1C - Fire Resistance Ratings of concrete Masonry Assemblies

UL Online Certifications Directory

Fire Resistant CMU

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Background

The code review is done. Required fire-resistant partitions are known and shown on the life safety plans. How is this reflected on the partition schedule? Let's see, what fire-resistant design should be used for the 2-hour masonry stair enclosures? Of course, the local block producer will furnish the CMU to help meet the LEED regional materials requirement.

Resources

One of the most obvious resources for fire-resistant design assemblies is the Underwriters Laboratory Fire-Resistance-Rated Systems and Products directory — the familiar set of orange books, in case you might still use print media. Otherwise you can start your search by design number here: at the [Online Certifications Directory](#).

But first let's narrow the search. Stop at the [Guide Information](#) to understand what systems even have CMU as the partition material.

Checking the chart for Numbering System for Fire-Rated Assemblies, you will find masonry partitions in the U, V, and W Construction Groups and the 900 Series indicating unprotected assemblies.

If you are old enough to remember DOS commands, you will find that you can enter a search string such as "U9*." The asterisk is a wildcard character allowing the search to find any assembly starting with U9, a total of 23 designs. The SEARCH HINTS on the page explain this. Of course not all are CMU.

Some are precast concrete; some are aerated autoclaved concrete.

The CMU designs, such as U901, list: "Concrete Blocks* — Various

designs, Classification B-4 (4 hour)." Be careful you understand what this means. The asterisk leads to a footnote reading "*Bearing the UL Classification Mark." Classification B-4 is another way to indicate a four hour rating.

To use the classification mark, the block manufacturer must be listed with UL under the category CAZT for concrete blocks. A total of 38 manufacturers in 20 states are listed. Most of them are in the eastern states. Identifying masonry partitions with a UL design number severely limits competition and may require the CMU to be transported half way across the country just to meet the design requirement. No sustainable design regional material credit will be awarded for that!

What's the option?

The International Building Code (IBC) Table 720.1(2) permits prescriptive fire-resistance ratings and Section 721 permits calculated fire-resistance ratings for concrete masonry units. Both methods rely on two factors: the type of aggregate — determining density (Table 1) — and equivalent wall thickness of the CMU.

So what is the difference among these types? The various aggregates are used to produce lightweight, medium weight and normal weight concrete masonry units defined by ASTM C 90. The lighter the density, the better the insulating value and fire protection will be.

Most CMU are hollow, even solid CMU is permitted to be up to 25 percent open core. For fire-resistance, the equivalent wall thickness is what matters. How much concrete is between you on one side of the wall

and the fire on the opposite side? The equivalent thickness is calculated by assuming the concrete used to produce the CMU was cast as a totally solid block with the same face dimensions. The greater the thickness, the greater the mass and fire resistance will be.

The importance of these prescriptive and calculated values is that any local CMU producer, including UL listed producers, can deliver 2-, 3-, and 4-hour fire-resistant rated CMU without the need of a UL Mark. NCMA TEK 7-1C provides a detailed explanation of calculated fire resistance ratings with a chart showing equivalent wall thicknesses for CMU.

TEK Manuals are available from NCMA sponsors. Select a state, a sponsor, and then TEK Manual to search for individual TEK documents.

Specifying the Result

Often, code officials are expecting to find fire resistance design numbers shown on construction drawings. Including design numbers is an easy way to assure the code official that the construction will meet the code requirements.

When relying on code permitted prescriptive or calculated methods, a different approach is required. The specification must include either prescriptive or performance requirements for the CMU to meet the

required fire resistance rating. Prescriptive requirements must state the type of aggregate and the minimum equivalent wall thickness for each fire resistant rating. Performance requirements must state the fire resistance rating required for each CMU unit thickness. For instance: Prescriptive Method:

- CMU: ASTM C 90; expanded slag aggregate, 3.2 inches minimum equivalent wall thickness.
- Performance Method:
- CMU: ASTM C 90; medium weight, calculated 2-hour fire resistance rating in accordance with applicable code.

The specification approach will dictate the submittal types that must be required to confirm compliance with the specification. It is not a matter of simply specifying the correct material.

Conclusion

Reference standards are a useful, efficient means to specify project requirements. There can be drawbacks, however. Be sure to know the standard and exactly what the standard means. Read the fine print and the footnotes to understand the full implications, including the effect on competition. Specifications can be proprietary, or highly restrictive, even without naming a single manufacturer

or product. Indicate the fire-resistance rated partitions. Show the required rating. Rely on the masonry properties set by code for fire resistive masonry partitions. Specify UL Designs cautiously. These designs may severely limit local competition. Use project specifications to set the requirements for fire resistive CMU. When the code official questions the missing design number on the partition schedule, reference the spec and the code permitted prescriptive and calculated values.

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Table 1: Concrete Masonry Unit (CMU)

Aggregate Types	Concrete Densities
Expanded slag or pumice	85 to 105 pcf Lightweight
Expanded clay, shale or slate	105 to 125 pcf Medium weight
Limestone, cinders, or air cooled slag	105 to 125 pcf Medium weight
Calcareous or siliceous gravel	125 to 150 pcf Normal weight

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