

May 28, 2008 ASPE Meeting Topic
BIDDING UL ASSEMBLIES—PITFALLS AND OPPORTUNITIES

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I. Introduction:

My talk today will focus on UL ratings common to my area of estimating—the wall and ceiling trades. But the lessons learned can be applied to other trades as well. We'll start with a brief overview of the UL Fire Resistance Directory. Then we will look at some examples of various UL assemblies with an eye toward some of the pitfalls and opportunities for estimating.

II. 2008 UL Fire Resistance Directory

- a. Volumes 1, 2A, 2B and 3
- b. UL Versus Other Rating Systems
- c. UL Numbering System

a. Volume 1 shows the various fire ratings for walls, roof-ceilings, floor-ceilings, beams and columns. Volume 2 shows fire ratings for joints between the rated assemblies in Volume 1, and for penetrations through them. Volume 2 is in two parts, A and B, because of its size. I thought for the longest time that 2A had the joints and 2B had the penetrations. But most of 2A and all of 2B is penetrations. Volume 3, which I have never opened, has fire ratings for dampers, doors, glazing and “related equipment.”

b. When bidding a job, the UL #'s you'll commonly see on the plans are for the assemblies in Volume 1. You'll find them on the wall legend (if there is one) for walls. You'll sometimes find them on the cover sheet or index sheet, usually under “Building Code Analysis.” And sometimes, if you're lucky, there will be a sheet or several sheets with the UL assemblies printed right on them. Architects who include UL sheets usually go the extra mile to include UL joints and penetrations as well. On occasion, an architect will have a schedule of UL joints and penetrations in the “Fire-Stopping” specification section, usually numbered 07840. Sometimes for walls and ceilings, an architect will use numbers from GA-600, the Gypsum Association's Fire Resistance Design Manual, such as WP-1081 for a 1-hour wall. GA-600 is a valuable resource for

us, because it is the only place I know that has the STC sound ratings for walls, as you can see from the example. But it does not conduct the fire tests. Each WP assembly (WC for walls/partitions, FC for floor-ceiling, RC for roof-ceiling, etc) in GA-600 references an outside testing agency who conducted the test. Our example WP-1081 is from UL # U465. There are sixteen different agencies or private companies that GA-600 references, but UL is the most commonly used. Speaking of other agencies, with our focus on pitfalls and opportunities, sometimes buried in specification section 07840, or in your specific trade's specification, is the referenced standard FM 4991. Who is familiar with this standard? It's the Factory Mutual "Fire-stop Contractor Approval Standard." It requires you to be an "FM Approved Contractor," that requires 4-6 months preparation and an exam, which costs \$4,000.00 to \$7,000.00 in their estimation, and you must then join FCIA, Fire-Stop Contractors International Association, whose dues are currently \$1,150.00 per year. If you see this in your specs, you can hire a sub that is qualified, or exclude it, on the grounds that you are certified by your manufacturer (which is another common requirement).

- c. The UL numbering system is shown in the hand-outs. There's one for Volume 1 and another for the joints in Volume 2A. I'll briefly touch on Volume 1 numbering system here, and Volume 2 a little later. I'll leave the penetrations for one of our MEP contractors to teach us another time. We'll look at a few examples next.

III. Fire Rated Assemblies from Volume 1:

- a. Masonry Walls: First we'll look at a couple of UL #'s for masonry (CMU) walls. UL # U905 is the most commonly used assembly for a 2-hour rated CMU wall. The CMU itself (D-2 block) has a 2-hour rating, simple enough. Now let's say the architect specifies U910 for a 4-hour wall. This requires a 2-hour rated block (D-2), and ½" fire rated (type X) drywall furred to both sides with hat channels. In many parts of the country, this is more expensive overall than to use UL # U901, which gets its rating from a 4-hour rated block (B-4), or from 2 or 3-hour block with filled cells. If the wall has to be furred

with drywall anyway, which is often the case, then it would be the opposite. You would want to bid U910 instead of U901 (unless it's a very high wall, say 30', and the drywall only has to go 10').

- b. Metal Stud Walls: Now back to U465. This is a **generic** metal stud and drywall 1-hour wall assembly, meaning many manufacturers are acceptable, both for the framing and for the drywall. Some assemblies are **proprietary**, and you must use the listed manufacturer's products—some of whom are grossly over-priced. Another one I like is U419, although it is not U419 unless you use USG's drywall. It's a proprietary assembly. It can be used for 1 to 4-hour ratings, by adding layers of drywall. I will often qualify a bid for U465 or U419, when the architect has specified some of the other assemblies that are either proprietary or have unnecessarily expensive requirements. Batt insulation is optional in most fire rated stud walls, and required in some, but some UL assemblies require special attachment methods. U412 for example, requires you to staple through the insulation to the drywall behind it with a 9/16" staple, which is pretty near impossible, since the architect usually wants 3-1/2" or 6" batt insulation in the wall. Some assemblies require semi-rigid insulation, while others allow blanket insulation. Some are just for cement backer board on one or both sides, plaster, etc. Sometimes the architect will specify a load-bearing (LB) UL #, when it's clearly a non-load-bearing (NLB) wall. Often a LB wall requires minimum 20 gauge studs, even if the plans and specs otherwise allow 25 gauge studs.
- c. Floor-Ceiling and Roof-Ceiling: I won't say too much here, except that recently I bid a 4-story hotel with hollow core concrete floors and metal trusses for the roof. The architect wanted drywall on resilient channels under the hollow core slabs, and the way he went about it was to specify the UL roof assembly # P526 for all the hollow core floors. Just know that the rating for floor-ceiling and roof-ceiling assemblies is for the assembly as a whole. If the code analysis on the cover sheet requires rated floors or roofs, you still have to use a rated assembly, but now you have the freedom to substitute one that's more cost-effective for you, without having to go through the substitution process (which as you know, can be a nightmare).

- d. Columns and Beams: The example I've chosen, UL # X528, is for fire-protection of structural steel columns using drywall. I chose it to show that the thickness and/or number of layers of drywall, similar to the thickness for other methods, such as spray-on fire-proofing or mineral board, depends on the size and weight of the steel columns being protected. When bidding this assembly on a multi-story steel structure, sometimes the architect will show less drywall than we'll need to meet X528 and other times he'll show more than we need. Knowing that column size and weight affects how much drywall you need to protect it can help you make money or lose it—especially on a hi-rise, where the steel columns on the upper floors will be much lighter (more drywall layers) than the columns on the lower floors (less drywall layers).

IV. Fire Rated Joints:

- a. Going back to the hand-out on Volume 2 numbering system, the one I printed for you is for wall and floor joints. There's FF for floor-to-floor, etc. I use the head-of-wall, HW, and base-of-wall, BW, joints for my work.
- b. Before looking at a couple of examples, we need to note the difference between static and deflection joints, that the static joints have no deflection. I'm limiting my talk about deflection joints to vertical deflection joints. Often an architect will require a vertical deflection joint for our non-load-bearing walls on a structure that we know will usually have no deflection, such as post-tensioned concrete or a two-way CIP slab. In those cases, we will often qualify our bid that "Head-of-wall joints are based on UL # HW-S-0032, with no deflection." HW-S-0032 allows us to use sound caulk (at about \$4.00 per tube) instead of fire-caulk (at \$15.00 to \$30.00 a tube), as long as the drywall is within 1/2" of slab overhead. Similarly, architects will almost always show fire-caulk at the base of a fire-rated wall. But as you can see in BW-S-0013, sound caulk will achieve the rating—just be sure to qualify your bid.
- c. For walls that do have vertical deflection, we have many, many HW-D joints to choose from. The architect tries to choose for us, by specifying the most expensive things he can find, such as double deflection track, slotted slip track, deflection clips and--

most expensive of all—FireTrak. FireTrak folds like an accordion. There are times when it is the best or even the only solution, but architects often specify it on the advice of a good salesman, even when it's not needed. What we have to understand first is that vertical deflection joints have design/performance criteria, namely the "width" of the joint and the percent of "compression" and "extension" required. You need to get your hands on that information in order to bid wisely. It's sometimes found in the drywall framing specs (the same place that the architect specifies the expensive track, if he hasn't shown it on the plans), and sometimes it's in 07840, the fire-stopping section. Often it's not found anywhere, so it's a good idea to take note of it when you do see it on some jobs, so you gain a general idea of what's typical for a given type of structure. There are a lot of ways, for example, to get a 1" joint with 18% to 50% compression and extension. But FireTrak is the only way to get 100% compression and extension. I rarely see buildings with that much movement expected. The most common deflection criteria I see are for joint width of 1" or less, and compression/extension of 50% or less. I've printed one solution from Hilti's web site, not because I favor Hilti, but just to show you that practically all of the manufacturers involved have the UL assemblies that use their products reproduced in their literature, on-line and in catalogues. (After all, they paid for these very expensive tests.) This assembly, HW-D-0295, has a 1" joint width and 12.5% compression and extension. This is identical in construction to numerous others I could have printed with 1" joint and up to 50% compression and extension. And they all allow a single 2" track. When you use a single track, you have to use one of several methods to stabilize the studs, either CRC bridging, Spazzer bars, flat strapping or even temporary screws that you remove after attaching drywall. All are usually much less expensive than the proprietary assemblies. Be sure to qualify your bid though.

V. Conclusion;

The important lesson to be learned is that you have options, because there are so many different assemblies that meet the same "performance

criteria.” Whether its an hourly rating for the assemblies in Volume 1, or a joint size and compression/extension criteria in Volume 2A, or God knows what kind of criteria they use for those mysterious MEP penetrations, knowing the details of the UL #'s that apply to your work will give you a competitive advantage when bidding, or when Value Engineering (in case you don't have the chutzpah to qualify your bids as much as I do). And not knowing them—and some of the related standards like FM 4991, can really get you in trouble on some of these jobs.

(Note: In the class I passed out copies of all the assemblies discussed. Copyright doesn't apply to use in a class, but I can't reproduce them here.)

