Historic Building Meets Contemporary Codes

by Gus Carlson

It took ingenuity and a modern sprinkler system to bring the 300-year-old Deacon John Grave House in line with current Connecticut codes.

Built in 1685 in Madison, Conn., the Deacon John Grave House had been added to three times. The house had been used as a tavern, a court, a school, a hospital, a meeting house, and continuously, until 1978, as the residence of the Grave family. Recently, when local residents banded together to save the place, the Deacon John Grave House was a two-family dwelling of combustible construction, further defined by code as "unprotected," meaning that the structural members had no fire-resistance rating. In short, Deacon John's place was the lowest form of building life allowed to be occupied by humans.

The owner's goal was to restore the main house for use as a public museum, and to keep the caretaker's apartment. The building code (Connecticut uses the 1987 BOCA code for commercial, and CABO 1986 for residential) requires that the converted building meet all provisions of the code *as though it were a new building*. Such a change in use is usually an involved task; to convert an historic house to a mixed-use building — public assembly and residential — was certain to be full of challenges.

The Building Code

Our first step was to study the height and area limitations the code places on all new uses. The first major issue confronting us was a one-story limitation on areas of public assembly in unprotected, combustible construction. The main house included about 1,350 square feet on the second floor, which were intended to be part of the museum. To resolve the conflict, we came upon the idea of limiting the number of persons using the second story to 50. This enabled us to redefine the second floor as business use, which allows for the second story in unprotected, combustible construction. The solution was a clever one, except that now we were faced with a single building with three uses: public assembly, business, and residential.

At this point we turned to the code's fire ratings for separation walls between uses. These ratings are quite stringent, but fortunately the code has some flexibility here. We could have chosen "Separated Uses," in which case all floors and ceilings between uses would have needed a two-hour fire rating; but this would have meant covering the exposed beams and second-floor planks with drywall — visually an unacceptable alternative. Or we could have chosen "Nonseparated Uses," meaning we could apply the fire ratings for each use separately, applying the higher rating where uses overlapped. Assembly and business uses have a two-hour rating, while residential walls are rated one hour. More importantly, ceilings in all three uses are given a zero-hour rating — meaning, to our great relief, that the wooden beams and flooring could remain exposed.

To comply with the separation-wall requirements, we had to provide a two-hour wall between the apartment and the assembly/business areas. We did this by adding two layers of 5/8-inch "fire code" gypsum board to both sides of the existing wall and installing a two-hour steel door and frame with a smoke seal (ugh!). Yes, this was a compromise for the historically minded; but, fortunately, it was a small area, which we appropriately disguised with plaster and paint.

Where the building code failed us — requiring two-hour fire enclosures around exits, exit hallways, and stairways — we were able to turn to a special code supplement that Connecticut has adopted: "Special Historic Structures and Districts." This recognizes the value of our architectural heritage and grants special exceptions through the use of "Life Safety Alternatives." These include such measures as upgrading fire-resistive finishes, installing sprinkler systems, limiting occupancy or use, providing alternative exits, and installing fire warning systems.

However, the alternatives must not compromise the provisions of the State Fire Safety Code. Also, a building must qualify as "historic," which usually requires the approval of the State Historic Preservation Officer, a process requiring some time and patience. The Grave House happened to fall in a historic district and was already on the National Historic Registry (sometimes a mixed blessing, if you desire to engage in less-than-historic development).

Structure: Tired And Undersized

While overcoming the fire-resistance requirements of the building code was certainly one of the most difficult problems, we also had a number of structural problems to solve, including rot, mortise and tenon joints pulling apart, major wooden beams badly deflecting (say, 4 inches in 20 feet), sagging rafters, and a gable-end girt bowing outward some 5 inches.

All this would have been bad enough for the future of the house,

To beef up the roof system, the renovation crew added steel tension rods and new rafters between the old ones.

but it was no longer just a house in the eyes of the code — it was a place of public assembly and business as well. These uses require design live loads of 50 to 100 pounds per square foot, not the 30 to 40 psf required for residential use.

We used a variety of techniques to fortify the structure, keeping the impact on the historic interior finishes to a minimum. Among other methods, we used epoxy and hidden metal connectors, slipped in new structural members where they would be hidden, doubled the number of rafters (the new ones were painted a muted green), and railed off a portion of the second floor to prevent foot traffic.

We also had to replace the electrical system, refurbish the heating system, enclose the boiler room with two-hour rated walls, reverse some door swings, repoint the stone chimney, reinforce the stairs, and install a smoke and heat detection system, complete with alarms and a self-dialing line to the fire and police departments.

The Fire Code

Even though the building code has stiff fire-resistance requirements, the fire code is tougher still. On the surface it says, in effect, that there are *no* grandfather provisions, and that any building at any time must meet the fire code as it exists on that day.

Connecticut uses the NFPA's 1988 Life Safety Code 101, together with a 1989 Connecticut Supplement. In general, the fire code is interested in saving lives. There is no historic building provision like the one that helped us meet the building code. Fortunately, however, the fire code does allow for "equivalent protection," and sends a nonconforming situation, like the Deacon John Grave House, directly to a "modification" process. This is a cumbersome process, and requires review by the local fire marshal and the state. A good reference on the subject is the NFPA's "Protection of Historic Structures and Sites" (available from the National Fire Protection Assoc., 1 Batterymarch Park, Quincy, MA 02269; 800/344-3555), which covers many of the dangers and nonconforming features involved in a project like the Grave House.

The local marshal approved our application and recommended it to the state, in large part because we were willing to install a commercial-duty (NFPA 13) sprinkler system. (We were fortunate to be served by a city water system with the required minimum volume and pressure.) This sprinkler system is very persuasive to all fire people, who, along with the codes, are less interested in the loss of a building than they are in saving lives. Since we were greatly interested in saving an irreplaceable

Installing a commercial-duty sprinker system persuaded the fire marshal to grant approval for the restoration.

building as well, we were able to accept the negative visual effect of the sprinkler system — in spite of a $30,000 drain on the budget.

With the local marshal's blessing, the application was forwarded to the state level for review. A considerable time later we received a stiff two-page letter: "Not approved as submitted, but address these things...," many of which made good sense. But it also showed that the reviewer did not understand some of our intentions and the historic nature of the undertaking. So, anxiously, we went back to the drawing board. The next round was done in person (we were never able to coax the state reviewer to the site, but we did include photographs).

Overall, the historic fabric was saved by agreeing to a number of alternative measures: no use of the attic, exit signs (though not self lighted), fireplace screens, reducing the occupant load on the second floor, supervision by docents during public tours, changes to the front door hardware, emergency lights, and so on. But again, our most persuasive argument was the sprinkler system.

Lessons Learned

Not every historic rehab is as complicated as the Graves House project, which took about eight months just to work through the code issues and get the necessary permits. But with any restoration project you'll be facing many of the same issues, and there are several steps you should take at the outset.

First and foremost, get to know the codes. Do this even before you buy the property. Waiting until work has begun and money has been spent makes even routine code work nerve-racking. And nothing is more upsetting than having an official shut down the job while code issues are being ironed out.

Second, go to the site and record, in very specific detail, what exists. Sketch the floor plans, the site plan, critical sections, electrical and hvac plans, and structural details. If you've done your code groundwork, you'll know what issues the codes address and you should be able to get about 90% of the required information on the first visit. Take photographs — they're a great help when you're back in the office making scaled drawings from field sketches.

Third, get to know the local code officials. Enlist their support in solving problems and assure them you're handling the situation properly. The truth is that many officials, particularly in smaller towns, do not often deal with historic restorations. In the beginning they struggle, just as you do, to get a feel for what the critical issues are. But if you show a basic appreciation of the codes and how to apply them, you'll greatly improve your working relationship. A little mutual respect goes a long way.

An unspoken rule of thumb at this stage is to discuss the general situation and state overall goals, but avoid making irreversible statements about how specific code issues will be handled. More facts, more reading, more strategy lie ahead.

Sometimes it is necessary to be able to cite what the code says. This keeps the discussion from becoming one person's memory vs. the other's. When the outcome of the job is hanging in the balance, opinions and even small errors of fact can be injurious if not fatal to your objective. It may happen that the official will get some code section half right, relying on his memory. Don't let this pass. Diplomatically get the item in question out in the open, and insist that it be related to the code. Have the code with you, read the words out loud, then get into interpretation. One or two such excursions in a conversation will pretty much dampen future speculation.

And, it goes without saying, be deadly honest. In case you or the owner does not already know it, the two of you, not the code official, are in the direct line of fire if, down the road, a lawsuit results from some oversight in applying the code. (There is an electrical subcontractor here in Connecticut serving time for forgetting this.)

If there is a lesson we learned with the Deacon John Graves House, it is that the building and fire codes are, in general, the product of experience and reason. Within limits, they're both flexible, with provisions for equivalent protection or exceptions to the general rule. Every project will require case-specific research to determine the best course to take through the codes. This process sometimes seems closer to the practice of law than of building, but Deacon John would undoubtedly be pleased that those holding earthly power these days also respected his architecture. And that is as it should be. ■

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