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The Magazine of Effective Compartmentation

Life Safety **DIGEST**

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Inspecting Fire-Rated Glazing

Repairing Fire Resistive Gypsum



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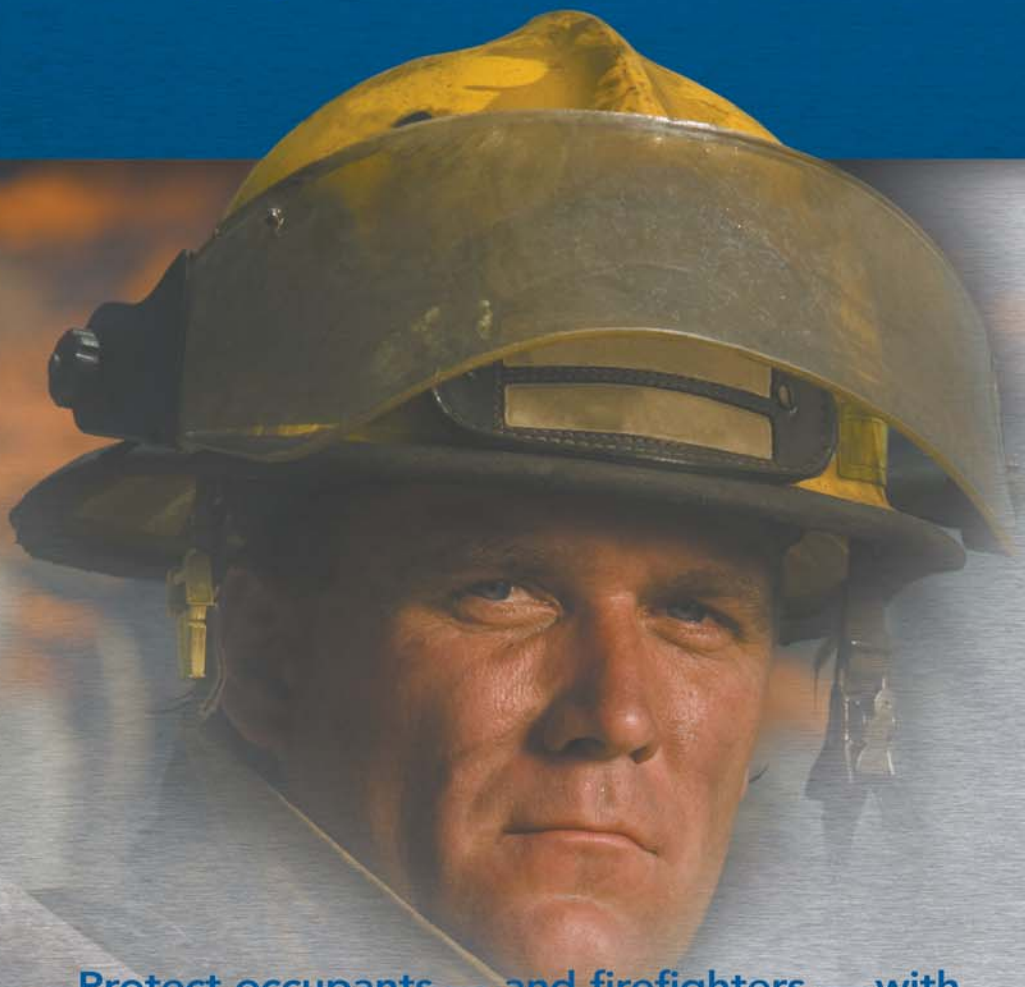
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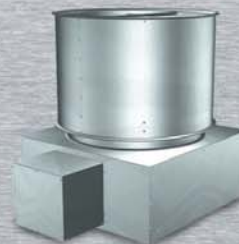
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Editors' Message



FCIA's Board of Directors

To complete the construction process, commissioning and periodic inspection needs to take place to assure continued successful performance of Effective fire-resistance and smoke-resistant Compartmentation when called upon to protect occupants.

Having inspection brings balance to the construction quality process, allowing the building owner and manager to procure installed systems from specialty contractors at the most accurate price possible. With an inspection firm commissioning, construction defects are found prior to occupancy and communicated to the installing contractor quickly for correction. Plus, an annual inspection means someone

has looked at fire barriers to maintain fire protection continuity throughout the building's life cycle.

FCIA believes that all types of fire protection - alarms and detection, fire- and smoke-resistance-rated Effective Compartmentation and each of the compartmentation features, suppression systems, plus occupant education - are needed to keep our families of all ages safe, wherever they are.

Read and enjoy articles about commissioning and periodic inspection of all fire- resistance-rated and smoke-resistant compartmentation features. Join FCIA and other associations that support Effective Compartmentation.

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Concrete Masonry Inspection

By Dennis Graber

Although local municipalities usually have minimum inspection requirements, the role of the concrete masonry inspector has been a source of confusion. Questions have arisen as to how long an inspector should be on a job site and what should be inspected.

In addition to considering public safety factors, the amount of inspection required depends on the owner's needs. The architect or engineer will typically specify the degree of inspection necessary to meet the owner's quality assurance program and meet local building code requirements.

To clarify how much inspection should be required on masonry projects, Specification for Masonry Structures includes detailed inspection guidelines that provide an excellent basis for the degree of inspection that should be provided on masonry projects.

The 2006 International Building Code (IBC) inspection requirements are virtually identical to those in the 2005 (and 2008) Specification for Masonry Structures (ACI 530.1-05/ASCE 6-05/TMS 602-0) reported by the Masonry Standards Joint Committee (MSJC). The corresponding designations are:

- * IBC special inspection Level 1 requirements (Table 1704.5.1) correspond to MSJC Level B.
- * IBC special inspection Level 2 requirements (Table 1704.5.3) correspond to MSJC Level C.
- * Although there is no special inspection requirement correspon-

ding to MSJC Level A, this basic requirement is covered in IBC section 109.

Three levels of inspection are defined within MSJC (IBC requirements are virtually identical but a little less straight forward):

* Level A (IBC Basic) - These requirements are the least stringent, requiring verification that masonry construction complies with plans and specifications. This level of inspection can only be applied to empirically designed masonry, glass unit masonry and masonry veneer used in facilities defined as nonessential by the building code. When masonry is designed by engineered methods or is part of an essential facility, Level B or C inspection is required.

* Level B (IBC Level 1) - These requirements provide a periodic-type inspection for engineered masonry used in nonessential facilities (as defined in the building code) and for empirically designed masonry, glass unit masonry and masonry veneer used in essential facilities. Key inspection items include assurance that required reinforcement, anchors, ties and connectors are in place and that appropriate grouting procedures are used.

*Level C (IBC Level 2) - The most comprehensive inspection procedures are required for essential facilities (as defined in the building code) that are designed by engineered design methods. Items inspected under a Level C quality assurance program are similar to those of Level B, with the added



requirement that inspection be continuous during all phases of masonry construction.

These inspection levels are minimum criteria and may be increased when deemed necessary by the building owner or designer. In this case, the construction documents must indicate the inspection level and tests that are required to assure that the masonry work conforms to



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the project requirements. Due to their relative importance or potential hazard, more significant inspection and quality assurance measures are required for essential facilities.

Although not required by the International Building Code or MSJC, inspectors may be qualified or certified under nationally recognized education programs offered through such organizations as the International Code Council. Completion of such a program may be required by a local jurisdiction or by a building official.

Section 1704.1 of the 2006 International Building Code provides general guidance on the minimum qualifications for inspectors, as follows: "The special inspector shall be a qualified person who shall

demonstrate competence, to the satisfaction of the building official, for inspection of the particular type of construction or operation requiring special inspection." Some equate qualification with a nationally recognized certification, while others have allowed a noncertified individual with sufficient experience to serve as an inspector.

As a minimum, however, a masonry inspector must be familiar with masonry construction and be able to read plans and specifications effectively in order to judge whether the construction is in conformance with the construction documents. As part of this task, an inspector should always review the construction documents thoroughly before construction begins.

More information on concrete masonry design, construction and inspection is available on National Concrete Masonry Association member web sites that sponsor e-TEK and e-Details. For a list of sponsors and links to their sites, go to www.ncma.org. 

Dennis Graber is with the National Concrete Masonry Association. Email him at dgrab@ncma.org.



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Fire Damper Inspection



By Rick Cravy

Fire dampers and combination fire/smoke dampers perform vital safety functions as part of a building's fire protection or life-safety system. They must function properly during a fire or life-safety emergency and so, must be periodically inspected and tested to ensure they work when needed. Codes, standards and manufacturer's recommendations have been published recommending inspection and test-

ing intervals as well as the procedures to use for the process.

The purpose of this article is to summarize these recommendations and to provide some guidance pertaining to the procedures to inspect fire, smoke, and combination fire-smoke dampers.

There are two important types of inspections, the initial construction inspection, or commissioning; and periodic inspection, testing and maintenance. The first inspection is part of the commissioning process.

Commissioning Inspection

A commissioning inspection ensures proper operation of a building's mechanical systems, including the fire protection or life-safety system. The commissioning of fire and fire/smoke dampers includes:

- Inspection of the installation to confirm it meets the requirements or intent of the building code.
- Operational test to prove the damper will fully close from the open position under normal operating conditions.

Commissioning inspections and proper operation need documentation in order to establish a point from which to begin the periodic inspection, testing and maintenance program for fire and fire/smoke dampers. Periodic inspections are the second important type of inspection.

Periodic Inspection, Testing and Maintenance

Described below is a typical periodic inspection, testing and maintenance procedure.

INSPECTION, TESTING & MAINTENANCE INSTRUCTIONS

DAMPER MODELS: All Fire/Smoke and Smoke Dampers

Regular inspection, testing and maintenance is essential to ensure a building's fire/smoke and smoke dampers will perform as intended under fire and smoke conditions. Regular inspection and maintenance should include periodic testing of all equipment, including dampers, fans, initiating devices, controls, etc., associated with the smoke-control or life-safety system. Consult standards like NFPA 92A, NFPA 80, NFPA105 and local codes for guidance regarding the frequency of inspections, testing and maintenance of fire/smoke and smoke dampers.

MAINTENANCE

- Check actuator and tighten linkage if necessary.
- Clean damper blades and other working parts if necessary.
- Lubricate linkage, bearings and other moveable parts with a silicone lubricant. Do not use petroleum-based products as they could cause excessive dust collection.
- Operate (open and close) the damper via the actuator (see note).
- Check the blades to make sure they completely close and re-open.
- Consult the manufacturer if problems occur.

TESTING FIRE/SMOKE DAMPERS

- Use a moderate heat source and heat the thermal disc found "in the air-stream" on the fire/smoke

damper. Caution: too much heat may damage the thermal disc.

- The disc will dimple and cause the flow of electricity to the actuator to stop. The damper blades will close.

- Allow the disc to cool. Press the reset button on the outside of the damper. Flow of electricity to the actuator will resume and the damper blades will open.

Note: If possible, operate the dampers under normal airflow conditions.

DAMPER MODELS: All Curtain Type and Multi-Blade Type Fire Dampers

Regular maintenance is essential to ensure that a building's fire protection system will perform as intended when fire occurs. Regular maintenance should include periodic testing of all equipment, including fire dampers, associated with the fire protection system. The frequency of inspection, testing and maintenance varies widely depending on the duration of system operation, condition of fresh air, amount of dust in return air, and other factors. NFPA 80 recommends inspecting and testing all fire dampers at least once every four or six years.

MAINTENANCE

(refer to notes)

- Check closure springs. If defective, repair or replace.

- Operate the damper by removing the fusible link and allowing the blades to drop or close. (Caution: keep fingers and hands out of the blade package travel path.)

- Check the damper for rust and/or corrosion.

- Clean damper blades and lubricate the working parts. Do not use petroleum-based products as they could cause excessive dust collection.

- Re-open the damper (move the blade package back to the top of damper) and replace the fusible link.

TESTING DAMPERS

(refer to notes)

- Use a heat source and melt the fuse link or remove the fuse link and let the blade package drop. (Caution: keep fingers and hands out of the blade package travel path.)

- Check the blades to make sure they completely close and lock (if a lock is used).

Notes:

1. Due to their construction (including size) and/or accessibility, dynamic curtain type fire dampers may be very difficult and in some cases impossible to test (close and re-open). If the damper is determined to be impossible to test, the authority having jurisdiction can omit the test and allow a thorough examination to ensure nothing exists that would prohibit the damper from closing. A thorough examination should include checking the damper for squareness and the blade channel for obstructions.

2. Fire dampers may be easier to reopen from a specific side. Consult the manufacturer for assistance.

3. If possible, test fire dampers under normal airflow conditions.

Fire dampers and combination fire/smoke dampers protect building occupants in two ways. First, they close internally to form a barrier against the threat. Second, they also provide fire and smoke protection around the perimeter of the duct with continuous metal angles and firestop systems. When firestop systems are used as the "angle substitute," they must be installed to the classified firestop system tested at the laboratory, with zero tolerance protocol. Annular space sizes, duct



size, backing and clips used in addition to the firestop sealants all must be installed to the tested system.

To function properly during a fire or life-safety emergency, dampers must be periodically inspected and tested. There are several companies that perform commissioning and periodic inspections of dampers as a specialty. Consult the Authority Having Jurisdiction and local building and fire codes for inspection frequency by occupancy. 🔥

Rick Cravy is Product Manager at **RUSKIN**, a damper manufacturer based in KS. Email him at rcravy@ruskin.com.

Standards Related to Smoke Control and Fire Doors by Rick Cravy

NFPA92A (Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences 2006 Edition) is prepared by the Technical Committee on Smoke Management Systems. The standard contains information relating to the design, installation, testing, operation and maintenance of systems for the control, removal or venting of smoke from fires in buildings. Combination fire/smoke and smoke dampers are an essential part of a properly designed smoke control system.

Engineered Smoke Control Systems can be divided into dedicated systems and non-dedicated systems. Dedicated systems are those used solely for providing smoke control. Non-dedicated systems are those used for other purposes like building HVAC. Dedicated systems

(including dampers associated with the systems) shall be tested at least semi-annually while non-dedicated systems shall be tested at least annually.

NFPA80 (Standard for Fire Doors and Other Opening Protectives 2007 Edition) is prepared by the Technical Committee on Fire Doors and Windows. The standard contains information relating to the installation and maintenance of fire doors, windows, shutters and other equipment, like fire dampers, used to restrict the spread of fire. Information regarding the installation, testing and maintenance of fire dampers was previously found in NFPA90A but moved to NFPA80 with the 2007 edition. NFPA80 is the predominant standard with respect to the fire damper maintenance

issue. Details regarding operational test, periodic inspection and testing, and maintenance can be found in NFPA80.

NFPA105 (Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives 2007 Edition) is prepared by the Technical Committee on Fire Doors and Windows. The standard contains information relating to the installation and maintenance of fire doors, windows, shutters and other equipment, like smoke and combination fire/smoke dampers, used to restrict the spread of fire. NFPA105 is similar to NFPA80 with respect to operational test, periodic inspection and testing, and maintenance. NFPA105, unlike NFPA80 pertains only to smoke and combination fire/smoke dampers.

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Firestop/Fire Containment Contracting in the Existing Healthcare Environment

By Randall L. Bosscawen

The healthcare environment uses compartmentation as a fire protection strategy throughout its building areas. Firestop systems are a big part of effective fire-resistance-rated compartmentation.

Many firestopping/fire containment contractors got their start in existing healthcare restoration projects. At Multicon, we quickly learned it is not a typical construction arena. Following the facilities rules with "no excuses" is very different than the typical construction project site, where much more freedom exists. There's a massive array of rules, regulations, requirements, and entities to understand and become experts at to provide clients services they expect and need in healthcare.

It is learned quickly that actions in this environment can have huge consequences on the facilities quality of care provided to patients. In the healthcare environment, acronyms like SOC, PFI, ILSM, CMS, ICRA, JC, ASHE, ACCREDITATION, EOC, LSC and others became part of our daily language and understanding to minimize impact on healthcare operations.

Contractors considering work in an existing healthcare environment need to understand these unique conditions and rules prior to getting involved.

One may be very proficient at firestop contracting in the construction market, yet be completely unsuited for the existing healthcare field. You must consider the customer's building characteristics, who you're working for and the surroundings.

Most firestop contracts are controlled

by the facilities director at the healthcare facility. This person is responsible for the Environment of Care (EOC) Standard for the Joint Commission (JC) who has deeming authority by the Centers for Medicaid and Medicare Services (CMS) to issue Accreditation of Healthcare Organizations.

Sound simple enough? Well, the facility managers have a lot on their plates and depend on contractors that follow the rules to a tee. Understanding that specialty firestop contractors work above ceilings and the facility director cannot check every penetration, we can be undetected in a building. However, if the Joint Commission surveys and finds any deviations, it's the facility director who healthcare building and management leadership holds responsible. All it takes is one or two missed penetrations out of a possible thousands and major impact is thrust on client relations.

As for the surroundings, installers work close to hospital staff, directly outside patient rooms and everywhere in the facility. Appearance, cleanliness and attitude are of utmost importance in healthcare. The work performed is an inconvenience to all around us. It really does take the right firestop/containment workers with the right attitudes and manners to handle this unique environment. Evening and weekend hours are often required in this occupancy.

Firestop contractors in new construction may be proficient in the International Building Code (IBC). However, the existing healthcare market operates under additional requirements, NFPA-101 the Life Safety Code, (LSC).



Healthcare work environment is above ceilings. Place where convenient.

Nothing is ever simple in this market. Currently JC and CMS recognize the 2000 Edition of NFPA-101 LSC. Interpretation of Chapter 19-Existing Healthcare can be a daunting task. Multiple interpretations on the same subject occur, especially when the facility has hired an inexperienced consultant or someone in the facility has been given incorrect information.

To add value to clients, we need to question some of these interpretations from time to time. We need to understand what a 30-minute smoke barrier is and the classified firestop systems designs to maintain continuity. Then, knowing how to treat hazardous rooms properly is important.

Plus, requirements differ for building portions that are sprinklered or non-sprinklered. Most importantly, we keep a company culture that pays attention to items that may reduce effectiveness of existing life safety features of the building as routine, rather than exception.

Infection control is another major concern. Hospital policies can vary greatly. Some facilities may require total containment of work areas from functioning hospital areas with hepa filters, while others permit opening single ceiling tiles in the same area without containment.



Work carts and workers must comply with needs.



High risk areas need protected work environments.

All high risk areas, such as oncology, need an Infection Control Risk Assessment (ICRA) completed and approved. All hospitals have an infection control officer that must be consulted prior to work being performed. The American Society of Healthcare Engineers (ASHE-<http://www.ashe.org>) provides training on infection control and other construction requirements for healthcare through their contractor certificate program.

Other issues for firestop/containment contractors are patient confidentiality and egress. Our workers will overhear confidential information about patients or even come across patients they recognize. We are held liable equally to the hospital staff in regards to privacy laws.

Maintaining clear egress is another concern. While working in a corridor with containment units or temporary enclosures required for infection con-

trol (and even our work carts), we are impeding the required egress width. We must have a plan in place to remove these obstacles immediately in the event of an emergency.

Playing by the hospital's rules - and developing and adhering to our own company policies for infection control, egress, and confidentiality - helps us meet important customer needs in the healthcare market. If we learn about the issues in this article and institute changes as part of our company culture, we become a great resource and benefit to clients in the healthcare market. 🔥

Randall L. Bosscawen is General Manager, Multicon Fire Containment and has provided firestopping/fire containment services to over 67 major hospitals across the country over the past 17 years Rbosscawen@multicon.us



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Inspecting Fire-Rated Glazing

Clear-cut labeling system helps ensure proper usage

By Jeff Razwick

Since many types of fire-rated and non-fire-rated glass look the same, effective inspection requires labels that fully disclose how any given product relates to the tested system according to laboratory directory and code requirements. This article will discuss the current fire-rated glazing labeling system, how it relates to testing requirements, and the implications for life safety.

Labeling System Overview

The current marking system required by the 2006 International Building Code (IBC) and adopted by Underwriters Laboratories (UL) has three broad marking categories addressing:

- Suitability of product for use in various locations in a building
- Whether the fire-rated glazing system has passed the required hose stream test
- Conformance with temperature rise criteria

In addition, a number indicates the fire rating period in minutes.

To show suitability for use in various locations in a building, the label includes one or more specific designations that describe where the system can be used:

- “D” indicates Doors
- “O” indicates Openings (sidelites, transoms, etc.)
- “W” indicates Walls



Performance on the hose stream test is indicated on the label by:

“H” indicates glazing meets the HOSE STREAM test standards (required for ratings of 45 minutes or more)

“NH” indicates glazing does NOT meet HOSE STREAM test standards (an NH marking is only appropriate for 20-minute fire-rated doors)

Likewise, conformance with temperature rise criteria is shown on the label with:

“T” indicates glazing meets TEMPERATURE RISE criteria

“NT” indicates glazing does NOT meet TEMPERATURE RISE criteria

Thus, a given label (see example) might read: “D-H-NT-45” for a product that can be used in doors, has passed the hose stream test, does not meet temperature rise criteria, and is fire-rated for 45 minutes. If the product is suited for additional locations, such as openings, a second line will be included with the appropriate marking categories.

UNDERSTANDING IBC LABEL REQUIREMENTS FOR FIRE-RATED GLASS

KEY TERMS & SAMPLE LABELS

DESCRIPTION OF LOCATION

- D** indicates **DOORS**
- O** indicates **OPENING**
(windows, sidelites, transoms, etc.)
- W** indicates **WALLS** (glass meets ASTM E119;
providing a barrier to radiant heat transfer)

HOSE STREAM TEST

- H** indicates glazing meets the **HOSE** stream test requirements of the test standard (required for 45 minutes and above)
- or
- NH** indicates the glazing does **NOT** meet the **HOSE** stream test standard (allowed for 20 minute only)

TEMPERATURE RISE

- T** indicates glazing meets **TEMPERATURE** rise criteria
- or
- NT** indicates glazing does **NOT** meet **TEMPERATURE** rise criteria

MINUTES

- XX** symbolizes fire protection rating period in minutes

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DOOR LABEL

- D** - indicates the glazing shall be used in a door assembly and the glazing meets the fire resistance requirements of the test standard
- NH** - indicates the glazing does not meet the hose stream requirements of the test (allowed for 20 minute rating only)
- NT** - indicates glazing does not meet temperature rise criteria
- XX** - symbolizes fire protection rating period, in minutes (minimum 20 minutes)



- H** - indicates glazing meets the hose stream test requirements of the test standard (required for 45 minutes and above)
- T** - indicates glazing meets temperature rise criteria



WINDOW LABEL

- OH** - indicates the glazing meets both the fire resistance and **required** hose stream test requirements for an opening (window, sidelite, transom, etc.)
- XX** - symbolizes fire protection rating period in minutes (minimum 45 minutes)



WALL LABEL

- XX** - symbolizes fire resistance rating period in minutes (minimum 60 minutes)



- W** - indicates walls (glass meets ASTM E119; providing a barrier to radiant heat transfer)

The test involves spraying a heated glass and framing assembly with water from a fire hose at pressures and durations specified in NFPA 257 (National Fire Protection Association's Standard on Fire Test for Window and Glass Block Assemblies). The test provides "a method for evaluating the integrity of constructions and assemblies and for eliminating inadequate materials or constructions." (NFPA 257, B.11.4) The standards further state "the cooling, impact, and erosion effects of the hose stream provide important tests of the integrity of the specimen being evaluated." To successfully pass the hose stream test, the glass and framing must remain intact and not separate from the frame, within limits specified in NFPA 257, B.12. Clearly, this test adds value as it makes the glazed wall subject to the same treatment as the wall, firestopping, fire dampers and fire doors.

So how does the test relate to life safety? NFPA 257, B.11.2 explains that spraying the glass and framing with water "provides a measure of its structural capabilities." The standard explicitly acknowledges that weights have been used in Europe to test impact, but that the hose stream test provides greater uniformity and accuracy. In addition, the hose stream test evaluates the assembly's ability to withstand thermal shock, such as might be experienced when hot glass is exposed to cool water from fire sprinklers or fire hoses. In essence, the hose stream test helps ensure that the glazing will not vacate the opening and create a path for the spread of flames and smoke.

The marking system also clearly indicates when a product has been adequately tested for heat transfer resistance. The "W" symbol for

An example of a label with marking system required by the 2006 International Building Code.

While there are many potential permutations of the specific designation codes within the marking categories, the fact there are only three allows building owners and managers, compartmentation inspectors, code officials, specifiers, the fire service and others to note at a glance if a product is suited for a given use.

Labeling Clarity and Life Safety

The labeling system specifically shows at a glance whether a product has met all testing requirements (see sidebar "Fire-Rated Glazing Test Requirements.") One of the important - but often misunderstood - requirements is the hose stream test.

The hose stream test is an important part of fire-rated glass testing, and the ICC's Code Development Process has repeatedly reaffirmed this. U.S. standards require the hose stream test for all fire ratings of 45 minutes or greater. Canadian standards also require the test for all fire ratings.

products suitable for walls indicates the product has been tested as a fire-rated wall according to ASTM E119. By their nature, such walls are fire-resistive.

There's no doubt that it's critical to make sure products provide fire-resistive protection where needed. Such products must be used in critical areas where people may be present for extended periods of

time, including exit corridors and stairwells.

The professionals on the front lines of inspecting glazing installations are the critical players in all of this. As they know, labeling systems should be clear and easy to read, and provide sufficient details to inspect critical fire-resistance-rated Effective Compartmentation systems. 🔥

Jeff Razwick is the Vice President of Business Development for Technical Glass Products (TGP), a Kirkland, WA-based supplier of fire-rated glass and framing systems, along with specialty architectural glazing products. He writes frequently about the design and specification of glazing systems for commercial buildings. Technical Glass Products can be reached at www.fireglass.com or (800) 426-0279.

Fire-Rated Glazing Test Requirements

Properly designed, specified, installed, maintained and inspected, fire-rated glazing provides an effective barrier against flames and smoke. To earn a fire protection rating, window glazing is subjected to testing requirements specified in the National Fire Protection Association's (NFPA) 257: Standard on Fire Test for Window and Glass Block Assemblies. These tests help ensure that glass and framing can withstand the intense heat from structural fires and the potential effects of firefighting actions.

Overview of Fire Ratings

Fire-rated glazing for door and window assemblies is rated from 20 minutes to three hours, reflecting the amount of time the material is anticipated to remain in place to help stop the spread of fire and smoke. While ordinary window glass and tempered glass break at temperatures well below those found in many building fires, fire-rated glazing is available that can withstand temperatures up to approximately 1,800° F or greater (980° C).

Fire ratings are determined by a series of tests conducted by independent testing facilities, such as Underwriters Laboratories. The lab installs samples of the glass and framing in a wall assembly. This assembly is then subjected to specified test standards that include two

required elements: a "fire test" and a "hose stream test."

Fire Test

For the first stage of testing, the wall assembly with glass and framing is placed in a furnace. The temperature inside the furnace is controlled following a standard time-temperature curve specified in NFPA 257, Figure 4.1.1. At five minutes, the temperature in the furnace reaches 1,000° F (583° C). At 30 minutes it rises to 1,550° F (843° C). After one-and-a-half hours it approaches 1,800° F (980° C).

For a given fire rating, the glass and framing must meet several performance criteria specified in NFPA 257 at the conclusion of the fire test. These include:

- "The window assembly shall remain in the wall in which it is installed for the duration of the fire test."
- "No flaming shall occur on the unexposed surface of the assembly."
- "There shall be no separation of the glazing material edges from the glazing frame."
- "There shall be no openings in the window assembly."

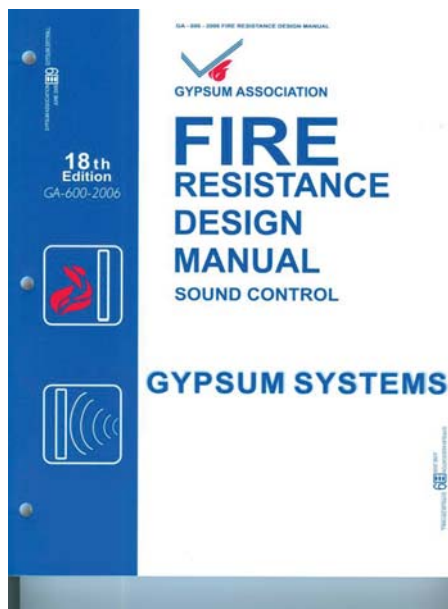
Additional performance criteria address limitations on the movement of operable components from their closed positions and limitations on the movement of the overall assembly relative to the wall.

Hose Stream Test

Within two minutes of completion of the fire test, the hot glass and framing is subjected to a hose stream test. The side of the assembly exposed to the heat of the furnace is sprayed with water from a fire hose at pressures and durations specified in NFPA 257, Table 6.2.3. This is a required part of the fire test for products to be suitable for use in the specific application in a fire-resistance-rated glazing system.

To successfully pass the hose stream test, the glass and framing must remain intact and not separate from the frame, within limits specified in NFPA 257, B.12.

Repairing Fire-Resistive Gypsum Partitions



By Bob Grupe

Life safety is of paramount concern in today's built environment. The best overall approach to preserving life safety in design is to combine both active suppression and alarm systems with fire-resistance-rated construction measures. Fire-resistance-rated construction is known as compartmentation, which of course leads to fire-resistive partitions.

Fire-resistive gypsum partitions are the assembly of choice in the construction industry. The reasons for this include economical performance, ease and speed of installation, as well as aesthetic properties. Fire performance comes from the gypsum mineral itself. Chemically combined water ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is released as steam at elevated temperatures. This process, called calcination, effectively retards the transfer of heat through the individual gypsum

panels and hence the entire system.

Hourly fire-resistive ratings are determined and assigned by testing to recognized standards. In the United States that test protocol is defined by ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials. Internationally, the test method that is used is ISO 834, Fire-resistance tests - Elements of building construction.

There are no fire-resistive ratings on individual products, especially as it relates to partitions. Specific products are combined in an assembly or system, in which an hourly resistance rating is derived. Substitutions of, or damage to these components may lead to a significant drop in fire-resistive performance. This article will explore some common areas of concern and offer solutions that keep the resistance ratings intact over the life-cycle of the built environment.

Gypsum Panel Construction

Fire-resistive gypsum panels are comprised of a specially formulated gypsum core that is encased in multi-layered paper facings. These facings provide tensile properties that increase the overall flexural strength of the panel. Conversely the gypsum core, being cementitious, provides compressive strength. This makes the panel a true engineered panel and, to perform as intended, both components must remain intact and solid.

Minor tears in the paper, or surface blemishes in the panel, may have little impact on overall fire performance. Tests conducted by individual panel manufacturers have documented the effect these

imperfections have upon performance. Consultation with individual manufacturers is advised to determine proper resolution.

Paper tears and edge damage repairs are covered in the Gypsum Construction Handbook published by USG Corporation. Chapter 12 of the handbook covers various types of repairs. Avoid using board with damaged edges that may easily be compressed or can swell upon contact with moisture. The damaged area must be removed and repaired with a suitable joint finish system. It is important that the gypsum core be solid and intact. Any core that is crumbled or crushed must be replaced.

Sometimes the finished wall surface appears to be fractured by either heavy blows or other abuse. As mentioned above, this fracture must be removed and replaced. Again, the Gypsum Construction Handbook can be used as a resource to cover this condition. First a square section of the damaged area should be cut out and removed. The new piece of gypsum panel, with the same dimension and core formulation of the removed damaged area, must be prepared for installation. There are commercially available drywall repair clips that can be used to mechanically hold the new panel in place. The four sides of the new piece can then be finished with joint tape and compound. The Gypsum Association has a pamphlet entitled "GA 225-08 Repair of Fire Rated Gypsum Board Systems" which can also be used as a reference for repairing holes in gypsum panels.

Repairs in specialty panels, such as cement boards and the 1-in. shaft liner panels found in shaft walls, are

best handled by contacting individual manufacturers for recommendations.

Fasteners play a key role in the overall performance of the system. Their spacing, length, and placement are based on testing, and close adherence to the tested system is required. The fastener must be properly seated without any paper tears to assure adequate holding power. Choosing the wrong type of screw for the application or using an improperly adjusted screw gun can result in the screw stripping or not seating properly. The faulty screw must be replaced and seated properly. Any associated paper tears must also be repaired as mentioned previously.

Another important component is the framing system. Typical systems include metal or wood studs. They must be installed properly and free of damage. Fire-resistive tests utilizing metal studs are always run at the minimum thickness, now measured in mil thickness and depth. Spacing of the studs is tested at the maximum. Therefore, installation shall be consistent with conditions allowed by the actual design as published in the testing laboratory directories or proprietary test description. The metal studs should not have buckled flanges or twisted webs. Also, the flange must be continuous along the span of the stud. Any framing member exhibiting damage that would impair structural performance should be replaced.

Gypsum Plaster Construction

The use of gypsum plaster in fire-resistive partitions predates the use of drywall. Currently it is available in two different types of systems known as conventional and veneer plaster. Conventional plaster is a three coat application of plaster over some type of lath. This lath can be made from metal, gypsum, or even wood mate-

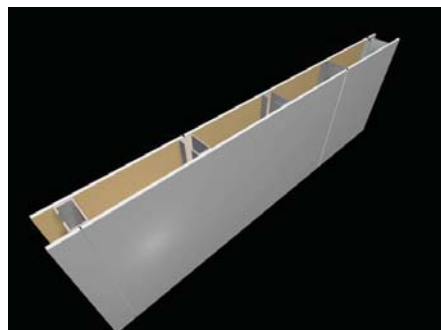
rials. Fire-resistive ratings are not obtainable if wood lath is used. The wood lath plaster assembly must be considered as open framing from a fire-resistance standpoint.

Gypsum lath. One is a small panel analogous to a standard drywall product. It's original size was basically 3/8-in. thick with a round edge, 16-in. wide and 48-in./96-in. long. Typically a clip attachment system was used to attach it to a specially designed stud. That stud is no longer available, so any contemporary installation calls for screw attaching the lath to a standard wood or steel stud. This small panel was first introduced in 1925. It's currently available 3/8-in. x 24-in. x 96-in.

Another gypsum lath product was actually a tile product, similar in concept to a concrete masonry unit. The tiles were stacked like concrete block in a running bond fashion and finished with conventional plaster. They offered excellent fire resistance in a very small partition width. The most common trade name was Pyrobar Partition Tile and it was introduced in 1903. The age of these products is impressive, and equally so, is their continued performance. Little has changed in the test methodology over the years. In conditions where the materials are still in good shape, it can be assumed the fire integrity is still intact.

Issues that come up relative to plaster assemblies range from performance verification of archaic systems to patching holes in the plaster membrane. Again, it is advised to contact the material manufacturer to determine performance.

There are many options available when it comes to repairing old plaster walls. They range from repairing with a plaster material, to furring over the existing plaster and finishing with the appropriate type of gypsum



panel. The decision, in part, is based on prevailing conditions and project budget. If the wall in question is sound but has minor cracks or small holes, repairing with plaster may be suitable. If the holes are large, or if the wall is part of a building rejuvenation and new electrical wiring and plumbing are being installed, the use of furring and gypsum panels may be the preferred solution.

The first step in the process is to remove all unsound plaster. All cracked and loose plaster should be removed down to the lath. Damaged or missing studs must be replaced in the larger holes, and the new framing must be in compliance to local code requirements. The lathing material must be in good condition. If the lathing is made of wood strips, then there is no fire-resistive rating and the wall as installed provides no basis for design. In that case, a new wall must be installed. Missing or deteriorated metal lath must be replaced by lapping new lath two inches over the missing or existing lath, and be installed with new wire ties. If the lath is gypsum base, all missing or damaged lathing panels must be replaced. They need to be mechanically attached to the existing wall as was described earlier for standard gypsum panel walls.

Large holes, for basis of discussion, are those walls having both length and width greater than trow-

el length. The edges of the existing plaster should be coated with a polyvinyl acetate plaster bonder. These large holes or newly framed areas require lath to be installed as if it were a new wall.

Small holes are defined as those having one dimension, length, or width equal to or less than a trowel length. Again, a plaster bonder should be installed on the existing plaster. Trowel in a basecoat plaster and leave the surface rough. Finish the process with a skim coat of a special formulated finish plaster. This new plaster should be trowelled flush with the original plaster surface.

Wide or deep cracks should be raked out approximately 1/4 in. and go down to the existing lath. Brush the crack clean and fill with a chemically setting joint compound. A paper tape designed for finishing drywall should be embedded in subsequent coats of joint compound. All the above plaster remedies require final approval by the authority having jurisdiction over the project prior to starting the process.

If the decision is made to resurface the walls with new fire-resistive gypsum panels, then some type of

framing system must be incorporated in the design solution. There is no testing to support the use of laminating gypsum board to existing plaster for fire-resistive purposes. The new framing material should be designed to be mechanically attached back to the existing framing or have the structural capacity to span the height of the new wall. The type and potential number of layers of gypsum panels will be predicated by the intended application, existing wall configuration, and anticipated fire-resistive ratings. There has been little or no testing relating to enhancing existing plaster walls with new panels. All solutions will have to be based on an evaluation of conditions and approval obtained from the authority having jurisdiction over the project.

Veneer plaster is a skim coat of plaster that is trowel applied over a gypsum panel similar in size and thickness to a standard panel. This panel, though, has special face papers that enhance the plaster's ability to bond. The plaster base board is recognizable by its unique blue color. The combination of the veneer plaster and the plaster base board can be used in fire-resistive systems. The base board core must be formulated the same as the standard fire-resistive gypsum panel. From an assembly standpoint, the base board and the standard panel are interchangeable. Therefore the repair procedures mentioned above work for veneer plaster systems as well.

The use of gypsum has been successfully used in fire-resistive assemblies for over 100 years.

Two sources of information on fire-resistance ratings on archaic assemblies are:

- Building Materials and Structures, Report BMS 92; and National Bureau of Standards, 10/7/1942
- Fire Ratings of Archaic Materials & Assemblies; NIBS, February 2000.

This article provided fairly simple repair procedures that assure long term in place performance of gypsum panel systems in fire-resistance-rated construction. When completed as a system with classified fire-resistance-rated firestop systems, swinging and rolling doors, fire dampers, fire-rated glazing, gypsum systems provide the base for Effective fire-resistance-rated Compartmentation systems. 🔥

Bob Grupe has over 30 years experience with USG and is based in Chicago, IL. Email him at bgrupe@usg.com.



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Industry News

Testing & Qualification News

FCIA going to San Antonio - This important industry conference Nov. 4-7, brings seminars on firestopping and Effective Compartmentation, FM & UL DRI Testing, 2009 International Code Council Update, the Ray Usher Memorial Golf Outing at the Quarry, and an optional tour of Intertek's Laboratories in Elmendorf. Visit <http://www.fcia.org> for details.



UL Firestop / Fireproofing Qualified Firestop Contractor Cost Reduction - At the Fall 2007 FCIA Firestop Industry Conference and Trade Show, Hollywood, FL, Betsy Titus of UL announced a 50% reduction in the first year cost of the UL program. The reduction expires Dec. 31. Audit costs dropped from \$6,000 to \$3,000 in this program. Now is the time if you are planning to get qualified.



Underwriters Laboratories

Qualified Firestop Contractor Program

FM, Koffel, FCIA, UL, participate at NFPA - FCIA is a member of the NFPA Fire Protection Research Foundation's Smoke Barrier Research Study. This study is attempting to understand air leakage values and code requirements for installed firestop systems. Look for results from the study in the next few months.

FCIA at UL Canada - FCIA members in Toronto, Ottawa, Ontario and Omaha, NE, attended the FCIA DRI Exam Education Session and Quality Management Seminar at UL Canada headquarters. The education session lasted about 3-1/2 hours, with DRI exam proctored by UL.

FCIA, DHI, at Construction Specifications Institute CONSTRUCT2008 - FCIA's booth and two seminars at CONSTRUCT2008 were well received by a packed room at the Firestopping Update session, and a good crowd to hear about Effective Compartmentation. Architect / specifiers, fire marshals, building officials and engineers who work for firms that specify firestopping and Effective Compartmentation were offered the FCIA Manual of Practice, FREE on PDF as a service.

DHI's booth at CSI had lots of action to promote DHI Programs, including The Fire-Rated Doors and Hardware - A Guide to Field Inspections course. The updated NFPA 80 standard now makes the inspection of fire-rated doors a yearly requirement. Learn more about this important program at DHI's Annual Exposition and Education in Boston Nov. 7-15.



The Architectural Openings Resource

FCIA at Construction Specifications Canada (CSC) - During FCIA's visit to Toronto, we called on Construction Specifications Canada, (Canada's Construction Specifications Institute - CSI) and



were able to secure FCIA firestopping presentations at CSC National Conferences for 2008 and 2009. FCIA's firestopping seminar in Halifax, Nova Scotia was well attended with attendees from throughout Canada.

FCIA Membership Growing - It's on its way to the 200 member mark. Contractors, manufacturers, consultants, distributors and manufacturers' reps have all joined in to help spread the news about firestopping and effective compartmentation's importance:

Code Corner

FCIA's Code Changes for Firestopping and Compartmentation - were heard in late September. Watch the next issue of Life Safety Digest and <http://www.iccsafe.org> for Final Action results important to Fire and Life Safety Compartmentation Features.

FCIA Comments and Attends IAPMO Hearings - The International Association of Plumbing and Mechanical Officials (IAPMO) code is used in jurisdictions throughout the west and other areas. FCIA public commented a code proposal that would have required firestop installers to be four-year plumbing journeyman to install firestop systems and won at the committee level. Final actions take place October in Atlanta.

Life Safety Digest 2008-09 Industry Calendar

Oct. 6 to 8

Glass Build America, Las Vegas

Oct. 19 to 22

SMACNA Convention, Maui, HI

Nov. 4 to 7

FCIA Firestop Industry Conference & Trade Show, San Antonio

Nov. 8 to 15

Door and Hardware Institute Show, Boston

Feb. 26 to 28, 2009

International Concrete Exposition, Indianapolis

March 24 to 28, 2009

AWCI Convention and INTEX Expo, Nashville

April 29 to May 1, 2009

FCIA Education and Committee Action Conference, Boston

June 8 to 11, 2009

NFPA Annual Convention, Chicago

June 17 to 19, 2009

CONSTRUCT2009, CSI Convention, Indianapolis

Oct. 24 to 31, 2009

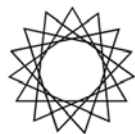
ICC Code Development Hearings, Baltimore

Nov. 1 to 4, 2009

ICC Annual Conference, Baltimore

Nov. 3 to 6, 2009

FCIA Firestop Industry Conference & Trade Show, San Antonio



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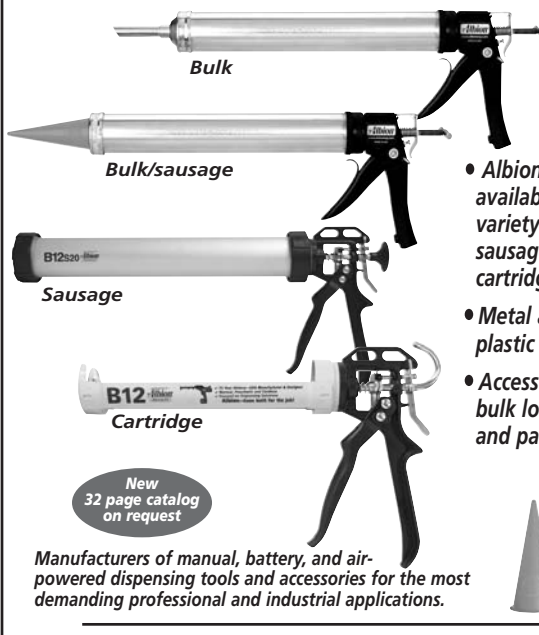


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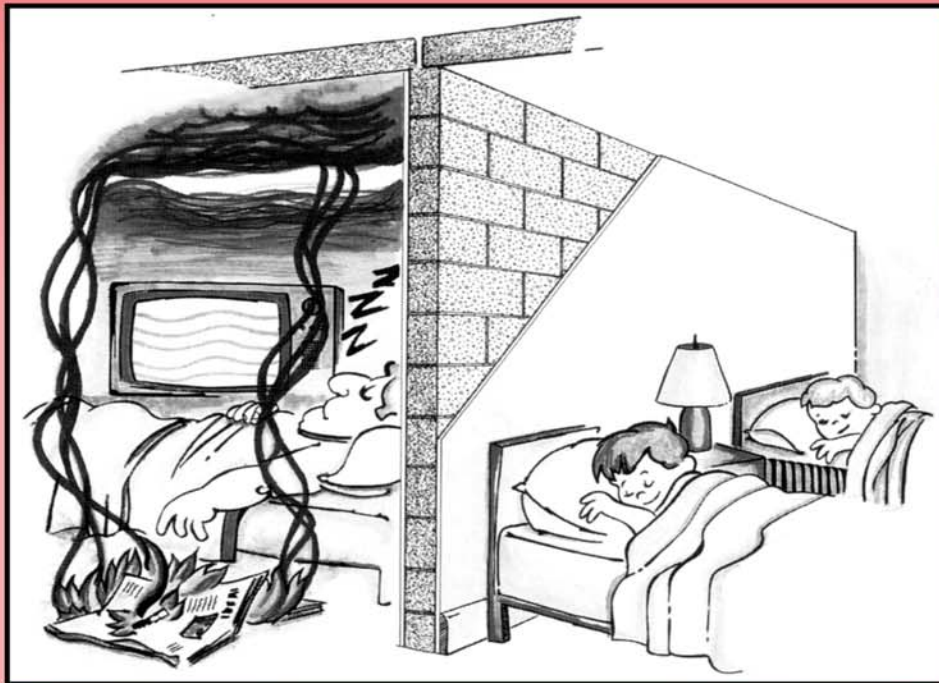
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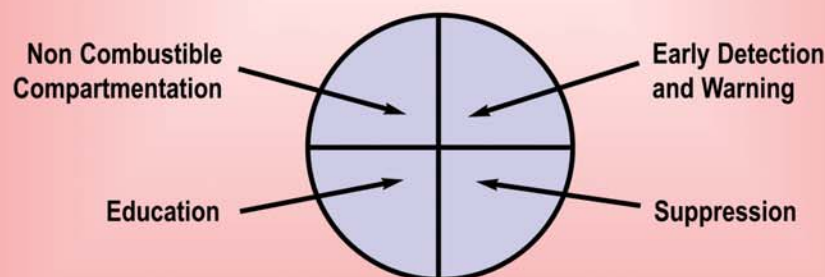


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