BARTKOWSKI AND MCDONALD PRESENT…

THE BARTKOWSKI REPORT

A recent development in through penetration firestopping is the introduction and subsequent specifying of water-tight firestopping. A number of factors were responsible for this initiative. The two driving factors, however, were the protection of lower floors from weather for projects not yet 'under roof' and the protection of finished floors from water damage should an 'incident' occur on floors above. This second scenario has lead to liability issues after the building has been turned over.

This issue of ***The Bartkowski Report*** will focus on…

Water-Tight Firestopping.

Product Data Sheets from various firestopping manufacturers may state that the products featured are water-resistant or moisture resistant. Some reading this literature may then assume that this satisfies the water tight requirement. Beware! Water resistant and moisture resistant is not the same as water tight.

Water Tightness is a completely new standard that was developed to provide the protection described in the introduction above.

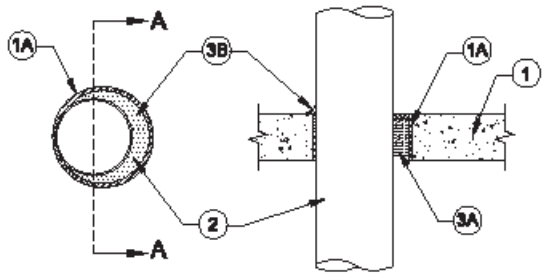
This is a very rigorous standard that first exposes the penetration, the penetration seal and the substrate to a 36" column of water for a time period of seventy-two (72) hours. During that time, water cannot pass through the seal, the penetration, the substrate or any of the interfaces. Any water that does breach the firestop system is considered a failure. Should the firestop system pass this initial test, the assembly is then subjected to the through penetration firestop test standard (ASTM E-814/ UL 1479) and the fire and hose stream tests described in the standard are conducted. Successful completion of this phase of the test will earn the installed system a 'W'-Rating for Water Tightness.

Each UL Tested Design System that successfully passes this testing protocol carries a 'W'-Rating along with the other Ratings listed ('F', 'T', 'L').

Let's examine UL Tested System Design Number C-AJ-1427 for a more in depth analysis.

Through Penetrations | Metallic Pipes | 1000 Series | Concrete | CAJ

System No. C-AJ-1427
March 05, 2007
F Rating – 3 Hr
T Rating – 0 Hr
W Rating – Class 1 (See Item 3)



SECTION A-A

1. **Floor or Wall Assembly** – Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Floor assembly may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening 12-3/4 in. (324 mm). Max diam of opening in floors constructed of hollow-core concrete is 7 in. (78 mm).

   See **Concrete Blocks** (CAZT) and **Precast Concrete Units** (CFTV) categories in Fire Resistance Directory for names of manufacturers.

1A. **Steel Sleeve** – (Optional) - Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Steel sleeve may be installed flush or may project max 2 in. (51 mm) beyond the floor or wall surfaces. As an alternate, nom 12 in. (305 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.

2. **Through Penetrant** – One metallic pipe, conduit, tubing or flexible metal piping installed concentrically or eccentrically within opening. Annular space between penetrant and periphery of opening or sleeve shall be min of 0 in. (0 mm) (point contact) to max 2 in. (51 mm). Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of penetrants may be used:
   - A. **Steel Pipe** – Nom 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   - B. **Iron Pipe** – Nom 10 in. (254 mm) diam (or smaller) cast or ductile iron pipe.
   - C. **Conduit** – Nom 6 in. (152 mm) diam (or smaller) steel conduit or nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing.
   - D. **Copper Tubing** – Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tubing.
   - E. **Copper Pipe** – Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.
   - F. **Through Penetrating Product*** – **Flexible Metal Piping** – The following types of steel flexible metal gas piping may be used:
     1.) Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
     OMEGA FLEX INC
     2.) Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
     GASTITE, DIV OF TITEFLEX
     3.) Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
     WARD MFG INC

3. **Firestop System** – The details of the firestop system shall be as follows:
   - A. **Packing Material** – Min 2 in. (51 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or top edge of sleeve or from both surfaces of wall or both ends of sleeve as required to accommodate the required thickness of fill material. In floors constructed of hollow-core concrete, packing material to be recessed from top and bottom surfaces of floor or sleeve as required to accommodate the required thickness of fill material.
   - B. **Fill, Void or Cavity Materials*** – **Caulk or Sealant** – Min 1/2 in. (13 mm) thickness of caulk applied within the annulus, flush with top surface of floor or top edge of sleeve or with both surfaces of wall or both ends of sleeves. In floors constructed of hollow-core concrete, min 1/2 in. (13 mm) thickness of caulk applied within the annulus, flush with top and bottom surfaces of floor or sleeve. Min 1/4 in. (6 mm) diam bead of caulk applied to the penetrant/concrete or penetrant/sleeve interface at the point contact location on the top surface of floor or both surfaces of wall or hollow-core.

     3M COMPANY – IC 15WB+, CP 25WB+ caulk or FB-3000 WT sealant
     (Note: W Rating applies only when FB-3000 WT is used.)

*Bearing the UL Classification Mark

This material was extracted and drawn by 3M Fire Protection Products from the 2007 edition of the UL Fire Resistance Directory.

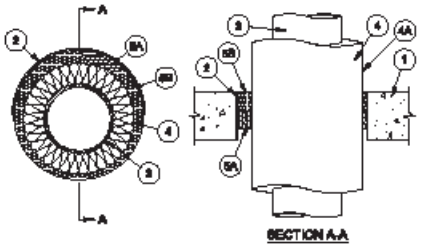
- If this system is appropriate for the field condition encountered, then this design would provide water tightness. The W-Rating notation above the illustration confirms this. Other systems that carry this W-Rating are noted in the same manner.
- Item 3.B. lists the material requirements for proper installation. It is noted that the 'W-Rating' only applies when the FB 3000 WT is used.
- We have stated in past issues that one should focus on the system and not the product. The FB 3000 WT is a water tight sealant; but one should not assume that installing any of the water tight sealants available for any condition will procure water tightness. The system carries the water tight protection – not the product.

- Many of the firestopping products are water based. This makes the successful testing for water tightness extremely impractical as the immersion of the seal in water for 72 hours compromises the integrity of the seal. With that in mind, the water tight sealants are silicone based.

An additional problem must be addressed when the penetration seal is insulated through the deck / floor. See UL Tested System Design F-A-5033 below for treating fiberglass insulated penetrations requiring water tightness.

System No. F-A-5033

March 05, 2007
F Ratings – 1-1/2, 2 and 3 Hr (See Item 5)
T Ratings – 0, 1/2, 3/4 and 1 Hr (See Items 1A and 5)
L Rating At Ambient – 2 CFM / sq ft
L Rating At 400 F – Less Than 1 CFM / sq ft
W Rating – Class 1



SECTION A-A

1. **Floor Assembly** – Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Max diam of opening is 18 in. (457 mm).
2. **Steel Sleeve** – (Optional) – Nom 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor assembly. Sleeve may extend a max of 2 in. (51 mm) above top of floor. As an alternate, nom 10 in. (254 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor assembly flush with floor surfaces. **T Rating is 0 Hr when sleeve is used.**
3. **Through Penetrants** – One metallic pipe or tubing to be installed concentrically or eccentrically within opening. Penetrant to be rigidly supported on both sides of floor. The following types and sizes of metallic pipes or tubes may be used:
   A. **Steel Pipe** – Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe** – Nom 12 in. (305 m) diam (or smaller) cast or ductile iron pipe.
   C. **Copper Tubing** – Nom 4 in. (102 mm) diam (or smaller) Type M (or heavier) copper tube.
   D. **Copper Pipe** – Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.
4. **Pipe Covering*** – Nom 1/2 to 2 in. (13 to 51 mm) thick hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt strip tape supplied with the product.

   See **Pipe and Equipment Covering – Materials*** (BRGU) category in Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4A. **PVC Jacket+** – An additional PVC jacketing, supplied in sheet form, shall be tightly wrapped around the all service jacket on the pipe covering with the longitudinal seam continuously sealed using the adhesive supplied with the jacket. The jacket is to be nom 48 in. (1219 mm) wide by nom 20 or 30 mil (0.5 or 0.8 mm) thick. The jacket shall be installed at a point 36 in. (914 mm) to 40 in. (1016 mm) above the top surface of the floor assembly and shall extend downward into and/or through the opening.

   See **Plastics** (QMFZ2) category in the Plastics Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.

5. **Firestop System** – The details of the firestop system shall be as follows:
   A. **Packing Material** – Min 1 in. (25 mm) thickness of firmly packed mineral wool batt insulation used as a permanent form. Packing material to be recessed from top surface of floor or sleeve to accommodate the required thickness of fill material (Item 5B).
   B. **Fill, Void or Cavity Material*** – **Sealant** – Applied to fill the annular space flush with the top surface of the floor or sleeve. When nom pipe covering thickness is 2 in., (51 mm) min thickness of sealant is 2 in. (51 mm). When nom pipe covering thickness is 1-1/2 in. (38 mm) or less, min thickness of sealant is 1 in. (25 mm). The hourly F and T Ratings of the firestop system are dependent upon the thickness of the floor, the size of pipe, the thickness of pipe covering material and the size of the annular space between the pipe covering material and the periphery of the opening, as shown in the following table:

Min Floor Thickness, in. (mm)	Max Pipe Diam in. (mm)	Nom Pipe Covering Thickness, in. (mm)	Annular Space, in. (mm)	F Rating Hr	T Rating Hr
2-1/2 (64)	4 (102)	1 or 1-1/2 (25 or 38)	1/2 to 2-3/8 (13 to 60 mm)	2	1
4-1/2 (114)	4 (102)	2 (51)	1/4 to 3-5/8 (6 to 92 mm)	2	1-1/2
2-1/2 (64)	12 (305)	1 (25)	1/2 to 1-1/2 (13 to 38 mm)	2	1/2
4-1/2 (114)	12 (305)	1 (25)	1/2 to 2-3/8 (13 to 60 mm)	3	1
2-1/2 (64)	12 (305)	1/2 (13)	1/2 to 2-3/8 (13 to 60 mm)	2	0

3M COMPANY – FB-3000 WT

*Bearing the UL Classification Mark
+Bearing the UL Recognized Component Marking

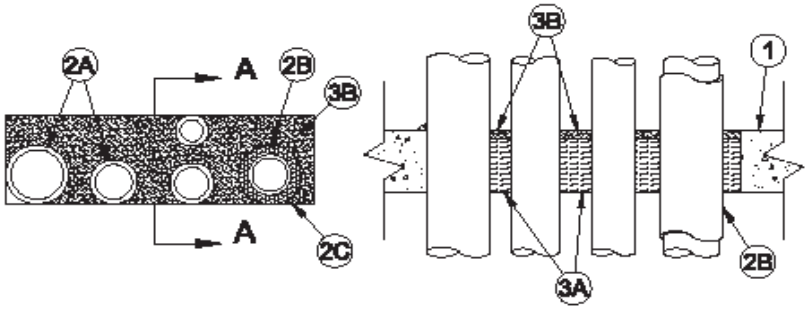
This material was extracted and drawn by 3M Fire Protection Products from the 2007 edition of the UL Fire Resistance Directory.

- Once again, the W-Rating for this system will provide the required protection should the design be appropriate for the field condition encountered.
- Item 5.B. lists the product for the installation as FB 3000 WT.

- Since the fiberglass insulation will absorb water during the 'water immersion' test, the insulation will need to be protected. This is accomplished by the application of PVC Jacket around the pipe covering. Item 4.A. provides details for this installation.
- There are also system designs for armaflex insulated pipe penetrations. Since this material is water impermeable, the additional PVC Jacket is not required. See UL Tested System Design **C-AJ-8085** for this condition.

Through Penetrations | Combos | 8000 Series | Concrete | CAJ

System No. C-AJ-8085
March 05, 2007
F Rating – 2 Hr
T Rating – 0 Hr
W Rating – Class 1



SECTION A-A

1. **Floor or Wall Assembly** – Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 108 sq. in. (697 cm²) with a max dimension of 18 in.

   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

1A. **Steel Sleeve** – (Optional, Not Shown) - Nom 11 in. (279 mm) diam (or smaller) circular sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.

2. **Through Penetrants** – Metallic pipes, tubing, conduit or cable to be installed either concentrically or eccentrically within the firestop system. Penetrants to be rigidly supported on both sides of floor assembly. The following types and sizes of penetrants may be used:

   A. **Metallic Pipes** – Max five metallic pipes, conduit or tubing. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). The following types and sizes of metallic pipes, conduit or tubing may be used:

      A1. **Steel Pipe** – Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

      A2. **Iron Pipe** – Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

      A3. **Conduit** – Nom 4 in. (102 mm) diam (or smaller) rigid steel conduit or steel electrical metallic tubing.

      A4. **Copper Tubing** – Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tube.

      A5. **Copper Pipe** – Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

   B. **Tube Insulation – Plastics+** – Nom 1/2 in. (13 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The tube insulation may be installed on all pipes or tubing. The annular space between the insulated penetrating item and the periphery of the opening shall be min 0 in. (0 mm) (point contact) to max 1-7/8 in. (48 mm). The annular space between the insulated penetrating item and uninsulated metallic pipes, conduit or tubing shall be min 1/2 in. (13 mm).

      See **Plastics** (QMFZ2) category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5A may be used.

   C. **Cables** – Max two 8/C No. 24 AWG (or smaller) control cable with polyvinyl chloride (PVC) insulation and jacket. Cable to be spaced min 0 in. (0 mm) (point contact) from tube insulation or min 1/2 in. (13 mm) from other penetrants. The annular space between cable and periphery of opening is min 0 in. (0 mm) (point contact) to max 1-7/8 in. (48 mm). Cable to be rigidly supported on both sides of floor or wall assembly.

3. **Firestop System** – The details of the firestop system shall be as follows:

   A. **Packing Material** – Min 3 in. (76 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor to accommodate the required thickness of fill material.

   B. **Fill, Void or Cavity Materials*** – **Sealant** – Min 1/4 in. (6 mm) thickness of fill material applied within the annulus, flush with top surface of floor. Min 1/2 in. (13 mm) diam bead of caulk applied to the penetrant/concrete interface at the point contact location on the top surface of floor or both surfaces of wall.

      3M COMPANY – FB-1003 SL, FB-1000 NS or FB-3000 WT

*Bearing the UL Classification Mark
+Bearing the UL Recognized Component Marking

This material was extracted and drawn by 3M Fire Protection Products from the 2007 edition of the UL Fire Resistance Directory.

- In this example one has the choice of using three products (item 3.B) to obtain the desired water tight protection.

Presently, there are no tested system designs that address water tightness for duct penetrations or construction joints. At this time, the best efforts attempt would require an engineered solution from the respective firestopping manufacturer.

Please feel free to call with any questions or concerns you may have on water tight firestops or any other firestopping matter.
Bartkowski & McDonald LLC is a full service provider of firestopping services and programs. Our service offerings include the following:

1. Firestopping Audits
2. Quality Control / Quality Assurance Programs for remediation work and new construction projects
3. Internet based Fire Barrier Management / Penetration Permit Program
4. Firestopping Installation Services – **FMG 4991 Certified Firestopping Contractor**
5. Damper Inspections

We'd like to hear from you. If there are any firestopping related issues you'd like to see addressed in future issues, let us know. You can contact us at mike.bartkowski@bartandmcd.com. You can also access our website – www.bartandmcd.com. Here we have archived past issues of ***The Bartkowski Report*** for your reference.

Sincerely,

Michael S. Bartkowski Robert M. McDonald

BARTKOWSKI & McDONALD LLC
FIRESTOPPING SERVICES

PREPARE NOW FOR THE FUTURE.....

Bartkowski & McDonald, LLC
Firestopping Services
17043 Westview, Suite 100
South Holland, IL 60473
Office: 708/825-9536
Fax: 708/825-9563