

ConQuest

FIRESPRAY

FLAMEBAR® FIRE RATED SYSTEMS



FIRE RATED SYSTEMS DESIGN GUIDE

Tested and Classified by UL and Intertek Labs

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FLAMEBAR® BW11 - FIRE RATED DUCT SYSTEMS

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DESCRIPTION

The Firespray Flamebar® BW11 System provides critical, life safety, fire-resistant protection in a variety of HVAC duct applications. System components are fabricated in a U.L. certified process from galvanized or stainless steel to the manufacturer's standards, typically 6" water gauge and above. Flanged sections are degreased and factory coated with Flamebar®. The BW11 coating is a VOC-free water-based compound with mineral fibers in an elastomeric

binder to a thickness of approximately 0.04" (1 mm). Fire rated duct systems are fabricated in flanged sections and assembled on site using Flamebar® gaskets and sealants. The Flamebar® coating is unique, offering low density together with a highly durable material that performs under varying and high stress conditions, including the extreme stresses arising from climatic moisture, structural loading variations, as well as the effect of thermal shock during a fire.

Conquest Firespray offers Flamebar® as a *Complete System* that is designed to comply with the rigorous testing requirements associated with different fire rated assembly applications.

- Duct segments incorporate a strict fabrication specification including gauge, seams, flanges, reinforcement, access door construction, wall and floor penetration seals, etc.
- Further, recognizing that the hangers are an integral part of the system, and that the tensile strength of steel is significantly reduced under a fire load, the comprehensive system design directly addresses both vertical and horizontal arrangements. Enhanced hardware requirement (anchors, threaded bar, unistrut, etc.) are needed to support the fire rated system.
- Spray facilities must be staffed with trained operators, performing the degreasing and coating application to strict guidelines, in addition to being subject to laboratory follow-up inspection.
- Installation of ductwork is performed on site by contractors that receive both training and support by Conquest Firespray, in accordance with the Flamebar® specification.

APPLICATIONS

The Firespray Flamebar® System is a fire rated duct assembly that provides value engineering solutions to complex and demanding fire assembly design applications. It is a tested and proven performer since 1987 and used worldwide. The Flamebar® System has been tested in the United States and is Classified by Underwriters Laboratories (UL) in accordance

with ISO 6944 (1985) per UL Category HNLJ. The system has been tested and classified as an un-insulated fire rated duct per UL Category HNLN. It has also been tested and listed by Intertek Laboratory (ETL) as a fire rated shaft enclosure. The system offers advantages in terms of space, schedule and overall cost when compared to traditional fire rated assemblies.

FIRE RESISTANT DUCTWORK - WHEN AND WHY:

Among the most important factors to consider when designing and constructing a building is the location of effective zones to limit the spread of smoke and fire throughout the building via the ventilation ducts. Under normal circumstances, this zoning is achieved by the use of fire dampers or fire/smoke dampers within the duct systems. However, under certain applications, the use of

fire dampers is inappropriate. Any duct system that is intended to operate, or has a special use, under a fire condition and cannot use fire dampers, will be required to be fire rated. A design engineer should be consulted to determine fire rated duct insulation requirements for clearance to combustible construction.

EXAMPLES of systems which have special use or operational effect under a fire condition include the following:

1. Stair & Elevator Pressurization Systems
2. Rated Exit Passageways and Lobbies
3. Parking Garage Extraction System
4. Engineered Smoke Control
5. Dual Ventilation/Smoke Exhaust Systems
6. Toilet Exhausts
7. Dryer Exhausts
8. Grease Ducts
9. Non-Commercial Kitchen Exhaust
10. Lab Fume Hood Exhaust

RATED SHAFT APPLICATIONS

The Flamebar® BW11 System is recognized as a superior fire rated drywall shaft alternative. It can be used as a supply riser and exhaust riser in high rise buildings and residential condominiums (Figure 1). Use of the Flamebar® system eliminates the need for conventional 2-hour fire rated drywall shaft enclosures around both vertical and horizontal ductwork. Note that where a ventilation duct penetrates a fire rated wall, floor or ceiling assembly, the resulting opening around the duct shall be properly fire stopped (refer to Installation & Appendix Sections).

The Flamebar® System Riser in the illustration to the right provides a minimum of 2 hours performance in the event of a fire per ASTM E119.

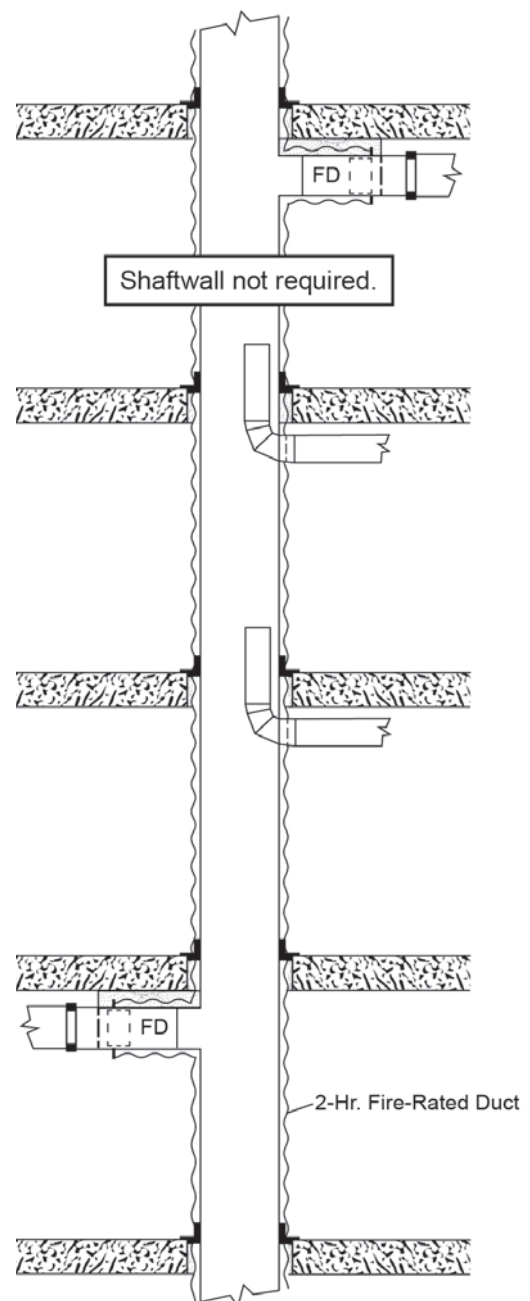


FIGURE 1

FEATURES AND BENEFITS

The Conquest Flamebar® System offers numerous advantages to building owners, the architect, consulting and mechanical engineers, general and mechanical

contractors. Installing contractors, and especially field personnel, appreciate the significant benefits to schedule and coordination processes.

SAFETY WITH SINGLE SOURCE RESPONSIBILITY

- The Flamebar® BW I I Fire Rated Duct System is engineered and manufactured to certified standards.

CODE COMPLIANCE AND TESTING

- Flamebar® Fire rated Duct Systems are classified by Underwriters Laboratories (Firespray International Ltd.) in accordance with ISO 6944 (1985). HNLJV-1 (Canada) and HNLJV-6. The Flamebar system is also classified by UL as an uninsulated ventilation duct assembly per UL Classification HNLNV-5 and V-18.
- The Flamebar® System is listed by Intertek to ASTM E119 with a 2-hour fire rating and has passed the corresponding Hose Stream Test, after the full 2 hour fire test.

A PROVEN SUPERIOR SOLUTION

- The Flamebar® Fire Rated Duct systems has been used extensively around the world since 1987.

SCHEDULE ADVANTAGES

- Schedule savings using the Flamebar® System as a 2-hour rated drywall shaft are significant. Beyond construction of the shaft, the system eliminates delays arising from the numerous inspections involved with a multilayered shaft.

ENVIRONMENTAL

- The Flamebar® System is both water and mold resistant. It can be installed before the building is watertight in direct contrast with a drywall shaft, offering direct benefits to the critical path schedule.

SPACE SAVING

- As shown in the diagram on the right, a conventional gypsum-based 2-hour fire rated shaft assembly incorporates a liner panel, steel studs, and two layers of gypsum. The use of the Flamebar® System can reclaim valuable floor space typically required for a separate enclosure around every ventilation riser.

TOTAL FLEXIBILITY IN DESIGN

- The Flamebar® System can be used with rectangular, flat oval and spiral duct.

RELATIVELY LIGHT WEIGHT

- The Flamebar® System is the lightest fire rated duct system available.

LEAKAGE TESTING

- The construction and sealing of the Flamebar® System system allows the ductwork to be tested up to a maximum of 6" wg pressure per SMACNA, if required by the client.

MOISTURE ABSORPTION

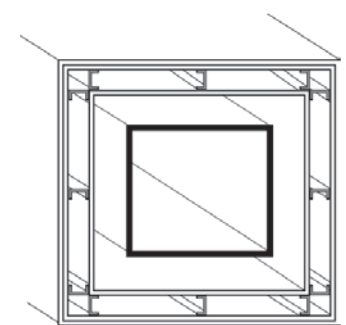
- The Flamebar® Fire Duct System is non-hygroscopic and has been tested in an artificial weatherometer to an equivalent of 60 years of external weather exposure.

MOLD RESISTANCE

- The Flamebar® System contains antimicrobial biocide and has been formulated for resistance to fungal attack. It does not support the growth of mold, fungi or bacteria.

EASILY CLEANED

- The robust and smooth internal finish of steel Flamebar® Systems enables easy cleaning.



Conventional 2hr Shaftwall
- No Longer Required -

STANDARDS AND TECHNICAL DATA

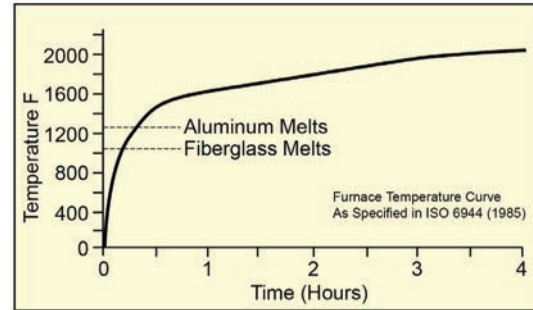
FLAMEBAR® BW11 FIRE RATED SYSTEM SUMMARY OF CLASSIFICATIONS AND LISTINGS

ISO 6944 (1985): Fire Resistance Duct Assemblies Ventilation Duct Assemblies	Classified by UL HNLJ	
ISO 6944 (1985) Fire Resistance Test (Ventilation Ducts)	Intertek Engineering Evaluation	
ISO-6944 (1985) Fire Resistance Duct Assemblies Un-Insulated Ventilation Duct Assemblies	Classified by UL HNLN	
ASTM E-119: Fire Test of Building Construction and Materials	Listed by Intertek	
ASTM E-84 / UL723: Surface Burning Characteristics <ul style="list-style-type: none"> • Flame Spread Rating • Smoke Developed Rating 	Unfaced Blanket Zero Zero	Encapsulated <25 <50
ASTM E-814: Firestop Test	Classified by UL and Listed by Intertek	



FEATURES AND BENEFITS

Flamebar® BW11 Fire Rated Duct Systems are tested in accordance with ISO 6944 (1985) and ASTM E 119. Tests cover both vertical and horizontal duct. Conditions include fire outside the duct (Type A) and fire inside the duct (Type B). The graph to the right depicts the time-temperature curve utilized in the test.



ISO 6944 measures the fire resistance of ductwork, expressed in minutes of duration, to one or more of the following criteria of failure:

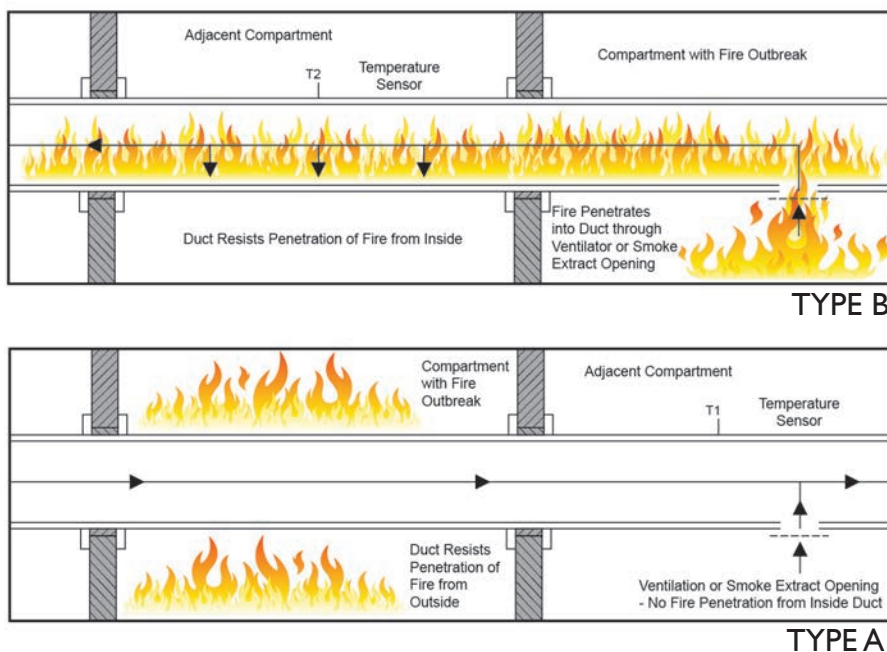
- **Stability:** The ability of the duct to remain intact and fulfill its intended function.
- **Integrity:** The ability of the duct to remain free of cracks, holes or openings.
- **Insulation:** The maximum temperature rise on the unexposed surface of the duct does not exceed 252°F (average value) above ambient or 324°F (maximum value) above ambient at any single point. The U.L. HNLN listings are for un-insulated assemblies with zero insulation rating.

ASTM E-84 / UL723: Surface Burning Characteristics. The fire test exposes a sample to a controlled air flow and a flaming fire exposure. Additionally, it measures the surface spread of flame and smoke density:

- Flame Index: 9.4
- Smoke Index: 0.2

ASTM E-119: Fire Test of Building Construction and Materials. This test evaluates the length of time a wall or partition can contain a fire and maintain its structural integrity. A test was performed on a 4-sided duct, instead of with a single layer of drywall, which accurately models an actual installation of the Flamebar® System. A 2-hour rating was achieved. Following the full 2-hour Fire Test, the corresponding Hose Stream Test, with water Pressure of 30 psi for 2.5 minutes, was also passed.

Artificial Weather Testing of Flamebar® Systems: The samples have undergone over 22,000 hours of alternate UV and condensation cycling which is considered excessive in duration terms; normally, 1,000 hours are sufficient to predict whether a material is suitable for exterior semi exposed conditions. For reference, 22,000 hours is equivalent to 60 years external exposure.



Fire Inside (B) and Outside (A) Protection:

Flamebar® is a factory engineered and manufactured system that protects against both Type A and Type B fires.

As shown in Figure 2 to the left, Type B ductwork shall resist fire from inside the duct, and Type A ductwork shall resist fire from outside the duct.

FIGURE 2

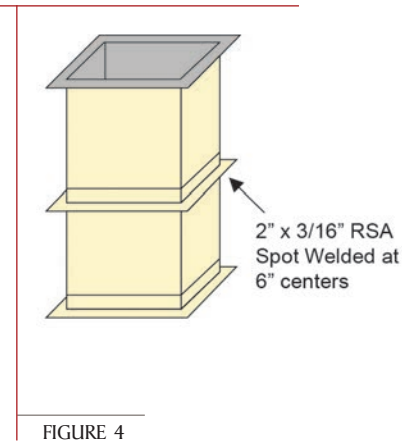
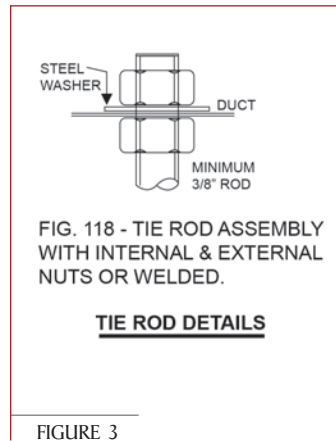
FABRICATION

Rectangular duct use in the Flamebar System is fabricated to manufacturers tested standards, which are enhanced compared to unrated duct and based on SMACNA HVAC Duct Construction Standard, 2nd Edition, for static pressures up to 6"

water gauge, positive or negative, and constructed of minimum G60 coated galvanized steel of lockforming grade to ASTM Standards A653 to A924, coated with 0.03" - 0.04" of BW II coating.

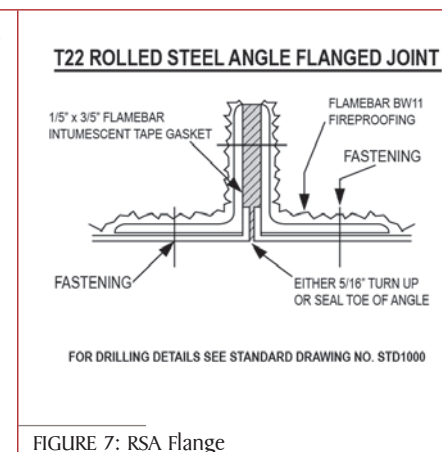
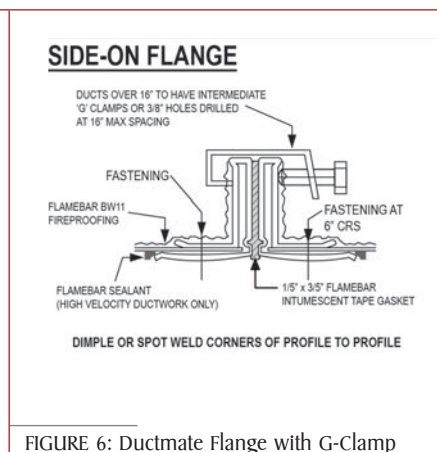
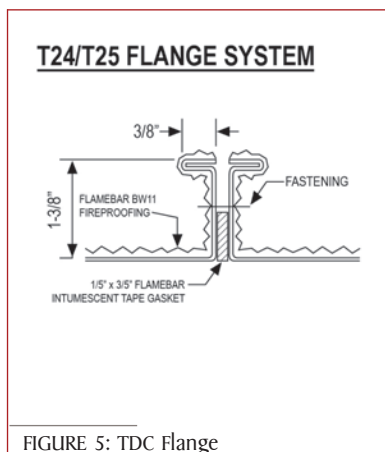
REINFORCEMENT

Flamebar® System Duct Reinforcement uses minimum 3/8" Tie Rod (Figure 3) either bolted or spot welded to the flanges at the end of the duct segment. Intermediate reinforcement at the duct segment's midsection can be performed utilizing either Tie Rod reinforcement or Rolled Steel Angle (RSA) reinforcement around the duct perimeter as illustrated in Figure 4 to the right. RSA reinforcement requires either rivets or spot welding around the external perimeter of the duct at 6" centers.



FLANGES

The Flamebar® System can be fabricated with TDC Flanges (Figure 5), Ductmate Flanges (Figure 6) or Angle Flanges (Figure 7). Duct segments flanged with TDC or Ductmate would have intermediate G-Clamps applied (Figure 6) at 12" maximum spacing, and Angle Flanges would have 3/8" bolts at 6" maximum centers. Certified Flamebar® self-adhesive gasket is applied in between all joints during installation.



FLANGES

(Continued)

Care must be taken to apply the gasket along the inner edge of the flange, with full overlapping of gasket strips at all points where the strips meet or intersect (Figure 8). A specially formulated intumescent, impregnated, closed cell, high temperature gasket is supplied with the system ensuring performance to system specification.

All Flamebar® System duct segments are fabricated with a grooved seam or a Pittsburgh lock seam. The seam is sealed with certified Flamebar® Fire Sealant for high velocity systems as illustrated in Figures 9 and 10 below.

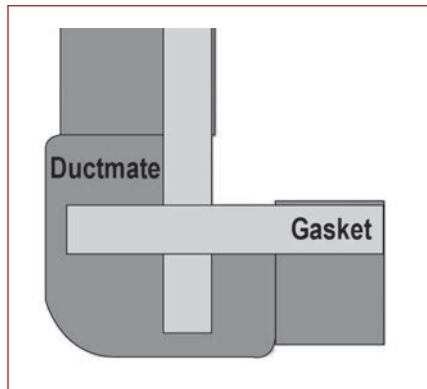


FIGURE 8: Ductmate, Flange with Gasket

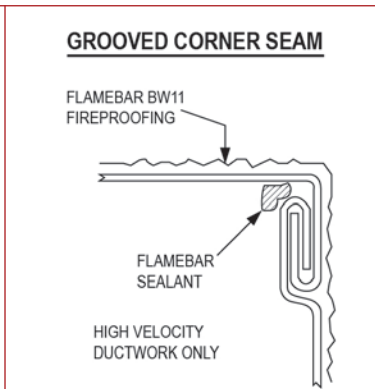


FIGURE 9: Grooved Corner Seam

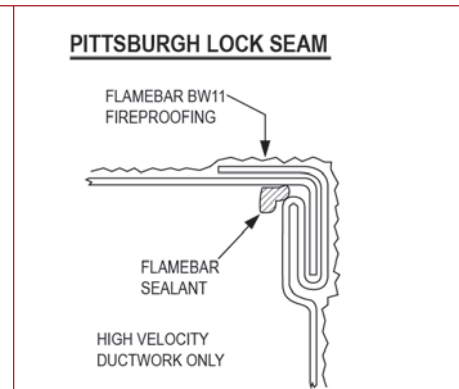


FIGURE 10: Pittsburgh Lock Seam

ACCESS DOORS FOR FLAMEBAR® BW11

Field fabricated and prefabricated access doors are both permitted for use with Flamebar® Fire Rated Duct Systems. Installation details are illustrated to the right in Figures 11 and 12 for uninsulated as well as insulated applications.

ACCESS DOORS FOR UNINSULATED FLAMEBAR® BW11:

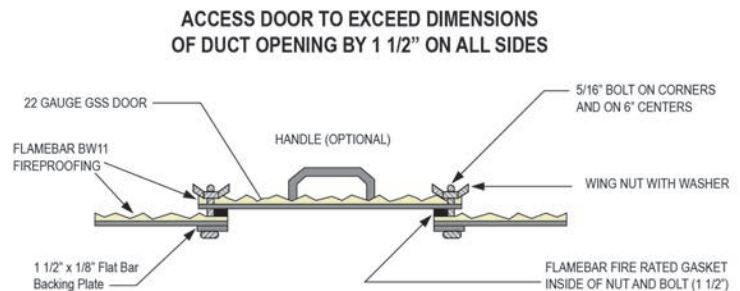


FIGURE 11: Uninsulated Access Door Assembly

ACCESS DOORS FOR INSULATED FLAMEBAR® BW11:

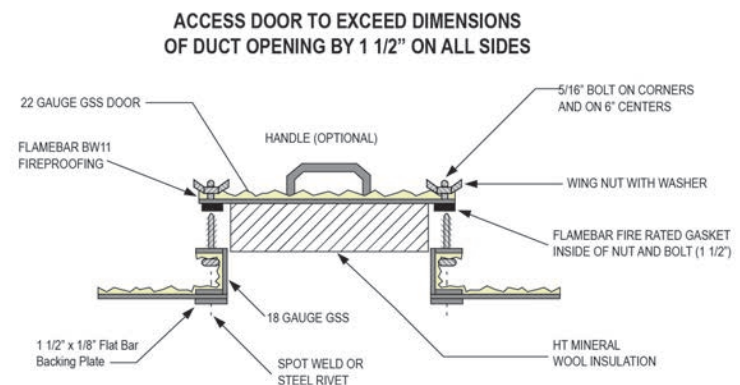


FIGURE 12: Insulated Access Door Assembly

INSTALLATION

Table 2 summarizes relevant support information for installation components of Flamebar® Systems related to trapeze style supports. Note supports are spaced out at 59" horizontal centers maximum. When designing and testing fire resistant ductwork, it is critical that the reduction in tensile strength of steel under fire load is given proper consideration.

For example, it must be recognized that the "pull-out" load of an anchor under fire conditions is significantly less than at ambient temperature. Specifying the Flamebar® System brings confidence that these critical design details have been addressed. The contractor must receive hanger specifications from Conquest Firespray prior to installation.

LONGEST SIDE		ASSEMBLY V5 & V18 120 min STABILITY & INTEGRITY				ASSEMBLY V6, 120 min STABILITY & INTEGRITY & INSULATION			
		MAXIMUM SIZE		HORIZONTAL DUCT 59" BEARER CENTRES		HORIZONTAL DUCT 59" BEARER CENTRES		HORIZONTAL DUCT 59" BEARER CENTRES	
				HANGER SIZE inches	BEARER MEMBER			HANGER SIZE inches	BEARER MEMBER
			Z ins ³	POSS. SIZE		Z ins ³	POSS. SIZE		
UPTO 16"	16" x 8"	3/8"	0.035	OR 1 1/2" x 3/4" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.	3/8"	0.071	OR 1 1/2" x 3/4" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.		
	16" x 16"	3/8"	0.043	OR 1 1/2" x 3/4" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.	3/8"	0.089	OR 1 1/2" x 3/4" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.		
OVER 16" UPTO 24"	24" x 12"	3/8"	0.064	OR 1 1/2" x 1 1/2" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.	3/8"	0.127	OR 1 1/2" x 1 1/2" x 1/8" SC 2" x 2" x 1/4" R.S.A.		
	24" x 24"	3/8"	0.078	OR 1 1/2" x 1 1/2" x 1/8" SC 1 1/2" x 1 1/2" x 1/4" R.S.A.	3/8"	0.158	OR 1 1/2" x 1 1/2" x 1/8" SC 2" x 2" x 1/4" R.S.A.		
OVER 24" UPTO 32"	32" x 16"	3/8"	0.112	OR 1 1/2" x 1 1/2" x 1/8" SC 2" x 2" x 1/4" R.S.A.	3/8"	0.203	OR 1 1/2" x 1 1/2" x 1/8" SC 2 1/2" x 2 1/2" x 1/4" R.S.A.		
	32" x 32"	3/8"	0.134	OR 1 1/2" x 1 1/2" x 1/8" SC 2" x 2" x 1/4" R.S.A.	3/8"	0.25	OR 1 1/2" x 2 1/2" x 1/8" SC 2 1/2" x 2 1/2" x 1/4" R.S.A.		
OVER 32" UPTO 40"	40" x 20"	3/8"	0.162	OR 1 1/2" x 1 1/2" x 1/8" SC 2" x 2" x 1/4" R.S.A.	3/8"	0.329	OR 1 1/2" x 2 1/2" x 1/8" SC 3" x 3" x 1/4" R.S.A.		
	40" x 40"	3/8"	0.208	OR 1 1/2" x 1 1/2" x 1/8" SC 2 1/2" x 2 1/2" x 1/4" R.S.A.	3/8"	0.394	OR 1 1/2" x 3" x 1/8" SC 3" x 3" x 1/4" R.S.A.		
OVER 40" UPTO 60"	60" x 30"	3/8"	0.414	OR 1 1/2" x 3" x 1/8" SC 3" x 3" x 1/4" R.S.A.	3/8"	0.583	OR 1 1/2" x 3" x 1/8" SC 3" x 1 1/2" CHANNEL		
	60" x 60"	3/8"	0.466	OR 1 1/2" x 3" x 1/8" SC 3" x 3" x 1/4" R.S.A.	1/2"	0.688	3" x 1 1/2" CHANNEL		
OVER 60" UPTO 78"	78" x 39"	1/2"	0.671	3" x 1 1/2" CHANNEL	1/2"	0.918	3" x 1 1/2" CHANNEL		
	78" x 78"	1/2"	0.751	3" x 1 1/2" CHANNEL	1/2"	1.074	3" x 1 1/2" CHANNEL		

TABLE 2

SC = SLOTTED CHANNEL
RSA = ROLLED STEEL ANGLE

FIELD REPAIR

In the event that a duct segment sustains limited damage on site, contractors can perform the repair as illustrated in Figure 13. The replacement panel is to be 20-gauge minimum, oversized by 1.5" on all sides, coated with Flamebar® BW11, and fire sealed and fastened as shown.

If a duct segment is simply scratched with slight damage to the coated surface, contractors may reapply coating with a touch up kit provided by Conquest.

FIELD INSTALLED DUCT PATCH

Flamebar® BW11 Duct Patch to be Same Gauge as Duct and to Exceed Opening by 1 1/2" on all sides. Patch to be Fire Caulked and fastened to Duct.

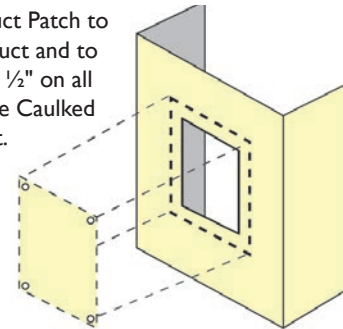


FIGURE 13: Duct Segment Repair

THROUGH PENETRATION SEALS

Where a ventilation duct penetrates a fire rated wall, floor or ceiling assembly, the resulting opening around the duct shall be properly fire stopped.

Through-Penetration Firestop Systems are UL Classified or Intertek Listed for use with the Flamebar® System. Contact Conquest Firespray for a full listing of firestop penetrations.

SUPPORTS FOR RISERS

Vertical ducts are supported by spanning floor slabs with appropriately sized bearer support steel. Alternatively, cantilever type supports may be utilized. Both methods are illustrated in Figure 14 and incorporate steel angle (RSA) bolted to the side of the duct (or alternatively welded during the fabrication process) and subsequently fastened to the bearer support on site. Note that a Through-Penetration Firestop System, as detailed to the right and shown in Figure 15, is considered a support on its own.

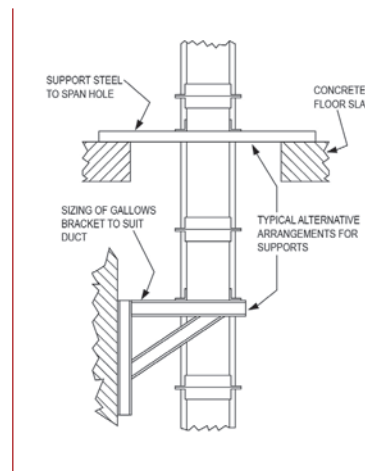


FIGURE 14: Supports for Risers

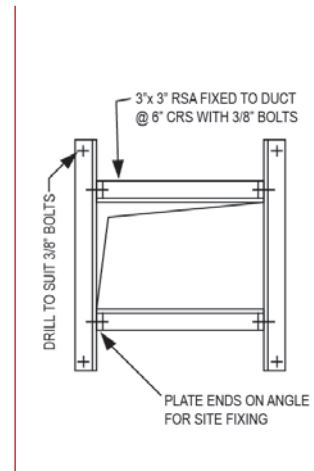


FIGURE 15: Supports Detail

If the height between floors exceeds 12 feet, then supplementary mid-floor support is required. Steel angle can be bolted to a duct section at mid floor on opposing sides of a duct segment. Threaded bar from the slab above can be fastened to it as a supplementary support. Alternatively, if a wall slab is nearby the duct, then the cantilever arrangement of Figure 14 can be used.

FIRE DAMPERS

Fire dampers are required for use in Flamebar® Systems at the transition between BW11 coated duct and SMACNA steel duct. The fire damper shall be located and secured to the inside of the BW 11 coated duct in accordance with damper manufacturer's installation supplement for "Fire and Combination Fire and Smoke Damper Installation in Fire Resistant Duct Assembly." Fire damper manufacturers acceptable with the Flamebar® System include: Ruskin, Greenheck and Pottorff. Blades of the fire damper are to be located inside the BW 11 coated duct section. Specific support requirements must be followed per the manufacturer's installation supplement.

The fire damper shall be fitted with a factory mounted sleeve, 16-gauge minimum, sized to fit inside the end of the BW 11 coated duct with 1/4" maximum clearance between the outside of the

sleeve and the inside of the coated duct. The sleeve is secured to the flange of the coated duct section with 1/4" thick retaining angles and steel fasteners in accordance with the damper manufacturer's installation supplement provided with the fire damper.

The SMACNA air duct shall be secured to the exposed end of the damper sleeve with a breakaway connection, in accordance with damper manufacturer's installation supplement (provided with the fire damper).

Note that if the damper is mounted in a 2-hour rated enclosure (wall or floor assembly) and not within the Flamebar® duct itself, then the damper-to-coated-duct connection must be fastened with non-breakaway connections in accordance with the damper manufacturer's instructions.

ARCHITECTURAL WALL

The Flamebar® System Riser shown in Figure 16 provides a 2-hour rating as tested per ASTM E119. The addition of an architectural wall, formed from a single layer of gypsum, positioned a minimum of 2 1/8" from the external surface of the coated duct, serves the dual purpose of providing both a 2-hour insulation rating and addressing aesthetic needs.

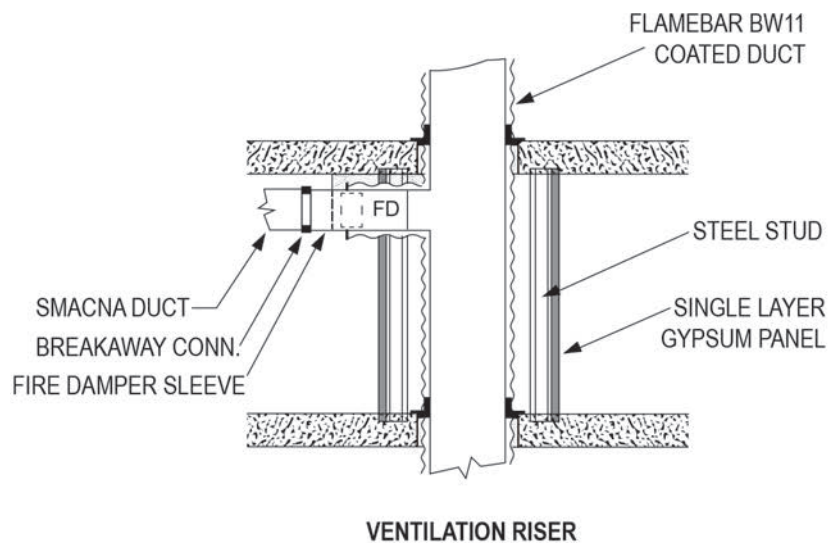


FIGURE 16: Fire Damper and Architectural Wall Installation

SHOE TAP AND SUB DUCT CONNECTION

Attachment of sub-ducts and shoe taps to Flamebar® System ductwork is illustrated in Figures 17 & 18 shown below. Note that sub-ducts do not require coating to be applied to the surfaces of the sub-duct damper is required at the connection point as long as the sub-duct turns up 22" vertically per SMACNA requirements.

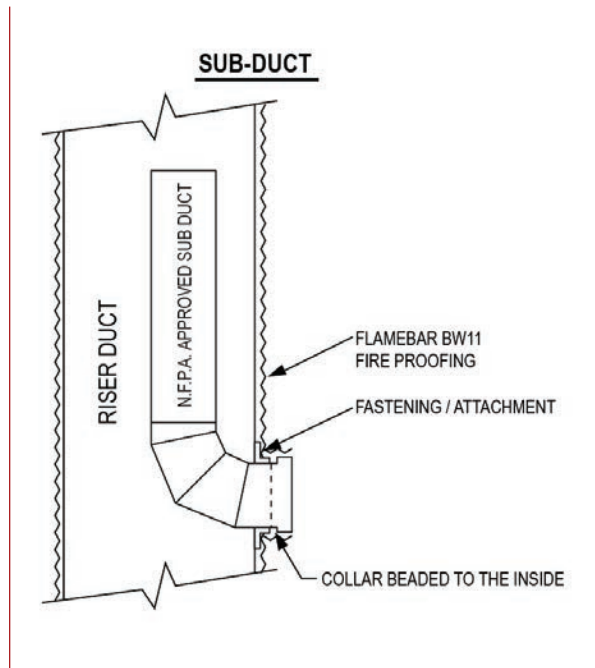


FIGURE 17: Sub Duct

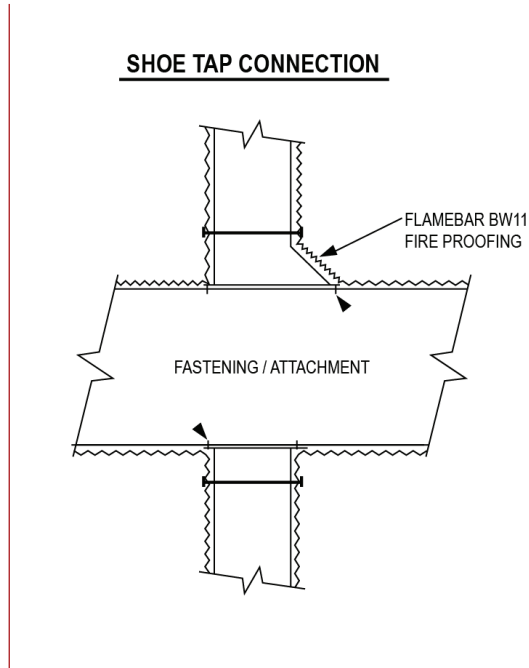


FIGURE 18: Shoe Tap Connection

FIELD MODIFICATION

If necessary, the length of a Flamebar® System duct segment can be reduced in the field. The duct can be cut to the desired length using standard sheet metal cutting tools and replacement Ductmate flanges can be installed. The replacement flanges do not require coating, provided they are the proper gauge. The new Ductmate flanges should then be inserted over the raw end of the duct, screwed, riveted or spot welded in place at 6" centers. Flamebar® System Certified Caulk must be smoothed along the inner seam of the flange and duct. Caulk should also be applied to corners. Since field measurements for a duct project seldom align on site without a final measurement and modification, please order the coated duct segments with at least one select segment that has a flange on one end only, with the other end left raw. The duct segment can be easily cut to size with flanges fastened in place as described above.

DUCT LEAKAGE AND TESTING

Flamebar® Fire Rated Duct Systems are fabricated in rectangular, round and flat oval duct segments to Firespray Technical Specifications. The systems are suitable for applications up to 6" wg static pressure, positive or negative. For installations where higher levels of leakage performance is required, duct segment joints and seams should be sealed with Flamebar® System Sealant.

OUTDOOR INSTALLATION

While the BW11 coating used in Flamebar® Systems is non-hygroscopic and particularly durable, all duct segments installed outdoors should have a protective water based paint applied to the coated surface of the duct. A watershed structure over the duct system is recommended in order to avoid any pooling of water on the top surface. Contact Conquest Firespray for additional information on recommended paint or alternative methods of protection.

INSULATION

The Flamebar® System UN-insulated Fire Rated Duct provides a minimum of 2 hours stability and integrity performance in the event of a fire.

1. Install an “architectural wall” (a single panel of gypsum) positioned a minimum of 2.25” from the duct’s external surface, around the entire perimeter of the duct. The resulting assembly provides a 2-hour insulation rating per ASTM E-119. This is typical for vertical risers in multistory buildings (supply, toilet & dryer exhaust).
If BW11 coated duct has conditioned air running through it and there is a potential for condensation, the duct should be wrapped with insulation in line with local code requirements by using fiberglass wrap for condensation control and thermal efficiency. Note that if the duct already has 2” thickness of 6 pcf mineral wool (typical exceeds R-Value: 8) installed, this extra step may not be necessary as it would likely already be compliant with local energy code R-Value requirements. Please contact Conquest Firespray for design assistance.
2. Wrap the duct with mineral wool insulation (density 6 pcf), to provide insulation ratings from 30 minutes to 4 hours depending on the application and distance to combustible construction materials.

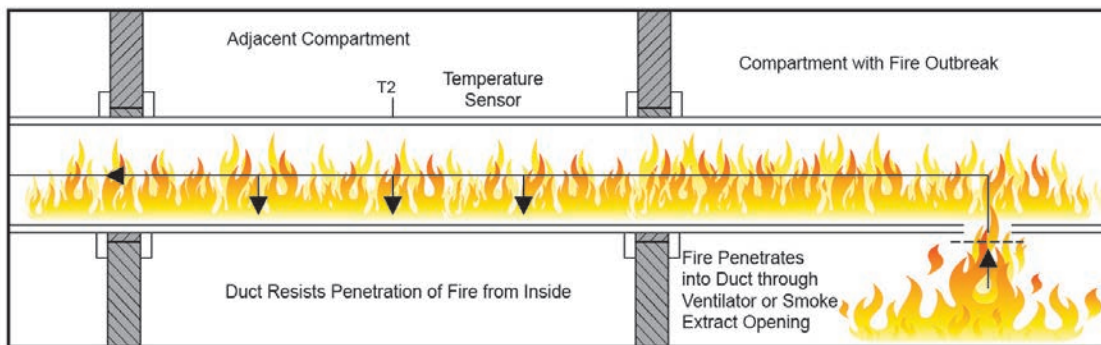
FIELD INSTALLATION INSPECTION CHECK LIST

Installing contractors are trained by Conquest Firespray to the installation techniques necessary for the correct hanging and connections of Flamebar. See *installation instructions manual*.

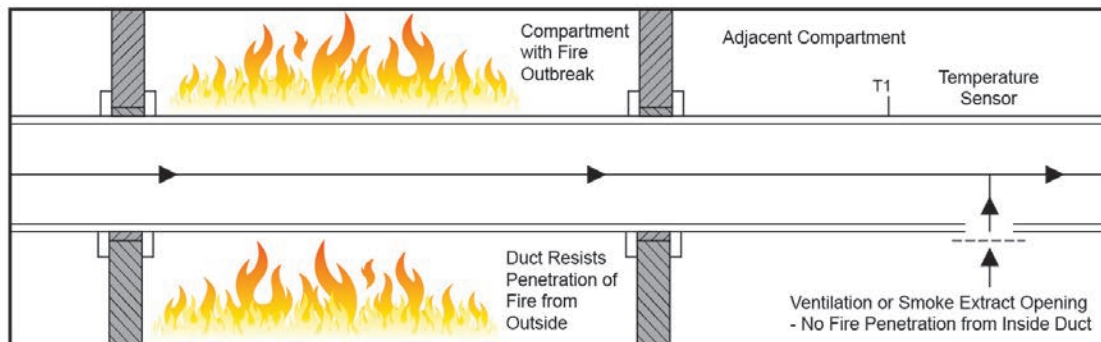
ConQuest

FIRESPRAY

FLAMEBAR® FIRE RATED SYSTEMS



TYPE B



TYPE A

Flamebar® is a factory engineered and manufactured system that protects against both Type A and Type B fires.

FIRE RATED SYSTEMS DESIGN GUIDE

Tested and Classified by UL and Intertek Labs

Phone: 586.576.7600
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