ORDER

U. S. Department of Transportation
Federal Aviation Administration

SO AF 3900.30

Southern Region 11/07/05

SUBJ: FIRE AND SMOKE BARRIER AND FIRESTOPPING PROGRAM

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1. INTRODUCTION. This Fire and Smoke Barrier and Firestopping Program (FSBFP) is intended to support compliance with the requirements of nationally recognized model codes and standards, such as the National Fire Protection Association (NFPA) National Fire Codes including NFPA 101, *Life Safety Code* and the codes of the International Code Council, Incorporated (ICCI), including the *International Building Code*. This FSBFP is consistent with the requirements in FAA Order 6930.1B, *Fire Prevention and Maintenance of Fire Protection Equipment*.

2. PURPOSE. The Federal Aviation Administration (FAA) Eastern Service Area (ESA) seeks to provide a safe working environment by developing employee awareness and training related to fire and smoke barrier protection. The FSBFP as required by the current editions of the model codes is designed to maintain the integrity of fire and smoke barriers in FAA workplaces.

3. DISTRIBUTION. This Order is distributed to the Airway Facilities (AF) Division, the National Airspace System (NAS) Implementation Centers, and all AF field offices in the Eastern, New England, and Southern Regions.

4. DEFINITIONS.

a. ASTM. American Society of Testing and Materials; an independent consensus standards generating group composed of volunteers.

b. Assembly. A wall, floor, or other partition, with or without such things as receptacles, outlet boxes, recessed lighting fixtures, or penetrations. The details of the assembly must be spelled out in any approval.

c. Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

d. Cable Tray. An opened or closed metal ladder that may be used to support multiple cables throughout FAA facilities.

e. Char (noun). A grayish black, crusty material formed by burning organic type sealants.

f. Classification or Classified. The method used by Underwriter's Laboratory (UL) to rate application-oriented products like firestop materials, where the final configuration is different in each installation. Firestop materials are "UL Classified", never "listed" or "approved".

g. Collar. A galvanized sheet metal restricting device used in conjunction with plastic pipe. Its function is to direct and control the intumescent action of the firestopping material.

h. Damper, Fire. A device, installed in air distribution systems, designed to automatically close upon detection of heat to interrupt migratory airflow and restricts flame passage.

i. Damper, Smoke. A device, located in smoke barriers, operated by a motor that is actuated by smoke detectors or fire alarm system. They are usually located in facilities with a smoke pressurization system to prevent the passage of smoke into egress routes.

j. Elastomer. A macromolecular material that returns rapidly to approximately the initial dimensions and shape after substantial deformation by a weak stress and release of the stress. *Elastomeric* is having the characteristics of an elastomer.

k. Engineered Solution. An engineering judgment issued by a manufacturer for a firestop installation that is not a UL system.

l. Fire and Smoke Barriers. As used herein, any fire resistance rated or smoke rated construction, including fire walls, fire barriers, smoke barriers, and smoke partitions.

m. Fire Rated or Fire Resistant. A system that has been tested in accordance with the appropriate ASTM test standard and has met the mechanical and endurance requirements of that standard. The property of a material or assembly to withstand fires or gives protection from it. As applied to elements of buildings, it is characterized by the ability to confine a fire or to continue to perform a given structural function, or both. Such testing is conducted by a nationally recognized laboratory, which rates the system for 1, 2, 3, or 4 hours, based on the results of the fire test.

n. Fire Test Standard. Fire test standards are procedures intended to measure and describe the response of materials, products, and systems to sources of heat or flame under controlled conditions. These tests are intended to provide information useful for such purposes as product development, quality control, and specification description. They are not intended to be used alone to provide a measure of the fire hazard of materials, products, or systems. One or more fire test standards, however, may be used as part of a fire hazard standard. Fire test standards are separate and distinct from fire hazard standards.

o. Fire Wall. A wall separating buildings or subdividing a building to prevent the spread and having a fire resistance rating and structural stability.

p. Firestop Installer. An FAA employee who has successfully completed an appropriate FAA or manufacturer's course which includes firestopping practices.

q. Intumescent. A class or type of firestop materials that will swell or expand upon exposure to elevated temperatures. Material will also form an insulating char.

r. Mineral Fiber. A noncombustible insulation material made from mineral fibers. It is also known as mineral wool or safing material. It is typically used as a backing and filler material in through-penetrations.

s. National Fire Protection Association (NFPA). A non-profit association providing fire protection consensus standards.

t. Opening, Fire and Smoke Barrier. A window, panel, door assembly, or similar opening in which the opening meets dimensions listed in NFPA 101 and is readily identifiable and readily opened from both the interior and exterior.

u. PE Pipe. Polyethylene pipe, a plastic pipe that is typically used for gas distribution and it melts quickly when exposed to heat.

v. Penetrating Items. The specific cables, conduit, pipe, ductwork, etc. that pass through the opening in the assembly, and that are to be protected by the firestop.

w. PVC Pipe/Tube. Polyvinyl chloride pipe or tube, a common plastic pipe/tube used for liquid or material distribution in either pressure (closed) or vented applications. This material melts quickly when exposed to heat.

x. Sealant. A material that has the adhesive and cohesive properties to form a seal.

y. Smoke Barrier. A continuous membrane, or a membrane with discontinuities created by protected openings, which is designed and constructed to restrict the movement of smoke.

z. System. The combination of the assembly, the penetrating item(s), and the firestop materials. All these items, together, constitute the system, and the system is the only basis for classification.

4. POLICY. As part of an overall fire and life safety program, employees will comply with this FSBFP. This FSBFP represents the minimum requirements for maintaining the integrity of fire and smoke barriers. Site-specific requirements may be more stringent based upon local risk assessments.

5. SCOPE AND APPLICATION. This FSBFP applies to personnel performing work for the FAA related to the design, construction, maintenance, and use of fire and smoke barriers, including work that requires penetrations, creating openings, or otherwise compromising their integrity.

6. ROLES AND RESPONSIBILITIES.

a. Program Managers for Environment and Safety (PMES) are responsible for:

(1) Ensuring sufficient resources and funding are available to comply with this FSBFP; including oversight, training, materials, etc.

(2) Coordinating a service area contract for fire engineering expertise.

(3) Developing and updating policy regarding fire and smoke barriers.

(4) Ensuring the FSBFP meets all applicable regulatory requirements.

b. Occupational Safety and Health Managers (OSHM) are responsible for:

(1) Implementing and managing the FSBFP in the ESA.

(2) Serving as a focal point to analyze, evaluate and resolve any fire and smoke barrier related issues, concerns, or hazards.

(3) Resolving complaints regarding the condition and/or integrity of fire and smoke barriers.

(4) Maintaining knowledge on currently available firestopping materials and other fire and smoke barrier protection equipment to facilitate recommending and purchasing of appropriate materials and equipment.

(5) Coordinating, developing, and identifying appropriate training materials and courses.

(6) Facilitating routine inspections and audits of FSBFP activities.

c. Environmental and Occupational Safety and Health (EOSH) Coordinators for Engineering Services Implementation Centers (IC) are responsible for:

(1) Implementing and managing the FSBFP for ICs.

(2) Assessing projects for level of impact on fire and smoke barriers.

(3) Serving as an IC focal point to analyze, evaluate and resolve any fire and smoke barrier related issues, concerns, or hazards.

(4) Maintaining knowledge on currently available firestopping materials and other fire and smoke barrier protection equipment to facilitate recommending and purchasing of appropriate materials and equipment for the ICs.

(5) Developing training requirements and coordinating, and identifying appropriate training materials and courses applicable to the ICs.

d. Safety and Environmental Compliance Managers (SECM) are responsible for:

(1) Serving as designated single point of contact for fire and smoke barrier and fire protection related activities within the Service Management Office (SMO).

(2) Assisting with the coordination of firestopping training for designated SMO employees.

(3) Advising on the purchases of materials used for the protection of penetrations and other fire and smoke barrier protection equipment.

(4) Assist with development of local procedures as needed.

e. System Support Center (SSC) Managers/Implementation Center (IC) Managers and Supervisors/ Field Maintenance Program (FMP) Supervisors are responsible for:

(1) Implementing and managing the FSBFP at all facilities occupied and/or maintained by FAA ATO personnel.

(2) Ensuring a Fire Protection Engineer (FPE) is consulted for technical assistance whenever a project may cause significant impacts to fire or smoke barriers. Contact an IC EOSH Coordinator for assistance with determining the level of impact.

(3) Designating one or more Firestopping Coordinator(s) per SSC/IC/FMP and ensure they receive the Fire and Smoke Barrier and Firestopping Training. Managers/Supervisors may designate themselves as a Firestopping Coordinator.

(4) Notifying the Firestopping Coordinators of projects involving fire and smoke barriers; ensuring they complete the *FAA Pre-Construction and Maintenance Project Safety and Health Checklist* (Order 3900.57), and they oversee firestopping installation activities in their area of responsibility.

(5) Ensuring the integrity of fire and smoke barriers is not compromised.

(6) Ensure that firestopping and other fire protection equipment is properly used, maintained, and inspected in accordance with this FSBFP and the manufacturer’s requirements.

f. Project Engineers are responsible for:

(1) Following the policies and procedures set in this FSBFP when working on or designing construction and renovation projects.

(2) Ensuring a FPE reviews all non-standard designs that establish, modify, penetrate, create openings in, or otherwise compromise fire and smoke barriers prior to finalization.

(3) Ensuring contractors on construction and renovation projects maintain the integrity of fire and smoke barriers in accordance with this FSBFP.

(4) Reviewing all contractor submittals for compliance with the codes and this FSBFP and as necessary consult with a FPE.

(5) Ensuring that all firestopping was installed properly.

g. Resident Engineers (RE) and/or Electronics Installation Leads are responsible for:

(1) Following the policies and procedures set in this FSBFP when working on or designing construction and renovation projects.

(2) Ensuring that the responsible projects where firestopping is disturbed are replaced properly and in accordance with this FSBFP.

(3) Ensuring contractors on construction and renovation projects maintain the integrity of fire and smoke barriers in accordance with this FSBFP.

(4) Reviewing all contractor submittals for compliance with the codes and this FSBFP and as necessary consult with a FPE.

(5) Verifying that all firestopping materials and other fire and smoke barrier protection equipment was installed properly.

(6) Evaluating a project for potential health effects, i.e. dust, hazardous vapors, etc.

h. Designated Firestopping Coordinators are responsible for:

(1) Ensuring fire and smoke barriers and penetrations through or openings therein are protected in accordance with this FSBFP.

(2) Notifying their supervisor if the integrity of a fire and smoke barrier appears to be compromised.

(3) Performing annual inspection of facilities in accordance with this FSBFP, FAA Order 6930.1B, and the related Maintenance Management System (MMS) Preventative Maintenance (PM) Tasks.

7. FIRE AND SMOKE BARRIER TRAINING.

a. Training Background. Training is required for each designated employee who will:

(1) Install firestopping;

(2) Penetrate fire and smoke barriers during work activities; and/or

(3) Provide oversight on construction and renovation projects.

b. Training Availability. Within one year of the publication of this order, the fire and smoke barrier training will be developed and available to the service area.

c. Initial training. The purpose of this training is to provide the applicable personnel with a level of understanding of the issues and concerns related to fire and smoke barriers.

(1) This course is designed for REs, Project Engineers, and facility firestopping installers.

(2) This course will not exceed 4 hours and will be available computer based via a CD-Rom.

(3) The course will consist of the following elements, at a minimum:

(a) Review of all applicable FAA Orders, NFPA, and ICCI regulations and standards.

(b) How to properly install firestopping and assessing an installation for deficiencies.

(c) Discussion of fire ratings, barriers, penetrations, and opening protection.

(d) Proper procedures and safe work practices for the installation of firestopping.

(e) Firestopping material and assembly variations and interpretation of manufacturer installation diagrams.

(f) Labeling fire and smoke barriers in accordance with this FSBFP.

(g) Review of materials, equipment, and installation methods of other fire and smoke barrier protectives.

d. Refresher Training. In order to keep knowledge related to firestopping and fire and smoke barriers current, refresher training will be provided if a trained employee is relocated and the new workplace requires an update in training or if a program evaluation determines inadequacies in the employee's knowledge.

8. FIRE AND SMOKE BARRIER AND FIRESTOPPING PROGRAM BACKGROUND.

a. Maintaining the integrity of the fire and smoke barriers is essential for providing protection of life safety, property, and operations from fire.

b. Fire and smoke barriers limit the spread of fire and products of combustion to other parts of the building, thus aiding in the evacuation time for occupants and controlling losses.

c. Fire and Smoke Barriers.

(1) Fire and smoke barriers must be designed, constructed, and maintained as required by NFPA and ICCI codes and standards, Occupational Safety and Health Administration (OSHA) regulations, and FAA Orders.

(2) Floor-ceiling assemblies and walls used as fire and smoke barriers, including supporting construction, shall be of a design that has been tested to meet the conditions of acceptance of NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*.

(3) *Barrier Locations*. The following are examples of typical fire and smoke barrier locations.

(a) Hazardous Areas.

1. All hazardous areas are separated by enclosure or compartmentation from the rest of the building by 1-hour fire resistive walls or partitions, ceilings, and floors.

2. Hazardous area enclosures include a minimum ¾-hour fire resistance rating of the door and other opening protection assemblies.

3. Engine Generator Rooms are considered hazardous areas.

(b) Vertical Shafts.

1. Vertical shafts, four or more stories in height, are enclosed with 2-hour fire resistive construction with 1½-hour opening protectives.

2. Shafts, three or less stories in height, are enclosed with 1-hour fire resistive construction with 1-hour opening protectives.

3. Elevator hoistways, elevator machine rooms, and cable/plumbing shafts are examples of vertical shafts.

(c) Exit Stairs and Exit Passageways.

1. Exit stairs and passageways, four or more stories in height, are enclosed with 2-hour fire resistive construction with 1½-hour opening protectives.

2. Exit stairs and passageways, three or less stories in height, are enclosed with 1-hour fire resistive construction with 1-hour opening protectives.

3. Any smokeproof enclosure and/or vestibule must have the same rating as the stair enclosure.

(d) Exterior – The exterior walls must have at least a 1-hour fire resistance rating extending a vertical distance of 15 feet from the roof of an adjoining building, unless the roof has at least a 1-hour fire resistance rating.

(e) Building Separation – Buildings are often separated by 2-hour fire resistance rated construction with 1½-hour opening protectives. Codes sometimes require building separations of 3 or 4-hour fire resistance rated construction.

(f) Floors – Floor assemblies are either fire resistance rated barriers or smoke barriers.

d. Firestopping.

(1) All firestopping materials used in FAA facilities will be installed in accordance with their UL system and manufacturer's instructions by a Firestop Installer.

(2) The Life Safety Code (NFPA 101) requires approved and tested firestop systems where conduit, pipe, cables, or other utilities pass through fire rated walls, floors, and ceilings. A typical firestopping system consists of three components, a wall or floor, the penetrating item, and the actual firestopping materials. Appendix 1 has standard descriptions of typical firestopping products.

(3) There are several different manufacturers of firestop materials and each manufacturer provides a technical manual that illustrates a properly installed firestop assembly.

e. Penetrations and Openings.

(1) Penetrations are piping, conduit, cable trays, and other utility type components that have to run through walls, floors, and fire and smoke barriers.

(2) Openings in fire and smoke barriers are windows, panels, door assemblies, or similar openings in which the opening meets dimensions listed in NFPA 101. The openings are readily identifiable and opened from both the interior and exterior. Examples of openings are:

(a) Fire Doors – A fire rated assembly, which includes the doorframe, door, and materials to maintain a seal. This entire assembly has a fire resistance rating equal to or less than the fire rated barrier it is located in.

(b) Fire and Smoke Dampers – An approved damper designed to resist the passage of fire or smoke. A discussion of fire and smoke dampers is available in Appendix 5.

1. Fire dampers are typically operated by a fusible link element.

2. Smoke dampers are located in smoke barriers and are operated by a motor that is actuated by smoke detectors or a fire alarm system.

3. Smoke dampers are usually located in facilities with a smoke pressurization system to prevent the passage of smoke into egress routes.

(c) Wall and Floor Joints – Where two fire resistance rated construction assemblies join; such as wall-to-wall or wall-to-floor/ceiling assemblies, the resulting construction joint shall be sealed with a UL fire rated joint system.

(d) Incomplete Construction – Where fire and smoke barrier construction is incomplete, it shall be repaired with construction similar to the existing barrier or the incomplete construction shall be provided with a UL firestop system.

9. FACILITY MANAGEMENT REQUIREMENTS.

a. Barrier Labeling.

(1) All fire and smoke barriers must be identified and labeled.

(2) If the area is finished, the label should be affixed or stenciled to the wall above the suspended ceiling. If it is an unfinished area the label should be affixed to the wall so it can be seen from the floor.

(3) Labeling is very important in notifying anyone performing activities on the barrier to ensure the integrity of the barrier. Labels and/or stencils are available from the Environmental and Occupational Safety and Health (EOSH) staff. The suggested wording for the labels is:

FIRE and/or SMOKE BARRIER
FIRESTOP ALL PENETRATIONS

b. Facility Inspection and Maintenance. Requirements for maintaining the integrity of fire and smoke barriers and for periodic inspections to ensure overall compliance and safety for facility occupants, equipment, and continuity of operations include the following.

(1) *General Requirements.*

(a) Prior to any project in the facility, review drawings to identify the location of all fire and smoke barriers that may be required in or impacted by the project.

(b) Ensure fire and smoke barriers are labeled appropriately and prominently in accordance with this FSBFP.

(c) During and/or after construction or renovation activities, inspect fire and smoke barriers for possible damage and repair.

(d) Ensure firestopping of penetrations and construction joints, and opening protectives, are maintained according to the UL system and this FSBFP.

(2) *Operations and Maintenance Activities*. It is important to maintain the integrity of fire and smoke barriers per following key elements:

(a) During the Joint Acceptance Inspection (JAI) of any construction or renovation project, the facility Technical Operations and Engineering Services representatives must inspect the fire and smoke barriers for improper firestopping installation, penetrations without firestopping, or otherwise verifying the integrity of the barrier has not been compromised.

(b) Consult a FPE for all complex projects that impact fire or smoke barriers, or firestopping projects that includes engineering solutions.

(3) *Periodic Inspections.* Fire and smoke barriers, opening protectives and firestopping must be assessed annually and following any renovation, construction, or installation project, to check for signs of deterioration, spaces, or other signs of wear (National preventative maintenance task reference # 9301BK).

c. Documentation Requirements.

(1) Ensure all required forms are completed and sent to the required personnel. These forms include:

(a) *Work Permit* – Required prior to work activities beginning that may impact building materials.

(b) *FAA Pre-construction and Maintenance Project Safety and Health Checklist, FAA Order 3900.57.* This form must be completed during critical phases of construction and maintenance activities (e.g. pre-construction meeting, 30-60 days prior to commencing work, weekly/daily construction meetings, etc.).

(2) All new project design drawings shall include a firestop schedule with the UL system(s) provided.

(3) Maintain all documentation received from contractors related to opening protectives and firestopping locations, selected systems, and other relevant information.

10. PROJECT IMPLEMENTATION REQUIREMENTS.

a. Underwriter's Laboratory (UL) System.

(1) The use of UL system indicates that the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified service.

(2) All firestopping materials used in FAA facilities will be installed in accordance with their UL system and manufacturer's instructions by a Firestop Installer.

b. Project Requirements.

(1) Avoid penetrating fire and smoke barriers by planning the route around the barriers, whenever possible.

(2) Only trained personnel shall install firestopping.

(3) The installation requirements, drawings, and descriptions are available on the UL web site utilizing the UL Firestopping Certifications Directory. Instructions for using the directory are available in Appendix 2. The same information is available in Fire Resistance Directories published by UL.

(4) A project planning standard operating procedure (SOP) is available in Appendix 3.

(5) *New Facility Construction Projects* – During construction of new facilities it is essential that the fire and smoke barriers be properly installed.

(a) The Resident Engineers (REs) on site must ensure that the contractor installing the fire and smoke barriers is qualified. A qualified contractor is one who has successfully completed the training performed by the manufacturer of the firestopping product. The REs must obtain documentation of the completed training and must verify the proper installation of firestopping used in these projects.

(b) All new fire and smoke barriers must be labeled according to this FSBFP.

(6) *Existing Facility Projects.* During projects at existing facilities, it is essential that the following requirements are met:

(a) The integrity of the existing fire and smoke barriers are maintained.

(b) New fire and smoke barriers shall meet applicable standards and this FSBFP.

(c) Label barriers in accordance with this FSBFP, whenever feasible.

c. Personal Protective Equipment (PPE) – Each firestopping material may present unique hazards. Installers must consult the Material Safety Data Sheet (MSDS) for PPE and health hazard requirements.

(1) The installer must wear the PPE listed on the MSDS and follow all instructions for the firestopping material being installed.

(2) MSDSs must be kept on site for any firestopping material used in each facility.

(3) Coordinate the MSDS with the building occupants to ensure the occupants are aware of any unusual odors or other characteristics of the firestopping material prior to using it.

d. General Safety Requirements.

(1) If safety hazards will be encountered during the installation of the firestopping such as elevated heights and electrical hazards the following procedures must be followed:

(a) The project lead must ensure that work is performed in accordance with applicable FAA Orders, this FSBFP, and federal regulations.

(b) Ensure all installers have had the appropriate training required for any hazard encountered and that they are provided with the information and guidance needed to ensure the task is performed safely and properly.

(2) Contact OSHM, IC EOSH Coordinator, or SECM for assistance when needed.

e. Contractor Requirements. Contractors are responsible for maintaining the integrity of any penetrated fire and smoke barrier encountered in their work activities.

(1) The ANI personnel managing contractors working in FAA owned and/or operated facilities with fire and smoke barriers are responsible for ensuring the contractors follow all applicable regulations and the requirements of this FSBFP.

(2) Project specifications must state the applicable requirements, including that penetrations in fire and smoke barriers must be protected in accordance with this FSBFP.

(3) Contractors installing firestopping shall have completed the training the firestopping product manufacturer offers and provide documentation of successful completion to the RE.

11. REGULATORY STANDARDS. Fire and smoke barrier requirements and fire protection standards are outlined in NFPA and ICCI codes and standards, OSHA standards, and the International Building Code (IBC). Federal regulations governing fire and smoke barrier protection are outlined below.

a. OSHA standard 29 CFR 1910, Subpart L, *Fire Protection*.

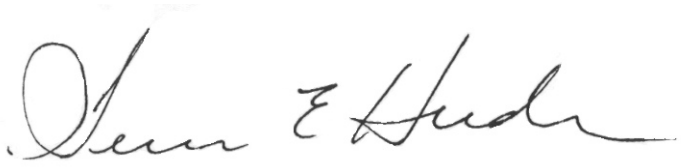
b. NFPA 101, *Life Safety Code* and NFPA 1, *Fire Prevention Code.*

c. NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials.*

d. Current version of FAA Order 6930.1A, *Fire Prevention and Maintenance of Fire Protection Equipment*.

e. The International Code Council Incorporated (ICCI), *International Building Code* and the ICCI, *International Fire Code*.

f. Current version of Underwriters Laboratories (UL) *Fire Resistance Directory*.



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APPENDIX 1. STANDARD DESCRIPTIONS OF FIRESTOPPING EQUIPMENT AND MATERIALS

Composite Sheet Firestops are rigid fire-resistant panels composed of a layer of elastomer firestopping material bonded to a galvanized steel sheet on one side. A composite sheet is reinforced with shaped steel wire mesh and bonded with aluminum foil on one side. These sheets or panels are used to seal penetrations where a large opening has been made. The firestopping material is usually intumescent and forms a char material that retards heat transmission and tightly seals the penetration against the spread of combustion products.

Firestopping Caulks - Most firestopping caulks are flexible materials that are usually silicon-based and particularly useful for openings in which the penetrating items are subject to movement or vibration. As part of a UL classified assembly, firestop caulk is used in firestop designs based on specific thicknesses of the material and may include mineral or ceramic fiber as backing material. One of the advantages to firestopping caulk is its ability to be used where the environmental exposure is more severe (exposure to moisture or exterior wall openings). Some of the latex-based caulks are well suited to a wide range of applications especially large diameter insulated piping.

Firestopping Cementitious Materials are ideally suited for relatively large, static openings. These materials are usually mixed with water very similar to a cement or concrete material and have a similar appearance to mortar. Like mortar material, the firestopping can be troweled to a smooth finish.

Firestopping Coatings are typically highly intumescent, water-based materials that are applied with a brush or sprayer. The coatings are highly effective at protecting cables and adhere well to cable insulation. Once applied, the firestop coating is designed to provide an insulating layer to keep the power and control cable operational.

Firestopping Collars consist of a heavy gage metallic device filled with a highly intumescent firestopping material. The collar mounts easily around non-metallic pipes by means of ordinary toggle or anchor bolts. A seam in the collar allows positioning around the pipe; closure is achieved by an integral clamp, which also allows for removal of the pipe collar for subsequent reinstallation. These collars typically accommodate pipes up to 4 inches in diameter. An application of this type of firestop would be the polyethylene drop tubes in the FAA control towers.

Firestopping Pillows are well suited for quick and simple installations allowing flexibility to remove and even reuse the firestop products. The pillows typically consist of a mineral fiber treated with a highly intumescent material enclosed in a strong polyethylene bag. The term intumescent is defined as a material that will swell or enlarge with the application of heat. Thus, when the pillows are exposed to fire they expand to seal the opening. These devices are primarily used in cable tray applications. **NOTE: Firestopping pillows cannot be used unless approved by a FPE or the OSHM.**

Firestopping Putty is a hand-moldable product that can be used to accommodate complex configurations of cable, cable trays, electrical receptacles, electrical ducts, and pipes or conduits. As part of an UL-classified assembly, putty is used in firestop designs based on specific thicknesses of the material and may include mineral or ceramic fiber or fiberboard with suitable support/attachment accessories. One of the advantages to firestopping putty is where penetrations are going to be reused and reentered by cables or wire the products have an indefinite shelf life and can be removed and reapplied. Firestopping putty would not be a good material in applications where environmental exposure or compartment flooding is a design requirement.

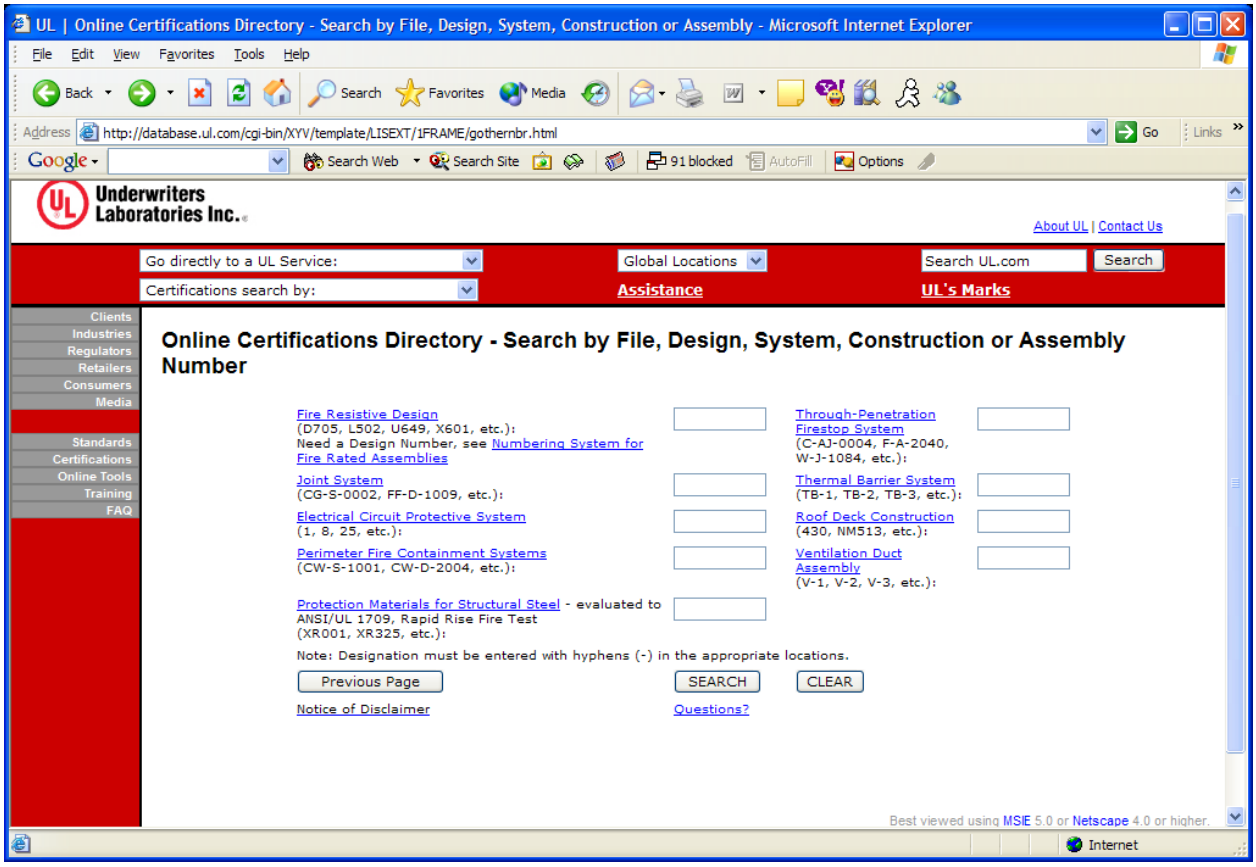
Multi-cable Firestops usually consist of rectangular metal frames suitable for floor or wall installation available in single or multiple units. Each frame contains an arrangement of modules with elastomeric material grooved to fit snugly around cables, pipes or conduit passing through the frame. The elastomeric material expands when exposed to heat providing a continuous seal even if cable jackets disintegrate under fire conditions. The entire assembly within each frame is locked in position to prevent dislodgment and the spread of fire and the products of combustion. The frame assemblies may be used individually, or stacked in multiple tandems for high volume installations.

Wrap Strips consist of flexible ¼ inch thick x 2-inch wide strips that are approximately 8 feet long. The strips can be cut and applied in layers fitting closely around pipes. When exposed to the heat of a fire, the wrap strip quickly expands to create a barrier, which can provide up to 3 hours of firestop protection.

APPENDIX 2. INSTRUCTIONS FOR USING THE UNDERWRITER'S LABORATORY FIRESTOPPING CERTIFICATIONS DIRECTORY

INSTRUCTIONS FOR USING THE UL CERTIFICATION DIRECTORY ONLINE

Utilizing the following website: http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/gothernbr.html, which looks like the following:



Begin entering the alphanumeric code according to the following guidelines.

NUMBERING SYSTEM

The systems are identified in this category by an alpha-alphanumeric identification system. The alpha components identify the type of assembly being penetrated and the numeric component identifies the type of penetrating item.

The first alpha component is an F, W or C. The F signifies a floor is being penetrated, the W signifies a wall is being penetrated, and C signifies either a floor or a wall is being penetrated. The second alpha component may be any letter. The significance of the letter used is:

Letter	Description
A	Concrete floors with a minimum thickness less than or equal to 5 inches
B	Concrete floors with a minimum thickness greater than 5 inches
C	Framed floors
D	Steel decks in marine vessels
E	Floor-ceiling assemblies consisting of concrete with membrane protection
F through I	Not used at present time
J	Concrete or masonry walls with a minimum thickness less than or equal to 8 inches
K	Concrete or masonry walls with a minimum thickness greater than 8 inches
L	Framed walls
M	Bulkheads in marine vessels
N	Composite panel walls
O through Z	Not used at present time

The numeric component uses sequential numbers to identify the penetrating item. The significance of the number used is:

No. Range	Description
0000-0999	No penetrating items
1000-1999	Metallic pipe, conduit or tubing
2000-2999	Nonmetallic pipe, conduit or tubing
3000-3999	Electrical cables
4000-4999	Cable trays with electrical cables
5000-5999	Insulated pipes
6000-6999	Miscellaneous electrical penetrants such as busducts
7000-7999	Miscellaneous mechanical penetrants such as air ducts
8000-8999	Groupings of penetrations including any combination of items listed above
9000-9999	Not used at present time

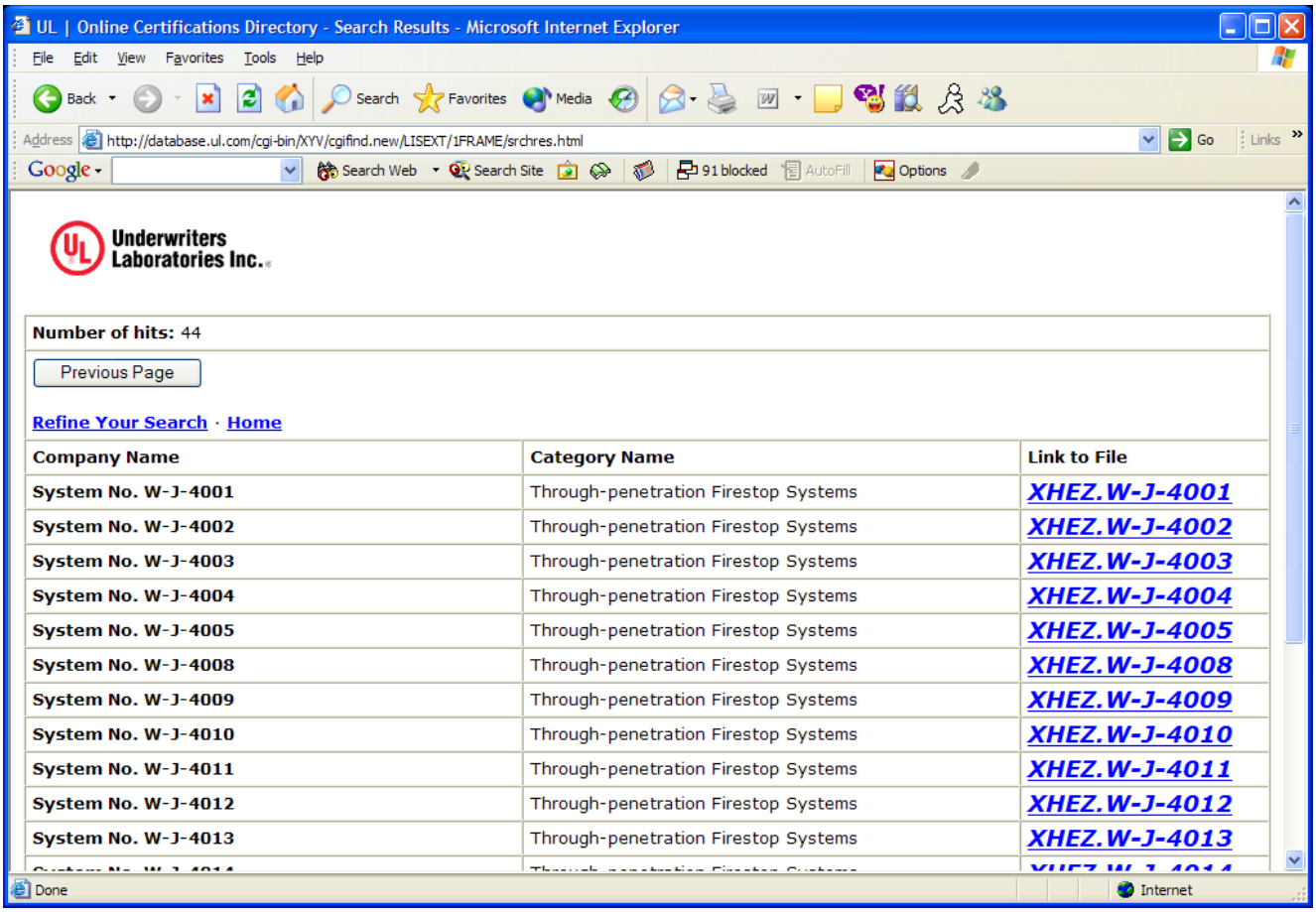
For example, if you were looking for firestopping material for a cable tray through a 7-inch concrete masonry wall you would put in the box on the web site that says “Through-Penetration Firestop Systems” the following:

“W” (since you are penetrating a wall), a hyphen “-“, then a “J” (since the wall is a concrete or masonry walls with a minimum thickness less than or equal to 8 inches), another hyphen, and since the penetrant is a cable tray you want the 4000-4999 range. But since you want to see all possibilities you would put in “4***” instead of 4000. So your overall alphanumeric code for this example would be:

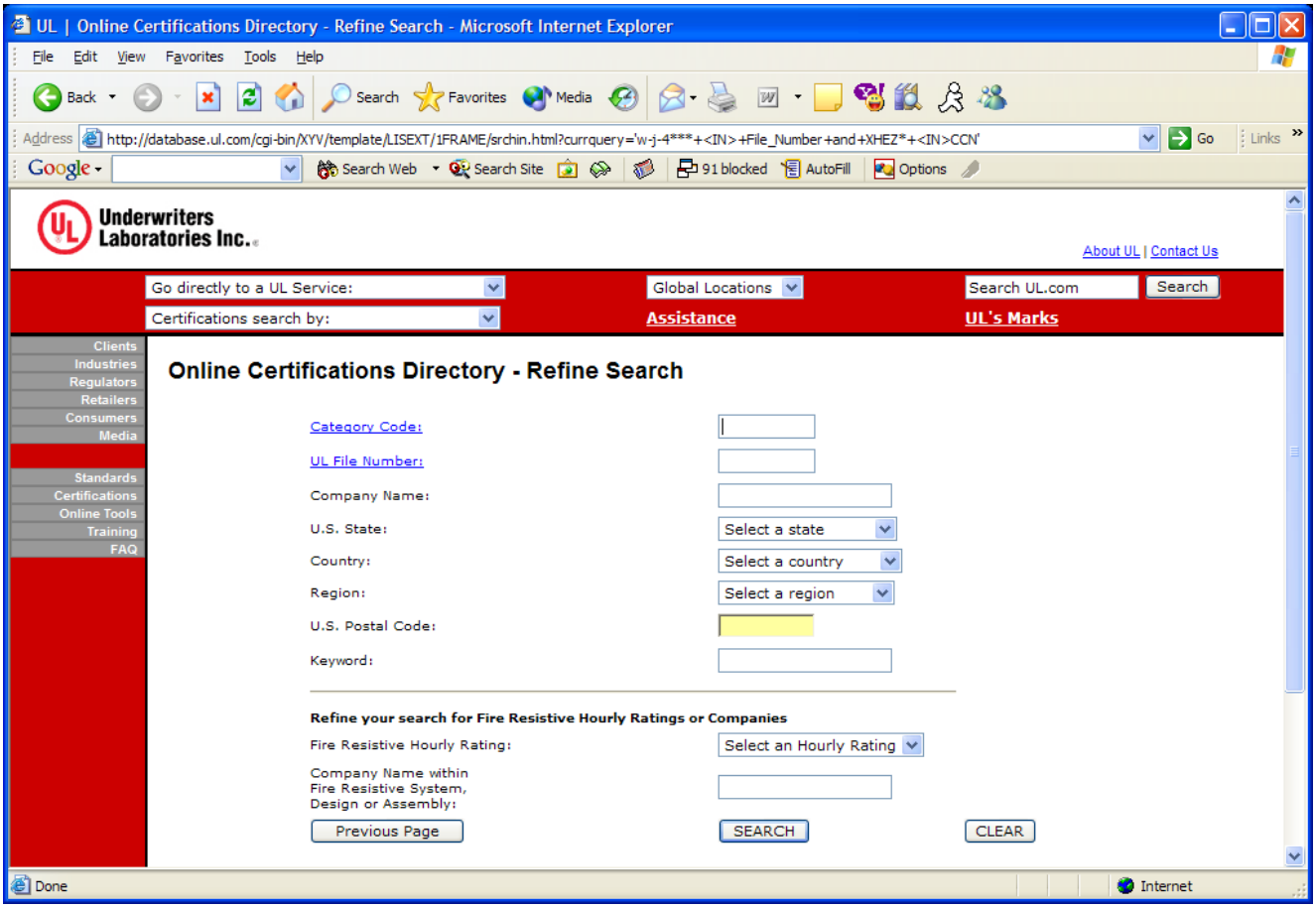
W-J-4***

Then hit the SEARCH button.

Your hit list would like:



Then if you hit the “Refine Your Search” link, just above the list of hits, and it will take you to the following screen:



This allows you to select the fire rating of your material being penetrated and the manufacturer you want e.g. 3M, Hilti, Nelson, or other firestopping manufacturers. This will narrow your hit list down and give you a link to the drawing and description.

If you do not know what the rating is of your wall, look at the rating of the fire doors in that wall and see what the rating is for the door.

If the door is rated at 1 hour then your firestopping will need to be 1 hour rated.

If the door is rated at 1½ hours then your firestopping will need to be 2 hour rated.

NOTE: These rules apply **UNLESS** it is a wall separating a tower from a link or between wings of ARTCCs and Large TRACONs. For these situations the walls will need to be 4 hour rated.

APPENDIX 3. STANDARD OPERATING PROCEDURES FOR PROJECT PLANNING FOR FIRE AND SMOKE BARRIER IMPACT

PROJECT PLANNING:

Prior to beginning a project, proper planning is needed to ensure the integrity of the fire and smoke barriers are not compromised.

WARNINGS:

1. Do not allow new penetrations in a fire and smoke barrier without proper firestopping protection installed.

PROCEDURE:

1. Assess the project scope to determine if a fire and smoke barrier will be penetrated.
2. Always plan to avoid penetrations in the fire and smoke barriers. Is there a way to route the equipment differently to avoid penetrating barrier or limit the number of penetrations?
3. Determine the impact to the fire and smoke barriers by assessing the type of penetrants expected, type of opening, and the type of barrier.
    a. For extensive firestopping projects, projects beyond the scope of the FAA training, consult with a fire protection engineer or a firestopping manufacturer's representative.
    b. For minor firestopping projects, consult with facility representatives to understand the preferred type of firestopping for that facility.
4. Develop a Scope of Work
    a. Consult UL Fire Resistance Directory on the UL website for assembly certifications.
    b. Consult the manufacturers guides.
    c. Identify the project extents and required assembly ratings.
    d. Example Scope of Work is available in Appendix 4.
    e. Obtain the Material Safety Data Sheets (MSDS) for any material that will be installed in the facility.
5. File for Required Permits.
6. Perform Project.

APPENDIX 4. SAMPLE FIRESTOPPING SPECIFICATION

FIRESTOPPING REQUIREMENTS

PART 1 – GENERAL REQUIREMENTS

1.01 SCOPE - Work of this Section includes, but is not limited to, firestopping and smoke sealing all penetrations, openings, ducts, conduit, tubing, piping (closed and vented), insulated conductors, cable trays, structural members, architectural joints, and doorways or access doors, in gypsum wallboard, plaster, concrete, masonry, tile and composite assemblies.

1.02 WORK INCLUDED – Each through-penetration firestopping shall be made in accordance with UL system methods proven to perform in accordance with ASTM E 814 – Fire Test of Through-Penetration Fire Stops. Work included in this effort shall complete the fire resistance rated separations for the {*Building/Wing*} and shall achieve the following:

A. Enclosure of the {*Building/Wing*} in {*1 or 2*}-hour fire resistance rated construction along {*Floor and Location*}. Shall use a UL rated penetration sealing system for holes in the floor, and around conduits, pipes, cables and cable trays that penetrate the {*Building/Wing/Floor*}.

B. Separation -{*list all the main areas that require separation and what fire rating is needed*}.

C. {*List areas that need*}

1. Enclosure with {rating}-hour fire resistance construction.
2. Doorways to be fitted with smoke seals, thresholds and replaced if necessary with the required labeled door.
3. Sealing of large air openings.
4. All exposed surfaces that must be marked with appropriate signage.

1.03 APPLICABLE DOCUMENTS:

A. Test standards for evaluating and rating the performance of firestop designs:

1. American Society for Testing and Materials (ASTM), ASTM E 814 – Fire Test of Through-Penetration Firestops
2. Underwriters Laboratories (UL), UL 1479 – Fire Tests of Through-Penetration Firestops

B. Firestop design classification references:

1. U. L. Fire Resistance Directory: (UL FRD) - Through-Penetration Firestop devices (XHJI), Through-Penetration Firestop Systems (XHEZ), and Fill, Void or Cavity Materials (XHHW).
2. Factory Mutual Approval Guide (FM P7825).

1.04 DEFINITIONS:

A. Fire Rated: Having the ability to withstand the effects of fire for a specified time, as determined by qualified testing.

B. Fire Rated Assembly: A floor, wall, or other partition able to withstand a design fire and hose stream test without failure.

C. Fire Resistance Rating: The time, in hours, for which the rated assembly can withstand the effects of fire without burn-through or structural failure.

D. Firestop: A means of sealing openings in fire rated assemblies to preserve or restore the fire resistance rating.

E. Firestop System: The combination of materials and/or devices, including the penetrating items, required to make up a complete firestop.

F. Penetrating Item: A pipe duct, conduit, cable tray, cable, or other element passing through an opening in a fire rated assembly.

G. Drop Tube – Polyethylene (PE) or Polyvinyl Chloride (PVC) tube used by Air Traffic Controllers in the CAB to transfer flight strips to personnel in the TRACON.

1.05 SUBMITTALS:

A. DATA SHEETS - Submit manufacturer's product literature for each type of firestop device or system to be installed. All literature shall include the UL Classification Mark. Literature shall indicate product characteristics, typical applications, performance and limitation criteria, test data, and storage requirements. Submittals shall include a copy of the through-penetration firestop system listing from the most recent edition of the UL directory. Where "engineered systems" are used, provide a copy of the manufacturer's written documentation on the engineered system. Provide literature for all products used in the system including packing, caulk and other materials.

B. MATERIAL SAFETY DATA SHEETS (MSDS) - Submit MSDS for each firestop product.

C. SHOP DRAWINGS - Show typical installation details for methods of installation. Indicate by schedule or drawing the location and type of each firestop device or system used – identified with Manufacturer's Engineered System or UL Fire Resistance Directory Codes. Submit manufacturer's installation procedures for each product used in every system.

D. INSTALLER CERTIFICATION - Installer shall have successfully completed, within the last three years, at least two firestop projects similar in type and size to this project and shall be certified by the manufacturer for the installation of the firestop systems to be used on this project. Submit written manufacturer's certification of the installer for said manufacturer's firestop products.

E. SCHEDULE - Submit a schedule of the entire work effort from notice to proceed to initiation of the final inspections by FAA (Subcontractor Acceptance Inspection). The schedule shall show the following information, as a minimum:

1. Notice to Proceed
2. Daily Anticipated Progress
3. Work Hours
4. Personnel Present
5. Name
6. Employer
7. Work Address and Telephone
8. Home Address and Telephone
9. Manufacturer Certifications
10. Daily Activities and Work Locations
11. Work Locations
12. Floor Level
13. Rooms
14. Column Line (only required for work in DSR Control Room)
15. Anticipated Inspection Dates
16. Interim
17. Final
18. Schedule of Value

1.06 QUALITY ASSURANCE:

A. WORKMANSHIP - Installation shall conform to requirements of qualified designs or manufacturer approved modifications, as supported by engineering reports, or as approved by the Resident Engineer (RE) and accepted by the authority having jurisdiction.

B. REGULATORY REQUIREMENTS - Firestop systems shall be installed in all openings and around all penetrating elements or devices as required by these Contract Documents, and conform to the 1999 Standard Building Code with {*State*} Amendments and other applicable governing codes.

1.07 DELIVERY AND STORAGE - Deliver materials to the site in original unopened containers or bags bearing the name of manufacturer, product name, type, grade and UL Classification Mark (or other acceptable approval or listing mark) where applicable. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job site.

A. Storage of products shall be off the ground and comply with manufacturer's requirements for each product. Storage shall be in an area protected from weather, moisture, and freezing.

B. Comply with recommended procedures, precautions or remedies described in Material Safety Data Sheets as applicable. All firestop materials shall be installed prior to expiration of shelf life.

1.08 COORDINATION - Coordinate work with other trades. Apply firestopping materials at penetrations of pipes and ducts, prior to insulating, unless insulation meets the requirements specified for firestopping.

1.09 ENVIRONMENTAL REQUIREMENTS - Provide proper ventilation in installation areas and all areas affected by installation. Comply with recommended procedures, precautions, or remedies described in the MSDS as applicable. Dispose of excess materials as required in the Material Safety Data Sheets and manufacturer's instructions. Excess materials shall be disposed off-site by the Subcontractor.

1.10 SPARE MATERIALS - Provide the following spare materials, in their original, unopened containers, and field installation instructions to the FAA Resident Engineer at the completion of the project:

A. Firestop Sealant or Putty: One (1) case of sealant cartridges and one (1) case of each type of putty used (sticks, pads, etc.).

B. Cementitious Firestop Mortars: One (1) 50-pound pail of dry material.

C. Firestop Collars/Intumescent Wrap Strips: One (1) case of collars (firestop devices) and one (1) case of wrap strips if not included above.

D. Non-combustible Insulation: One (1) standard roll, 4 pounds per cubic foot mineral wool.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Firestop materials shall be UL Classified for use in firestopping systems to achieve a 2-hour F and T rating for penetrations of floor assemblies or a 2-hour F rating for penetration of wall assemblies in accordance with ASTM E 814 (UL 1479), unless otherwise noted on the drawings.

B. Each firestop material used shall be suitable and UL Classified for firestopping the penetrations (steel, glass, plastic pipe, steel pipe, copper tube, insulated pipe, conduit, flexible conduit, cable, bus duct, cable tray) for which it is used.

C. Firestop materials shall not be used in annular spaces greater than annular space tested per UL or other national test organization via ASTM E 814. Do not use any firestop material that is chemically incompatible with plastic covered cables, PVC pipe, or drop tubes, etc.

D. Materials shall be non-asbestos and non-toxic to human beings during installation and fire conditions.

Note: the use of "bag" or "pillow" type firestopping products is not permitted. Again, the use of BAG or PILLOW type firestopping products IS NOT PERMITTED.

E. Where the penetrating item(s) is subject to movement, materials shall be specifically listed to accommodate vibration or movement.

F. Materials shall have a flame-spread rating of 25 or less, a smoke development rating of 50 or less when tested in accordance with UL 723 or UL system and accepted.

2.02 APPLICATION – Application of the following materials and devices for the respective uses listed does not constitute an expressed endorsement of a particular system or manufacturer of firestopping. The following application 'guidance' is intended to present examples of systems and respective manufacturers that offer firestopping in accordance with ASTM E 814 – Fire Test of Through Penetration Fire Stops. Other manufacturers and systems may be used if submitted and approved accordingly:

A. Metal Conduits/Pipe penetrating concrete floors/walls

1. Minnesota Mining and Manufacturing: UL Designs C-AJ-1007, C-AJ-1021 or approved equivalent.
2. International Protective Coatings: UL Designs C-AJ-1008, C-AJ-1023 or approved equivalent.
3. Nelson: UL Designs C-AJ-1041, C-AJ-1054 or approved equivalent.

B. Metal Conduit/Pipe penetrating gypsum walls

1. Minnesota Mining and Manufacturing: UL Designs W-L1002, W-L-1009 or approved equivalent.
2. Nelson: UL Designs W-L-1005, W-L-1030 or approved equivalent.
3. Rectorseal Corp.: UL Designs W-L-1012, W-L-1013 or approved equivalent.

C. Cable Trays penetrating concrete floors/walls

1. International Protective Coatings: UL Designs C-AJ-4025, C-AJ-4027 or approved equivalent.
2. Hilti: UL Designs C-AJ-4019, C-AJ-4035 or approved equivalent.
3. Nelson: UL Designs C-AJ-4002, C-AJ-4031 or approved equivalent.

D. Cable Trays penetrating gypsum walls

1. Minnesota Mining and Manufacturing: UL Design W-L-4004 or approved equivalent.
2. International Protective Coatings: UL Design W-L-4009 or approved equivalent.

E. Cables penetrating concrete floors/walls

1. Minnesota Mining and Manufacturing: UL Designs C-AJ-3021, C-AJ-3030 or approved equivalent.
2. International Protective Coatings: UL Design C-AJ-3020 or approved equivalent.
3. Nelson: UL Designs C-AJ-3004, C-AJ-3118 or approved equivalent.

F. Cables penetrating gypsum walls

1. Nelson: UL Designs W-L-3087, W-L-3088 or approved equivalent.

2. United States Gypsum: UL Design W-L-3023
3. Hilti: UL Designs W-L-3047, W-L-3053 or approved equivalent.

G. PVC tubes/pipes penetrating concrete floors/walls
1. Minnesota Mining and Manufacturing: UL Designs C-AJ-2001, C-AJ-2002 or approved equivalent.
2. International Protective Coatings: UL Designs C-AJ-2007, C-AJ-2042 or approved equivalent.
3. Nelson: UL Designs C-AJ-2032, C-AJ-2086 or approved equivalent.

H. PVC tubes/pipes penetrating gypsum walls
1. Minnesota Mining and Manufacturing: UL Designs W-L-2002, W-L-2003 or approved equivalent.
2. Rectorseal Corp: UL Designs W-L-2015, W-L-2086 or approved equivalent.
3. Nelson: UL Designs W-L-2010, W-L-2022 or approved equivalent.

I. MISCELLANEOUS COMBINATIONS OF PENETRATIONS - Provide an engineered solution from one of the manufacturers listed above. A copy of the engineered solution drawings and specifications shall be provided to the Resident Engineer for approval before installation.

PART 3 - EXECUTION

3.01 INSPECTION - examine the areas and conditions where firestops are to be installed and notify the Resident Engineer (RE) of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the RE. Verify that all penetrating elements and supporting devices are safe and suitable for installation of firestop products.

3.02 PREPARATION - Conform to manufacturer's detailed recommendations for surface preparation. Surface to receive firestops shall be free of dirt, dust, grease, oil, form release agents, rust or other matter that would impair the bond of the firestop material to the substrate or penetrating item(s). Voids and cracks in substrate shall be filled and unnecessary projections removed prior to installation of firestops. All penetrating items shall be permanently installed prior to firestop installation. Substrate shall be frost-free and, when applicable, dry. Provide covering for protection of adjacent areas in accordance with good work practices.

3.03 INSTALLATION - Installation shall be performed in strict accordance with manufacturer's detailed installation recommendations, fire test reports, fire resistance requirements and acceptable sample installations:

A. Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Non-combustible damming materials may be left as a permanent component of the firestop system if consistent with the listing.

B. Follow safety procedures recommended in the Materials Safety Data Sheets.

C. Apply through-penetration firestop systems or devices as provided in the UL Fire Resistance Directory. Provide flame (F) rating of the assembly in which installed. Systems for floor penetrations shall have a temperature rating of at least one hour but not less than the required fire resistance of the floor being penetrated. Ensure effective seal against flame, smoke, heat, and hot gases. Do not install water-based products at building exterior. Firestop systems and materials shall no require special tools for installation and shall not emit hazardous, combustible or irritating fumes during installation, curing or use.

D. Where protection will be applied to wire or cable tray penetrations with 100 sq. in. or greater of unused area, spare sleeves will be provided to accommodate installation of additional conductors. The spare sleeve area will be approximately 40% of the unused area of the opening. Sleeves shall be schedule 40 steel pipes, installed and firestopped in accordance with the firestop listing.

3.04 GENERAL CONSIDERATIONS - Firestop systems do not re-establish the structural integrity of load bearing partitions. Consult structural engineer prior to drilling or coring operations in any load bearing assembly. Firestop systems are not intended to support live loads and traffic. Curbs or steel plates may be required to restrict or accommodate potential traffic. Subcontractor shall notify the RE if he has reason to believe these limitations may be violated.

3.05 REPAIRS AND MODIFICATIONS - Identify damaged or re-entered seals requiring repair or modification and remove loose or damaged materials. If penetrating elements are to be added, remove enough material to insert new elements, being careful not to cause damage to the balance of the seal. Insure that surfaces to be sealed are clean and dry. Use only materials approved by manufacturer as suitable for repair of original seal.

3.06 FIELD QUALITY CONTROL - The CET shall perform inspections to verify compliance with requirements. The Subcontractor shall correct unacceptable work and provide further inspection to verify compliance with requirements. Examine penetration seals for proper installation, adhesion and curing as may be appropriate for the respective seal materials. Keep areas of work accessible. Document completion and inspection as required.

3.07 CLEAN-UP - Clean surfaces adjacent to sealed joints of excess firestopping material as work progresses, using solvent or cleaning agents recommended in writing by the firestop manufacturer. Remove equipment, materials, and debris, leaving area in a clean, undamaged condition.

APPENDIX 5. FIRE AND SMOKE DAMPERS DISCUSSION

BACKGROUND.

The Life Safety Code (NFPA 101) states:

"Every opening in a fire barrier shall be protected to limit the spread of fire and restrict the movement of smoke from one side of the fire barrier to the other."

Consequently, openings for the handling of environmental air or air movement must be limited or protected. The following summarizes the protection required by the Life Safety Code.

FIRE WALLS.

Fire walls, such as those used to **separate different buildings**, require installation of 3- hour fire resistance rated damper assemblies, where openings are permitted.

FIRE BARRIERS.

Fire barriers used for the enclosure of **shafts and exits** require installation of 1½-hour fire resistance rated damper assemblies in duct openings. Some codes permit the use of a short section of duct called a "sub-duct" configured to protect the opening, in lieu dampers.

Fire barriers used for **enclosure of hazards, separation of occupancy types, or separation of floor levels** require installation of 1½-hour fire resistance rated damper assemblies in duct openings in walls or floors having a rating of less than 3-hour fire resistance and 3-hour fire resistance rated dampers in walls or floors having a rating of 3-hours or more. Additionally, fire barrier walls having a fire resistance rating of 1-hour or less, do not require the use of dampers by most codes, **if all of the following conditions exist**:

- Ducted HVAC
- Non-hazardous Occupancy Type
- Fully Sprinklered Facility

SMOKE BARRIERS.

Smoke barriers, generally not used in FAA facilities; require installation of smoke dampers or combination fire/smoke dampers, based upon the fire resistance rating of the barrier. Smoke dampers are generally classified based on their resistance to leakage.

SMOKE PARTITIONS.

Smoke partitions or "barriers resistant to the passage of smoke" do not require dampers (fire or smoke) if barriers do not have a fire resistance, contains only ducted HVAC openings and do not form part of a smoke management boundary, where the requirements for smoke management are more rigorous than "resistant to the passage of smoke."