GRABBER®

GrabberGard Firestopping Application Guide

www.grabberman.com

Version 4.0

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

Table of Contents

Through-Penetrations Firestop Systems

How to use selection table;

Select penetrating item (Blank, Metallic, Non-metallic, etc.) and then select type of assembly being penetrated:

CFW – Concrete Floors & Walls
CF – Concrete Floors
CMD – Concrete Metal Decks
PCF – Precast Concrete Floors
FF – Framed Floors
HFS – Hambro Floor Systems
CW – Concrete Walls
FW – Framed Walls

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Type of Assembly	System #	GrabberGard Product Used	System Details	Page #
CABLES & ELECTRICAL BOXES				

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Joint Systems

Type of assembly joint system:

BW – Bottom of Wall
FF – Floor to Floor
FW – Floor to Wall
HW – Head of Wall
PJ – Perimeter Joint (Curtain Wall)
WW – Wall to Wall

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GENERAL CERTIFICATE OF CONFORMANCE

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC, IFC & EFS

THESE PRODUCTS ARE TESTED TO THE FOLLOWING TEST STANDARDS

In the USA:

ASTM E-814	Standard Test Method for Fire Tests of Through Penetrations Fire Stops
ASTM E-1399	Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
UL 1479	Fire Tests of Through-Penetration Firestops
UL 2079	Tests for Fire Resistance of Building Joint Systems

In Canada:

ULC S115-M95	Standard Method of Fire Tests of Firestop Systems

TESTED BY THIRD PARTY AGENCIES

Underwriters Laboratories, Inc. (UL)
Intertek Testing Services Inc. – Warnock Hersey (WHI)

No Asbestos or PCBs are used or contained in this product.

Phil Desjardine
Executive Director

July 13/07
Date

Firestop Products & Systems
Submittal Documentation

____ Service Penetrations
____ Construction Joints/Gaps

Project: _____
_____
_____

Contractor: _____
_____

Installer: _____
_____

Supplier: John Wagner & Associates dba
Grabber Construction Products
866-237-GRAB(4722)

Distributor: _____
_____
_____

GrabberGard Technical Assessment Request Form for Penetrations

You may encounter a job site situation for which there appears to be no specific firestopping listing. This form is intended for your use, to provide us with the information necessary to identify or develop the firestopping design.

Please complete the form with as much detail as possible and fax it to Grabber Technical Services at (604) 515-1783. If available, architectural drawings, competitor listings for the application (if any), or other documents pertinent to the application should be included.

Upon receipt, we will contact you to discuss the application, to inform you of a current applicable listing if there is one, and to determine if UL-approved testing for the application can be scheduled.

Each Separate Firestop System Requires Its Own Listing Request Form

Your Name: _____ Company Name: _____

Address: _____

City/State/Zip Code: _____

Phone Number: _____ Fax Number: _____

Do you wish to be contacted by a local Grabber representative? Yes No

Project:

Project Location:

Opening size (diameter or length and width):

Required rating:

Special requirements (if any):

Construction Specifications:

Sketch Application Here

Fax this form to Grabber Technical Services – (604) 515-1783

January 2009

Floor Construction

- ☐ Concrete Slab
  - Thickness_____ inches
- ☐ Concrete Steel Deck
  - ___Fluted
  - ___Cell. Deck
  - Steel Deck Depth_____ inches
  - Concrete Depth_____ inches
- ☐ Other

Wall Construction

- ☐ Concrete
  - Thickness_____ inches
- ☐ Masonry
  - Thickness_____ inches
- ☐ Stud/Gyp Board
  - Fire Rating of Wall_____ hours
  - Thickness_____ inches
- ☐ Other

Type of Penetrations

Pipe

- ☐ Metallic
  - Type: _____
  - Size: _____
  - No. of pipes: _____
- ☐ Non-Metallic
  - Type: _____
  - Size: _____
  - No. of pipes: _____
- ☐ Insulated
  - Type: _____
  - Size: _____
- ☐ Vented
- ☐ Non-Vented
  - Size: _____

Cable(s)

- ☐ Single
- ☐ Multiple
  - No. per Opening:_____
  - Type: _____
  - Size: _____
- ☐ Jacketed
- ☐ Non-Jacketed
- ☐ Insulated
  - Type:_____

Other Electrical

- ☐ Cable Tray
  - Size: _____
  - Cables per Tray: _____
- ☐ Bus Duct
  - Size: _____
- ☐ Other:
  - _____
  - _____
  - _____
  - _____

Other

- ☐ Drawing of Firestop penetration assembly enclosed
- ☐ Architectural drawings enclosed
- ☐ Competitor listings for the application (if any) enclosed
- ☐ Other documents enclosed

GRABBER CONSTRUCTION PRODUCTS

John Wagner & Associates
dba Grabber Construction Products
205 Mason Circle
Concord, CA 94520 USA
Internet: http://www.grabberman.com

Technical Assistance
(866) 237-GRAB(4722)
Fax: (604) 515-1783

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GrabberGard Technical Assessment Request Form for Joints

You may encounter a job site situation for which there appears to be no specific firestopping listing. This form is intended for your use, to provide us with the information necessary to identify or develop a firestopping design.

Please complete the form with as much detail as possible and fax it to Grabber Technical Services at (604) 515-1783. If available, architectural drawings, competitor listings for the application (if any), or other documents pertinent to the application should be included.

Upon receipt, we will contact you to discuss the application, to inform you of a current applicable listing if there is one, and to determine if UL-approved testing for the application can be scheduled.

Each Separate Firestop System Requires Its Own Listing Request Form

Your Name: _____ Company Name: _____

Address: _____

City/State/Zip Code: _____

Phone Number: _____ Fax Number: _____

Do you wish to be contacted by a local Grabber representative? Yes No

Project:

Project Location:

Required rating:

Special requirements (if any):

Construction Specifications:

Sketch Application Here

Fax this form to Grabber Technical Services – (604) 515-1783

GrabberGard Technical Assessment Request Form for Joints

Floor Construction

- ☐ Concrete Slab
  - Thickness_____ inches
- ☐ Concrete Steel Deck
  - ___Fluted
  - ___Cell. Deck
  - Steel Deck Depth_____ inches
  - Concrete Depth_____ inches
- ☐ Other

Wall Construction

- ☐ Concrete
  - Thickness_____ inches
- ☐ Masonry
  - Thickness_____ inches
- ☐ Stud/Gyp Board
  - Fire Rating of Wall_____ hours
  - Thickness_____ inches
- ☐ Other

Type of Joint

- ☐ Floor to Floor, Dynamic, Static
- ☐ Floor to Wall, Dynamic, Static
- ☐ Wall to Wall, Dynamic, Static
- ☐ Bottom of Wall, Dynamic, Static
- ☐ Head of Wall, Dynamic, Static
- ☐ Wall to Steel Deck, Dynamic, Static
- ☐ Curtain Wall to Slab, Dynamic, Static
  - Gap size _____ inches

Other

- ☐ Drawing of Firestop penetration assembly enclosed
- ☐ Architectural drawings enclosed
- ☐ Competitor listings for the application (if any) enclosed
- ☐ Other documents enclosed

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Technical Assistance
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GRABBER CONSTRUCTION PRODUCTS
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PRODUCT DATA SHEET
GRABBERGARD EFC

Description

GRABBERGARD EFC is a superior performance latex-based endothermic firestop caulk. It has excellent adhesion and bonding characteristics and will not slump or sag out after it has been properly installed. GRABBERGARD EFC elastomeric caulk has been designed to stop the passage of fires, smoke and fumes through fire-rated assemblies after it has been fully cured. GRABBERGARD EFC is chemically compatible with plastic pipes and cable jackets and is water resistant after fully cured. Once cured Grabbergard EFC provides a durable and flexible firestop and can be repaired if damaged or cut.

Applications

GRABBERGARD EFC firestop caulk provides an effective firestop seal when used as a single or multiple component system for through-penetrations, construction joints and voids. To make certain installation is correct, consult manufacturer's current listings, as well as, Third Party published Fire Resistance Directories and/or their websites. GRABBERGARD EFC common uses and features are listed below:

Used on: Single and multiple penetrations
Metallic pipes
- Copper, steel, cast iron
- Conduits

Non-metallic pipes
- ABS, CPVC, FRPP, PE, PEX, PVC
- Rigid and ENT conduit

Insulated pipes
- Fiberglass
- AB/PVC

Electrical cables and wires
- Jacket & non-jacketed

Cable trays
Mechanical ducts
Construction joints/gaps
- Top-of-Wall
- Horizontal and vertical joints
- Perimeter floor joints

Voids
Common construction substrate materials:
- Concrete
- Concrete block
- Steel deck
- Wood
- Gypsum wallboard

Features: Red Color
Non-toxic
Safe and easy to use
Easy clean up (Water Only)
Low volatile organic content (VOC)
No asbestos or PCB
Water resistance (when fully cured)
Mildew resistant (when fully cured)
Paintable (with latex based paints)
Excellent application characteristics
- Flows easily
- No slump
- Superior bond and adhesion

Excellent acoustic properties
Seals smoke and gases
One-component systems

Advantages

Endothermic – When GRABBERGARD EFC is exposed to high temperatures or direct fire, it releases water vapor, forms a solid char and retards the spread of fire.

Single Component

GRABBERGARD EFC Caulk can be used as a single component firestop in many applications. Just install the caulk directly into the opening without using fibrous insulation materials. In many situations GRABBERGARD EFC will replace the more conventional intumescent firestop devices such as pipe collars and wrap strips. This will reduce both the cost and installation time.

Versatility

GRABBERGARD EFC adheres to dry and damp concrete, wood, metals and other common construction material surfaces to form an air and watertight bond. GRABBERGARD EFC can be painted over using a latex-based paint after fully cured.

Flexibility

When installed GRABBERGARD EFC is properly installed in construction joints it will allow up to 33 per cent extension and compression movement of the intersecting assemblies. It will also accommodate longitudinal and lateral movement of through and partial service penetrating items installed in the assembly. GRABBERGARD EFC will remain flexible after it has fully cured.

GRABBER CONSTRUCTION PRODUCTS
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PRODUCT DATA SHEET
GRABBERGARD EFC

Limitations

Consult the Installation Instructions, Storage and Handling and Transportation Sections. **Exposure to rain, running or standing water; before, the sealant is cured may cause the installed material(s) to wash out.** The curing process occurs naturally through the evaporation of its water content into the atmosphere. Slower cure times may be experienced if the sealant is installed at low temperatures, damp and/or in high humidity environments. Any materials used in the firestop system for damming, insulation or support that may not allow for the free passage of air could result in longer curing times. The environment in which the compound is being used should be considered when estimating cure times.

Compliance/Approvals

GRABBERGARD EFC has been Third Party tested for many firestop applications. They meet or exceed the requirements of ASTM E 814; ASTM E 119; UL 1479; UL 2079; ULC S 115-M95; ULC S 101; ASTM E 84. Underwriters Laboratories (UL) and Intertek Warnock Hersey are Third Party fire endurance testing agencies accredited by ICBO, BOCA, and SBCCI (National Evaluation Services) in the United States.

Additional Testing

GRABBERGARD EFC caulk becomes an integral component in a complete building system of walls, floor/ceiling assemblies, service penetration, joints and the like. For this reason, its physical compatibility to other materials used in these complex configurations requires more than the routine firestopping product testing. The results of these additional tests are listed in Table 1,Physical and Chemical Properties.

GRABBERGARD EFC caulk has proven that it has all the physical and chemical characteristics desired in a firestopping product. After it has been installed and fully cured, it has excellent stability and flexibility, even after four weeks at freezing temperatures of -15 F (-26 C) and exposure to extreme temperatures of 300 F(149 C) for 24 hours. Dimensional changes were well within the accepted standards (<2% per ASTM C 356). Dynamic testing has demonstrated the high elasticity properties of GRABBERGARD EFC.

Installation Instructions

GRABBERGARD EFC must be installed in compliance with the listed system designs published by Third Party testing laboratories (UL, ITS Warnock Hersey). Refer to their respective published Fire Resistance Directories and/or their Websites. GRABBERGARD EFC does not require mineral wool insulation in many applications.

Prep-work

To install properly, remove excessive dust, dirt, debris, grease, oil and standing water.

Application

Apply caulking material with standard cartridge or bulk-loading application guns or trowel in place with standard toweling tools. Install the required amount of caulking material into the opening using sufficient pressure to ensure it is in contact with all surfaces, substrates and/or penetrating items. The manufacturer recommends tooling the surface with a moist putty knife or similar tooling utensil. Tooling the caulking material will create a stronger bond and a smooth finish especially on irregular or porous surfaces. Do not apply GRABBERGARD EFC to mineral wool that is or was wet from exposure to water, standing water, rain or snow.

Caution: Mineral wool may cause eye, skin or respiratory tract irritation. Avoid contact with eyes, skin of clothing. Recommend using gloves and goggles. Refer to mi neral wool manufacturer's Material Safety Data Sheets.

Installation Temperature

For best results, installation temperatures should be between 45°-90°F(7°-32°C).

Maintenance

No special maintenance is required after the GRABBERGARD EFC sealant is installed a nd fully cured. If, after installation, the GRABBERGARD EFC sealant is damaged or cut, repairs should be made with the same sealant.

GRABBER CONSTRUCTION PRODUCTS
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PRODUCT DATA SHEET
GRABBERGARD EFC

Manufacturer's Recommendations
The manufacturer recommends this product be installed by those trained in proper installation procedures (Approved Installer Card) and be able to read and understand a firestop system design listing (i.e. UL or WHi Listed System Design).

Storage and Handling
Keep product stored in a protected covered area in its original unopened containers. Manufacturer recommends storage temperatures to between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

Product has a shelf life of one(1) year. Stock rotation program is recommended.

Transportation
Recommended transportation temperatures should be between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

First Aid
In case of contact with eyes, flush with water and consult a physician. Skin contact, clean up thoroughly with water or soapy water. Consult a physician if eye or skin irritation develops or is persistent. **SEE MSDS FOR ADDITIONAL INFORMATION.**

Availability
GRABBERGARD EFC caulk is supplied in:

- 10 fl. oz. (300ml) plastic cartridges
- 29 fl. oz. (850ml) cartridges
- 20 fl. oz. (590ml) sausages
- 5 gal. (18.9L) tapered plastic pails

Coverage
Estimated product usage will vary depending on opening size and configuration. Check GRABBERGARD'S estimating charts for coverage.

Warranty
John Wagner & Associates dba Grabber Construction Products will not accept liability for more than product refund. Any claim regarding product defect must be received in writing within 1 year from date of shipment. Grabber makes no other Warranty or Guarantee express or implied, including warranties of fitness for a particular purpose or merchantability. The seller shall assume no other liability for incidental or consequential damages arising out of the sale or use of this product.

Technical Services
For technical information and assistance regarding application information, code requirements and performance specifications:

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Web Site www.grabberman.com

GRABBER CONSTRUCTION PRODUCTS
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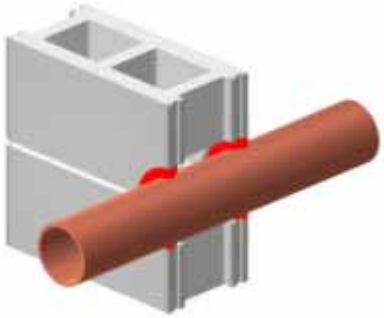
PRODUCT DATA SHEET
GRABBERGARD EFC

Table 1 – Physical and Chemical Properties

As Supplied

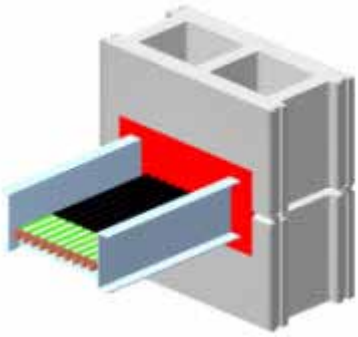
Type of Polymer	Waterborne Resin
Odor	Mild Latex
Solids Content (Wt%)	77±2%
Application Temperatures	45°-90°F(7°-32°C)
Viscosity (ASTM D-2196)	560000-744000cps
Extrudability	Passed
Color - (ASTM C-834)	Rust Red
Specific Gravity - (ASTM D-1475)	1.40-1.50
Dry Time - (ASTM D-1640)	
Dry to touch @ 6mils	20-30 mins
Full Cure Time (depends on thickness & environment)	7-21 days
pH - (ASTM E-70)	8-9



Typical Pipe Penetration

As Cured

In Service Temperature	up to 120°F(49°C)
Moisture Absorption	<4%
Stability [Dimensional, Cracking, Blisters, Flexibility]	Passed
Corrosion - (ASTM C-655) [for Aluminum, Copper, Steel, Galvanized Steel, Stainless Steel]	Passed
Volume Shrinkage - (ASTM C-1241)	Passed
Chemical Compatibility - (ASTM D-543)	Passed
Slump Test - (ASTM D-2202 - Modified)	Passed
Hardness - (ASTM D-2240, Shore A)	22
Freeze/Thaw - (ASTM D-2243)	Excellent
Tensile Properties - (ASTM D-2370)	
Tensile Strength	26 psi
Maximum Elongation	1400%
Corrosion - (ASTM D-5894)	Passed
Surface Burning Characteristics - (ASTM E-84)	
Flame Spread Index	<25
Smoke Developed Index	<50
STC Sound Transmission Loss - (ASTM 90-99)	Full Recovery



Typical Cable Tray Penetration

GRABBER CONSTRUCTION PRODUCTS
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PRODUCT DATA SHEET
GRABBERGARD IFC

Description
GRABBERGARD IFC caulk is a latex-based, intumescent caulk designed to stop the passage of fire, smoke, and fumes through fire-rated separations. GRABBERGARD IFC has been tested in many different 1, 2, 3 and 4 hour rated floor and wall assemblies. It has excellent adhesion qualities with most common construction materials. After fully cured, GRABBERGARD IFC forms a durable, flexible water resistant and paintable seal.

Applications
GRABBERGARD IFC firestop caulk provides an effective firestop seal when used as a single or multiple component system for through-penetrations, construction joints and voids. To make certain installation is correct, consult manufacturer's current listings, as well as, Third Party published Fire Resistance Directories and/or their websites. GRABBERGARD IFC common uses and features are listed below:

Used on: Single and multiple penetrations
Metallic pipes
- Copper, steel, cast iron
- Conduits

Non-metallic pipes
- ABS, CPVC, FRPP, PE, PEX, PVC
- Rigid and ENT conduit

Insulated pipes
- Fiberglass
- AB/PVC

Electrical cables and wires
- Jacket & non-jacketed

Mechanical ducts
Cable trays
Construction joints/gaps
- Top-of-Wall
- Horizontal and vertical joints
- Perimeter floor joints

Voids
Common construction substrate materials:
- Concrete
- Concrete block
- Steel deck
- Wood
- Gypsum wallboard

Features: Red Color
Non-toxic
Safe and easy to use
Easy clean up (Water Only)
Low volatile organic content (VOC)
No asbestos or PCB
Water resistance (when fully cured)
Mildew resistant (when fully cured)
Paintable (with latex based paints)
Excellent application characteristics
- Flows easily
- No slump
- Superior bond and adhesion

Excellent acoustic properties
Seals smoke and gases
High intumescent characteristics
One-component systems

Advantages
Intumescent – When exposed to high temperatures or fire, GRABBERGARD IFC caulk expands in volume to quickly close off voids left by melting or burning construction materials.

Single Component
GRABBERGARD IFC caulk can be installed directly into an opening or joint without mixing or the use of additional materials such as metal collars or wraps. This simplifies installation and minimizes the materials needed at the jobsite.

Versatility
GRABBERGARD IFC caulk adheres easily to dry or damp concrete, wood, metal and other common building material surfaces.

Flexibility
When installed GRABBERGARD IFC caulk, when used in joints, accommodates up to 33 percent joint movement compression/extension. It remains flexible and fully resistant to water after fully cured.

Limitations
Consult the Installation Instructions, Storage and Handling and Transportation Sections. **Exposure to rain, running or standing water; before, the sealant is cured may cause the installed material(s) to wash out.** The curing process occurs naturally through the evaporation of its water content into the atmosphere. Slower cure times may be experienced if the sealant is installed at low temperatures, damp and/or in

high humidity environments. Any materials used in the firestop system for damming, insulation or support that may not allow for the free passage of air could result in longer curing times. The environment in which the compound is being used should be considered when estimating cure times.

Compliance/Approvals
GRABBERGARD IFC caulk has been tested for hundreds of firestop installations and meets or exceeds the requirements of ASTM E 814, ASTM E 119, UL 1479, UL 2079, ULC S115-M95, and CAN/ULC S101. Underwriters Laboratories (UL) and Intertek Testing Service (ITS) NA Ltd (Warnock Hersey) are third party fire endurance testing agencies accredited by ICBO, BOCA and SBCCI (National Evaluation Services) in the United States.

Additional Testing
GRABBERGARD IFC caulk becomes an integral component in a complete building systems of walls, pipe penetrations, HVAC ducts, joints, and the like. For this reason, its physical compatibility to other products used in these complex configurations requires more than the routine firestopping products testing. The results of these additional tests are listed in Table 1, GRABBERGARD IFC Caulk Physical and Chemical Properties.

GRABBERGARD IFC Caulk has proven that it has all the physical characteristics desired in a firestopping product. Once installed and fully cured, it has excellent stability, even after four weeks at freezing temperatures of -15 F (-26 C) and exposure to extreme temperatures of 300 F(149 C) for 24 hours. Dimensional changes were well within the accepted standards (<2% per ASTM C-356). Dynamic testing has demonstrated GRABBERGARD IFC caulk's highly elastic properties.

When tested in simulated fire conditions, this intumescent caulk expanded uniformly, to at least eight times its original volume, without causing failure to other components. When tested per ASTM E-84, the flame spread index was less than 25 and smoke development index was less than 50.

Corrosion and microbial growth were tested using procedures outlined in ASTM C-665. GRABBERGARD IFC caulk does not promote the corrosion of steel, copper, or aluminum, but may cause discoloration on galvanized metal surfaces. Also, GRABBERGARD IFC caulk does not support mold growth.

The use of GRABBERGARD IFC caulk will restore the acoustical performance level (STC rating) to firewall systems used in standard building construction when tested according to ASTM E-90-99.

Installation Instructions
GRABBERGARD IFC must be installed in compliance with a listed system design published by a third party testing agency (UL, ITS). Refer to their respective published Fire Resistance Directory or their web site.

Prep-work
To install properly, remove excessive dust, dirt, debris, grease, oil and standing water.

Application
Apply caulking material with standard cartridge or bulk-loading application guns or trowel in place with standard toweling tools. Install the required amount of caulking material into the opening using sufficient pressure to ensure it is in contact with all surfaces, substrates and/or penetrating items. The manufacturer recommends tooling the surface with a moist putty knife or similar tooling utensil. Tooling the caulking material will create a stronger bond and a smooth finish especially on irregular or porous surfaces. Do not apply GRABBERGARD IFC to mineral wool that is or was wet from exposure to water, standing water, rain or snow.
Caution: Mineral wool may cause eye, skin or respiratory tract irritation. Avoid contact with eyes, skin of clothing. Recommend using gloves and goggles. Refer to mineral wool manufacturer's Material Safety Data Sheets.

Installation Temperature
For best results, installation temperatures should be between 45°-90°F(7°-32°C).

Maintenance
No special maintenance is required after the GRABBERGARD IFC sealant is installed and fully cured. If, after installation, the GRABBERGARD IFC sealant is damaged or cut, repairs should be made with the same sealant.

GRABBER CONSTRUCTION PRODUCTS
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PRODUCT DATA SHEET
GRABBERGARD IFC

Manufacturer's Recommendations

The manufacturer recommends this product be installed by those trained in proper installation procedures (Approved Installer Card) and be able to read and understand a firestop system design listing (i.e. UL or WHi Listed System Design).

Storage and Handling

Keep product stored in a protected covered area in its original unopened containers. Manufacturer recommends storage temperatures to between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

Product has a shelf life of one(1) year. Stock rotation program is recommended.

Transportation

Recommended transportation temperatures should be between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

First Aid

In case of contact with eyes, flush with water and consult a physician. Skin contact, clean up thoroughly with water or soapy water. Consult a physician if eye or skin irritation develops or is persistent. **SEE MSDS FOR ADDITIONAL INFORMATION.**

Availability

GRABBERGARD IFC caulk is supplied in:

- 10 fl. oz. (300ml) plastic cartridges
- 29 fl. oz. (850ml) cartridges
- 20 fl. oz. (590ml) sausages
- 5 gal. (18.9L) tapered plastic pails

Coverage

Estimated product usage will vary depending on opening size and configuration. Check GRABBERGARD'S estimating charts for coverage.

Warranty

John Wagner & Associates dba Grabber Construction Products will not accept liability for more than product refund. Any claim regarding product defect must be received in writing within 1 year from date of shipment. Grabber makes no other Warranty or Guarantee express or implied, including warranties of fitness for a particular purpose or merchantability. The seller shall assume no other liability for incidental or consequential damages arising out of the sale or use of this product.

Technical Services

For technical information and assistance regarding application information, code requirements and performance specifications:

Toll Free 1-866-237-GRAB(4722)
Web Site www.grabberman.com

GRABBER CONSTRUCTION PRODUCTS
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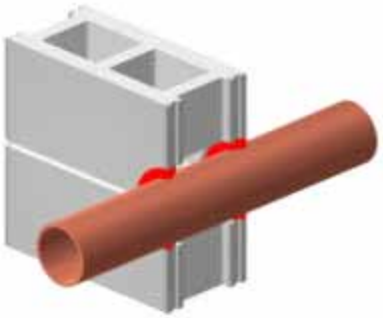
PRODUCT DATA SHEET
GRABBERGARD IFC

Table 1 – Physical and Chemical Properties

As Supplied

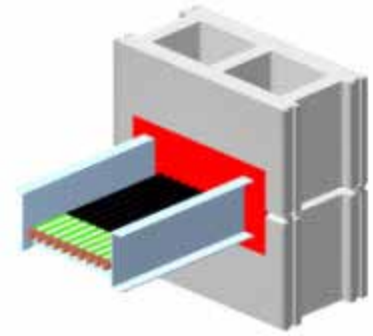
Type of Polymer	Acrylic Emulsion
Odor	Mild Latex
Solids Content (Wt%)	82%
Application Temperatures	45°-90°F(7°-32°C)
Viscosity (ASTM D-2196)	640000-960000cps
Extrudability	Passed
Color - (ASTM C-834)	Rust Red
Specific Gravity - (ASTM D-1475)	1.40-1.50
Dry Time - (ASTM D-1640)	
Dry to touch @ 6mils	20 mins
Full Cure Time (depends on thickness & environment)	7-21 days
pH - (ASTM E-70)	8-9



Typical Pipe Penetration

As Cured

In Service Temperature	up to 120°F(49°C)
Moisture Absorption	<4%
Stability [Dimensional, Cracking, Blisters, Flexibility]	Passed
Corrosion - (ASTM C-655) [for Aluminum, Copper, Steel, Galvanized Steel, Stainless Steel]	Passed
Volume Shrinkage - (ASTM C-1241)	<20%
Chemical Compatibility - (ASTM D-543)	Passed
Slump Test - (ASTM D-2202 - Modified)	Passed
Hardness - (ASTM D-2240, Shore A)	26
Freeze/Thaw - (ASTM D-2243)	Excellent
Tensile Properties - (ASTM D-2370)	
Tensile Strength	41.8 psi
Maximum Elongation	667%
Corrosion - (ASTM D-5894)	Passed
Surface Burning Characteristics - (ASTM E-84)	
Flame Spread Index	<25
Smoke Developed Index	<50
STC Sound Transmission Loss - (ASTM 90-99)	Full Recovery



Typical Cable Tray Penetration

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

PRODUCT DATA SHEET
GRABBERGARD EFS

Description

GRABBERGARD EFS is a sprayable elastomeric latex-based firestop mastic coating. This high solids compound is designed to stop the passage of fires, smoke and fumes through fire rated assemblies. GRABBERGARD EFS spray or brush-applied coating has been formulated to adhere to all common construction materials. It has been tested in rated assemblies to provide firestopping protection from 1 to 4 hours. After it has fully cured, GRABBERGARD EFS elastomeric coating remains flexible to accommodate normal building movement.

Applications

GRABBERGARD EFS spray material provides an effective firestop for joints and gaps at the intersection of similar or dissimilar rated assemblies. (i.e. top of wall; floor to floor; floor to wall; wall to wall; floor/ceiling steel deck; assembly to gypsum wallboard and concrete walls). GRABBERGARD EFS is also used on pipes, cables, conduit and cable tray installations through floors and walls. It has an installation advantage over caulk material when the service penetrations are in larger openings. For these applications GRABBERGARD EFS can be applied using a brush or conventional airless spray equipment. To make certain installation is correct, consult manufacturer's current listings, as well as, Third Party published Fire Resistance Directories and/or their websites. GRABBERGARD EFS common uses and features are listed below:

Used on: Single and multiple penetrations
Metallic pipes
- Copper, steel, cast iron
- Conduits

Electrical cables and wires
- Jacket & non-jacketed

Cable trays
Construction joints/gaps
- Top-of-Wall
- Horizontal and vertical joints
- Curtain wall safing joints
- Perimeter floor joints
- Control joints
- Floor to floor joints
- Wall to wall joints

Voids

Features: Red Color
Non-toxic
Safe and easy to use
Easy clean up (Water Only)
Low volatile organic content (VOC)
No asbestos or PCB
Water resistance (when fully cured)
Mildew resistant (when fully cured)
Paintable (with latex based paints)
Easy and safe to apply
Adheres to dry or damp surfaces
Adheres to common construction substrate materials:
- Concrete
- Concrete block
- Steel deck
- Wood
- Gypsum wallboard

Up to 33% joint movement compression/extension
Remains flexible after fully cured

Advantages

Endothermic – When exposed to high temperatures or fire, GRABBERGARD EFS absorbs the heat and provides a fire barrier.

System Design

Whether for small or large joints, GRABBERGARD EFS spray is designed to be part of a multiple component system used with mineral wool and other damming materials. All these materials used in conjunction with one another maximize the firestopping characteristics.

Versatility

When applied properly, GRABBERGARD EFS will adhere to most common building materials. GRABBERGARD EFS bonds with dry or damp concrete as well as drywall, metals and wood. After GRABBERGARD EFS has fully cured it provides a strong bond, will not readily pull away and accommodates compressive and extension movement up to 33 per cent. GRABBERGARD EFS can be painted with a latex paint after it has completely cured.

Flexibility

When installed GRABBERGARD EFS caulk, when used in joints, accommodates up to 33 percent joint movement compression/extension. It remains flexible and fully resistant to water after curing.

PRODUCT DATA SHEET
GRABBERGARD EFS

Limitations

Consult the Installation Instructions, Storage and Handling and Transportation Sections. **Exposure to rain, running or standing water; before, the sealant is cured may cause the installed material(s) to wash out.** The curing process occurs naturally through the evaporation of its water content into the atmosphere. Slower cure times may be experienced if the sealant is installed at low temperatures, damp and/or in high humidity environments. Any materials used in the firestop system for damming, insulation or support that may not allow for the free passage of air could result in longer curing times. The environment in which the compound is being used should be considered when estimating cure times. **This product is not designed to be a waterproof seal and should not be installed where there will be constant wet conditions or immersed in water continuously.**

Compliance/Approvals

GRABBERGARD EFS has been installed in many system designs and Third Party tested to meet or exceed the requirements of ASTM E 814, ASTM E 119, ASTM E 1399,UL 1479, UL 2079, ULC S 115-M95, ULC S 101, ASTM E 84. Construction joints recently tested in conformance with "Perimeter Fire Containment Systems" (assimilation of NFPA 285, ANS/UL 2079). Underwriters Laboratories (UL) and Intertek Testing Service (ITS) NA Ltd (Warnock Hersey) are third party fire endurance-testing agency accredited by ICBO, BOCA and SBCCI (NES) in the United States.

Additional Testing

GRABBERGARD EFS spray material becomes an integral component in a complete building system of walls, floors and ceilings. Its physical and chemical compatibility with other materials used in these complex configurations requires more than just the necessary firestop tests. The results of additional and extensive tests are listed in Table 1. GRABBERGARD EFS – Physical and Chemical Properties.

GRABBERGARD EFS spray has been tested and meets the classifications for less than 25 flame spread index and less than 50 smoke development index (NFPA Class "A", Building Code Class "1").

GRABBERGARD EFS has been tested for chemical compatibility with all types of metal and plastic pipes and plastic or nylon coated wires that are listed in the system designs.

Installation Instructions

GRABBERGARD EFS must be installed in compliance with a listed system design published by a third party testing agency (UL, ITS). Refer to their respective published Fire Resistance Directory or their web site.

Prep-work

To install properly, remove excessive dust, dirt, rust, debris, grease, oil and standing water. Atmospheric temperatures should be considered. If the product is colder than the recommended temperatures, warming before attempting to spray should be considered. In cold temperatures the building should be sealed or heat protected. The spray equipment should be clean of material from previous applications. GRABBERGARD EFS can also be applied with a brush.

Application

Insulation and backing materials should be installed in accordance with a published system design (i.e. type, density, compression and orientation). When spraying GRABBERGARD EFS use airless spray equipment that has min 3000psi capabilities and reversible spray tips. (Consult the manufacturer for more information on equipment setup, hose, spray guns, tips, etc.) To achieve a dry thickness of 60-mil (1/16 in.) GRABBERGARD EFS should be applied at 80-mil (1/12 in.). All research testing was performed using a Spray Tech EP2510 airless sprayer with: 50 feet of 3/8 in. hose, Graco Flex Plus spray gun, tip sizes from 0.019 to 0.031, fan with from 4 in. to 12 in. Do not apply GRABBERGARD EFS to mineral wool that is or was wet from exposure to water, standing water, rain or snow.

Caution: Mineral wool may cause eye, skin or respiratory tract irritation. Avoid contact with eyes, skin of clothing. Recommend using gloves and goggles. Refer to mineral wool manufacturer's Material Safety Data Sheets.

Installation Temperature

For best results, installation temperatures should be between 43°-90°F(6°-32°C).

PRODUCT DATA SHEET
GRABBERGARD EFS

Maintenance
No special maintenance is required after the GRABBERGARD EFS sealant is installed and fully cured. If, after installation, the GRABBERGARD EFS sealant is damaged or cut, repairs should be made with the same sealant. GRABBERGARD EFS will form a full chemical bond and adhere to itself.

Manufacturer's Recommendations
The manufacturer recommends this product be installed by those trained in proper installation procedures (Approved Installer Card) and be able to read and understand a firestop system design listing (i.e. UL or WHI Listed System Design).

Storage and Handling
Keep product stored in a protected covered area in its original unopened containers. Manufacturer recommends storage temperatures to between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

Product may become damaged and unusable if exposed to extreme freezing conditions.

Do not dilute with water.

No mixing or stirring of the product is required.

Product has a shelf life of one(1) year. Stock rotation program is recommended.

Transportation
Product should be transported in a protection-equipped carrier when very low or high atmospheric temperatures will be experienced.

Recommended transportation temperatures should be between 40°-90°F(4°-32°C).

DO NOT ALLOW TO FREEZE

First Aid
In case of contact with eyes, flush with water and consult a physician. Skin contact, clean up thoroughly with water or soapy water. Consult a physician if eye or skin irritation develops or is persistent. **SEE MSDS FOR ADDITIONAL INFORMATION.**

Availability
GRABBERGARD EFS spray is supplied in:

- 5 gallon (18.9L) tapered plastic pails

Coverage
Estimated product usage will vary depending on opening size and configuration. Check GRABBERGARD'S estimating charts for coverage.

Warranty
John Wagner & Associates dba Grabber Construction Products will not accept liability for more than product refund. Any claim regarding product defect must be received in writing within 1 year from date of shipment. Grabber makes no other Warranty or Guarantee express or implied, including warranties of fitness for a particular purpose or merchantability. The seller shall assume no other liability for incidental or consequential damages arising out of the sale or use of this product.

Technical Services
For technical information and assistance regarding application information, code requirements and performance specifications:

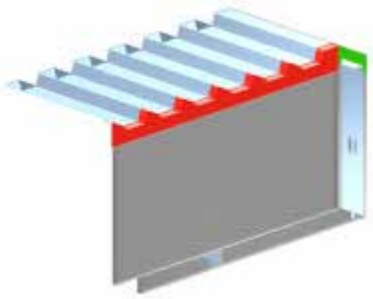
Toll Free 1-866-237-GRAB(4722)
Web Site www.grabberman.com

PRODUCT DATA SHEET
GRABBERGARD EFS

Table 1 – Physical and Chemical Properties

As Supplied

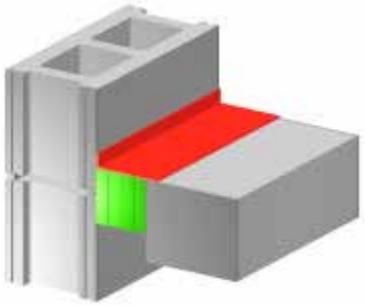
Type of Polymer	Waterborne Resin
Odor	Mild Latex
Solids Content (Wt%)	68±5%
Application Temperatures	43°-90°F(6°-32°C)
Viscosity (ASTM D-2196)	50000-60000cps
Color - (ASTM C-834)	Red
Specific Gravity - (ASTM D-1475)	1.15-1.35
Dry Time - (ASTM D-1640)	
Dry to touch @ 6mils	20-30 mins
Full Cure Time (depends on thickness & environment)	7-14 days
pH - (ASTM E-70)	8-9



Typical Head of Wall Joint

As Cured

In Service Temperature	up to 120°F(49°C)
Volume Shrinkage - (ASTM C-1241)	Passed
Freeze/Thaw - (ASTM D-2243)	Excellent
Tensile Properties - (ASTM D-2370)	
Tensile Strength	28 psi
Maximum Elongation	1000%
Sag Resistance - (ASTM D-4410)	Passed
Surface Burning Characteristics - (ASTM E-84)	
Flame Spread Index	<25
Smoke Developed Index	<50
Joint Movement - (ASTM E-1399) (compression/extension)	Passed
Sprayability	
Fan Pattern	Excellent
Volume Output	Excellent



Typical Floor to Wall Joint

MATERIAL SAFETY DATA SHEET

Product Identifier	**GrabberGuard EFC**
Product Use	Fire and Smoke Stop Caulk and Sealant
Manufacturer	Passive Fire Protection Partners, 1412 Derwent Way, Delta, BC V3M 6H9
Emergency Number	(800) 810 - 1788

INGREDIENT INFORMATION

Ingredient	CAS Number	% (wt.)	LC_{50} (rat)	LD_{50} (rat)	TLV	STEL
Calcium Carbonate	1317-65-3	< 50	N/A	N/A	N/A	N/E
Vinyl Acetate Polymers	Not disclosed	< 40	N/A	N/A	N/A	N/A
Water	7732-18-5	< 25	N/A	N/A	N/E	N/E
Auxiliary Chemicals	N/A	< 5	N/A	20–34 g/Kg	50 ppm	N/A
Color Pigment	1309-37-1	< 1	N/A	N/A	N/A	N/A
Vinyl Acetate Monomer	108-05-4	< 0.2	11400 mg/m^3/4H	2900 mg/Kg	10 ppm	N/A

PHYSICAL PROPERTIES

Appearance / Physical State	Red, viscous compound	**Specific Gravity (@25°C)**	1.40 – 1.50
Odour	Mild odour	**Evaporation Rate**	< 1
Odour Threshold	Slightly aromatic odour	**Boiling Point (°C)**	> 100
Vapour Pressure (mm Hg)	18.51880	**Freezing Point (°C)**	0
Vapour Density (Air = 1)	of Water vapor	**pH**	8.0 – 9.0
Coefficient of H_2O/Oil Distrib	Not determined	**VOC contents (g/L)**	53.9

FIRE AND EXPLOSION DATA

Flammability	No
Means of Extinction	Normal fire fighting procedures should be followed to avoid inhalation of smokes and gases.
Special Fire-fighting Procedures	Firefighters should wear the usual protective gear use self-contained breathing apparatus.
Auto-ignition Temperature (°C)	N/A
Flash Point (°C) / Method	N/A
Upper Flammable Limit (%, Volume)	N/A
Lower Flammable Limit (%, Volume)	N/A
Sensitivity to Mechanical Impact	No
Sensitivity to Static Discharge	No
Hazardous Combustion Products	Carbon Monoxide, Carbon Dioxide, aliphatic hydrocarbons and hydrocarbon oxidation products

REACTIVITY DATA

Stability	Stable at normal condition
Condition of Reactivity	Contact with incompatible substances
Incompatible Materials	Reacts with mineral acids and alkalis
Hazardous Decomposition Products	Dried films forced to burn will produce: Carbon Monoxide, Carbon Dioxide, and hydrocarbon oxidation products.

TOXICOLOGICAL PROPERTIES

Routes of Exposure	☒ Skin contact ☒ Skin absorption ☒ Eye contact ☒ Inhalation ☒ Ingestion
Effects of Acute Exposure to Product	Skin and eye irritation may occur after contact with the product.
Effects of Chronic Exposure to Product	None known
Exposure Limits	10 ppm for vinyl acetate monomer (ACGIH)
Irritancy of Product	Slight on skin and eyes
Sensitization of Product	None known
Carcinogenicity	OSHA, NTP, and ACGIH have not classified this product as a carcinogen. However, Vinyl Acetate is identified by IARC as a potential carcinogen on testing on laboratory animals. But there is no evidence that it has caused cancer in human.
Teratogenicity	None known
Reproductive Toxicity	None known

FIRST AID MEASURES

Eye Contact	Flush with large quantities of water gently for 15 minutes and get medical attention.
Skin Contact	Wash with soap and water.
Inhalation	Remove affected person away from source of exposure to fresh air and get medical attention IMMEDIATELY
Ingestion	Get medical attention IMMEDIATELY.

PREVENTIVE MEASURES

Engineering Controls	Standard industrial ventilation is recommended.
Personal Protective Equipment	Chemical safety glasses and gloves were required during normal use and handling.
Eye Protection (Specify)	Face shield or chemical goggles were recommended.
Skin Protection (Specify)	Chemical resistant nitrile, neoprene or rubber gloves were recommended if contact to the product directly.
Respiratory (Specify)	Respiratory protection is not normally required. Use NIOSH/MSHA approved respirator if condition warrant.
Other	

PRECAUTION FOR SAFE HANDLING AND USE

Handling Procedure and Equipment	N/A
Storage Requirement	Material should be kept in a closed canteens and stored between 4 – 32°C (40 –90°F)
Spill, Leak or Releases	Wear protective equipment during cleanup.
Waste Disposal	Care should be taken to ensure that the material or it's containers and disposed of in an approved facility, state, provincial and local regulations.
Special Shipping Instructions	DO NOT FREEZE

REGULATION INFORMATION

WHMIS	Not controlled
HMIS	Health 1, Flammability 0, Reactivity 0
TDG Regulation	Not classified as a hazardous material.
TSCA	All ingredients of this product are on the inventory list.
DSL	All ingredients of this product are on the list.

PREPARATION INFORMATION

Prepared by	Chemical Laboratory, Passive Fire Protection Partners
Preparation Date	11 March 2003
Telephone	(604) 515-1788
Reason for Revision	New updating, rev 002, April27, 2007 Logo updating, rev 003, June 18, 2007 Spelling mistake on Section of Preventive Measures, rev 004, April 9, 2008 Formulation updating, rev 005, January 16, 2009
Revision Date	January 16, 2009
Abbreviations Used	**% (wt.)** = Weight Percentage **ACGIH** = American Conference of Governmental Industrial Hygienists **CAS Number** = Chemical Abstracts Series Number **DSL** = Domestic Substance List in Canada **H** = Hours **HMIS** = Hazardous Material Identification System **IARC** = International Agency for Research on Cancer **LC_{50}** = Lethal Concentration, 50% **LD_{50}** = Lethal Dose, 50% **MSHA** = Mine Safety and Health Administration **N/A** = Not Applicable or Not Available **N/E** = None Established **NIOSH** = The National Institute for Occupational Safety and Health **NTG** = National Toxicology Program **OSHA** = The Occupational Safety and Administration **STEL** = Short Term Exposure Limit **TDG** = Transportation of Dangerous Goods **TLV** = Threshold Limit Value **TSCA** = Toxic Substance Control Act in US **VOC** = Volatile Organic Compounds **WHMIS** = Workplace Hazardous Material Identification System

MATERIAL SAFETY DATA SHEET

Product Identifier **GrabberGuard IFC**
Product Use Fire and Smoke Stop Intuemescent Caulk
Manufacturer Passive Fire Protection Partners, 1412 Derwent Way, Delta, BC V3M 6H9
Emergency Number (800) 810 - 1788

INGREDIENT INFORMATION

Ingredient	CAS Number	% (wt.)	LC_{50} (rat)	LD_{50} (rat)	TLV	STEL
Calcium Carbonate	1317-65-3	< 50	N/A	N/A	N/A	N/E
Acrylic Polymer	None known	< 45	N/A	N/A	N/A	N/A
Water	7732-18-5	< 25	N/A	N/A	N/E	N/E
Graphite	7782-42-5	< 10	N/A	N/A	2.0 mg/M^3	N/A
1,2-Propylene Glycol	57-55-6	< 2	N/A	20–34 g/Kg	50 ppm	N/A
Color Pigment	1309-37-1	< 1	N/A	N/A	N/A	N/A
Polyethylene Glycol	25322-68-3	< 0.5	N/A	N/A	N/A	N/E
P(EA/MAA)	25212-88-8	< 0.5	N/A	N/A	N/A	N/A

PHYSICAL PROPERTIES

Appearance / Physical State	Rust Red, viscous compound	**Specific Gravity (@25°C)**	1.40 – 1.50
Odour	Mild odour	**Evaporation Rate**	< 1
Odour Threshold	Slightly aromatic odour	**Boiling Point (°C)**	> 100
Vapour Pressure (mm Hg)	N/A	**Freezing Point (°C)**	0
Vapour Density (Air = 1)	of Water vapor	**pH**	8.0 – 9.0
Coefficient of H_2O/Oil Distrib	Not determined	**VOC contents (g/L)**	37.1

FIRE AND EXPLOSION DATA

Flammability	No
Means of Extinction	Normal fire fighting procedures should be followed to avoid inhalation of smokes and gases.
Special Fire-fighting Procedures	Firefighters should wear the usual protective gear use self-contained breathing apparatus.
Auto-ignition Temperature (°C)	N/A
Flash Point (°C) / Method	N/A
Upper Flammable Limit (%, Volume)	N/A
Lower Flammable Limit (%, Volume)	N/A
Sensitivity to Mechanical Impact	No
Sensitivity to Static Discharge	No
Hazardous Combustion Products	Carbon Monoxide, Carbon Dioxide, aliphatic hydrocarbons and hydrocarbon oxidation products

REACTIVITY DATA

Stability	Stable at normal condition
Condition of Reactivity	Contact with incompatible substances
Incompatible Materials	Reacts with mineral acids and alkalis
Hazardous Decomposition Products	Dried films forced to burn will produce: Carbon Monoxide, Carbon Dioxide, aliphatic hydrocarbons and hydrocarbon oxidation products.

TOXICOLOGICAL PROPERTIES

Routes of Exposure	☒ Skin contact ☒ Skin absorption ☒ Eye contact ☒ Inhalation ☒ Ingestion
Effects of Acute Exposure to Product	Skin and eye irritation may occur after contact with the product.
Effects of Chronic Exposure to Product	None known
Exposure Limits	None known
Irritancy of Product	Slight on skin and eyes
Sensitization of Product	None known
Carcinogenicity	None known
Teratogenicity	None known
Reproductive Toxicity	None known

FIRST AID MEASURES

Eye Contact	Flush with large quantities of water gently for 15 minutes and get medical attention.
Skin Contact	Wash with soap and water.
Inhalation	Remove affected person away from source of exposure to fresh air and get medical attention IMMEDIATELY
Ingestion	Get medical attention IMMEDIATELY.

PREVENTIVE MEASURES

Engineering Controls	Standard industrial ventilation is recommended.
Personal Protective Equipment	Chemical safety glasses and gloves were required during normal use and handling.
Eye Protection (Specify)	Face shield or chemical goggles were recommended.
Skin Protection (Specify)	Chemical resistant nitrile, neoprene or rubber gloves were recommended if contact to the product directly.
Respiratory (Specify)	Respiratory protection is not normally required. Use NIOSH/MSHA approved respirator if condition warrant.
Other	

PRECAUTION FOR SAFE HANDLING AND USE

Handling Procedure and Equipment	N/A
Storage Requirement	Material should be kept in a closed canteens and stored between 4 – 32°C (40 –90°F)
Spill, Leak or Releases	Wear protective equipment during cleanup.
Waste Disposal	Care should be taken to ensure that the material or it's containers and disposed of in an approved facility, state, provincial and local regulations.
Special Shipping Instructions	DO NOT FREEZE

REGULATION INFORMATION

WHMIS	Not controlled
HMIS	Health 1, Flammability 0, Reactivity 0
TDG Regulation	Not classified as a hazardous material.
TSCA	All ingredients of this product are on the inventory list.
DSL	All ingredients of this product are on the list.

PREPARATION INFORMATION

Prepared by	Chemical Laboratory, Passive Fire Protection Partners
Preparation Date	11 March 2003
Telephone	(604) 515-1788
Reason for Revision	New updating, rev 002, April 27, 2007 Logo updating, rev 003, June 18, 2007 Spelling mistake on Section of Preventive Measures, rev 004, April 9, 2008 Formulation updating, rev 005, January 16, 2009
Revision Date	January 16, 2009
Abbreviations Used	**% (wt.)** = Weight Percentage **CAS Number** = Chemical Abstracts Series Number **DSL** = Domestic Substance List in Canada **H** = Hours **HMIS** = Hazardous Material Identification System **LC_{50} =** Lethal Concentration, 50% **LD_{50} =** Lethal Dose, 50% **MSHA** = Mine Safety and Health Administration **N/A** = Not Applicable or Not Available **N/E** = None Established **NIOSH** = The National Institute for Occupational Safety and Health **STEL** = Short Term Exposure Limit **TDG** = Transportation of Dangerous Goods **TLV** = Threshold Limit Value **TSCA** = Toxic Substance Control Act in US **VOC** = Volatile Organic Compounds **WHMIS** = Workplace Hazardous Material Identification System

MATERIAL SAFETY DATA SHEET

Product Identifier **GrabberGuard EFS**
Product Use Fire and Smoke Stop Caulk and Sealant
Manufacturer Passive Fire Protection Partners, 1412 Derwent Way, Delta, BC V3M 6H9
Emergency Number (800) 810 - 1788

INGREDIENT INFORMATION

Ingredient	CAS Number	% (wt.)	LC_{50} (rat)	LD_{50} (rat)	TLV	STEL
Calcium Carbonate	1317-65-3	< 45	N/A	N/Av	N/A	N/E
Water	7732-18-5	< 35	N/A	N/A	N/E	N/E
Vinyl Acetate Polymers	Not disclosed	< 30	N/A	N/A	N/A	N/A
Modified Acrylic Polymer	Proprietary	< 10	N/A	N/A	N/A	N/E
Additives	N/A	< 5	N/A	20–34 g/Kg	50 ppm	N/A
Color Pigment	1309-37-1	< 1	N/A	N/A	N/A	N/A
Vinyl Acetate Monomer	108-05-4	< 0.2	11400 mg/m^3/4H	2900 mg/Kg	10 ppm	N/A
Ammonia	7664-41-7	< 50 ppm	2000 ppm/4H	N/A	25 ppm	N/A

PHYSICAL PROPERTIES

Appearance / Physical State	Red, viscous compound	**Specific Gravity (@25°C)**	1.15 – 1.35
Odour	Mild odour	**Evaporation Rate**	< 1
Odour Threshold	Slightly aromatic odour	**Boiling Point (°C)**	> 100
Vapour Pressure (mm Hg)	18.51880	**Freezing Point (°C)**	0
Vapour Density (Air = 1)	of Water vapor	**pH**	8.0 – 9.0
Coefficient of H_2O/Oil Distrib	Not determined	**VOC contents (g/L)**	81.3

FIRE AND EXPLOSION DATA

Flammability	No
Means of Extinction	Normal fire fighting procedures should be followed to avoid inhalation of smokes and gases.
Special Fire-fighting Procedures	Firefighters should wear the usual protective gear use self-contained breathing apparatus.
Auto-ignition Temperature (°C)	N/A
Flash Point (°C) / Method	N/A
Upper Flammable Limit (%, Volume)	N/A
Lower Flammable Limit (%, Volume)	N/A
Sensitivity to Mechanical Impact	No
Sensitivity to Static Discharge	No
Hazardous Combustion Products	Carbon Monoxide, Carbon Dioxide, aliphatic hydrocarbons and hydrocarbon oxidation products

REACTIVITY DATA

Stability	Stable at normal condition
Condition of Reactivity	Contact with incompatible substances
Incompatible Materials	Reacts with mineral acids and alkalis
Hazardous Decomposition Products	Dried films forced to burn will produce: Carbon Monoxide, Carbon Dioxide, and hydrocarbon oxidation products.

TOXICOLOGICAL PROPERTIES

Routes of Exposure	☒ Skin contact ☒ Skin absorption ☒ Eye contact ☒ Inhalation ☒ Ingestion
Effects of Acute Exposure to Product	Skin and eye irritation may occur after contact with the product.
Effects of Chronic Exposure to Product	None known
Exposure Limits	10 ppm for vinyl acetate monomer (ACGIH)
Irritancy of Product	Slight on skin and eyes
Sensitization of Product	None known
Carcinogenicity	OSHA, NTP, and ACGIH have not classified this product as a carcinogen. However, Vinyl Acetate is identified by IARC as a potential carcinogen on testing on laboratory animals. But there is no evidence that it has caused cancer in human.
Teratogenicity	None known
Reproductive Toxicity	None known

FIRST AID MEASURES

Eye Contact	Flush with large quantities of water gently for 15 minutes and get medical attention.
Skin Contact	Wash with soap and water**.**
Inhalation	Remove affected person away from source of exposure to fresh air and get medical attention IMMEDIATELY
Ingestion	Get medical attention IMMEDIATELY**.**

PREVENTIVE MEASURES

Engineering Controls	Standard industrial ventilation is recommended.
Personal Protective Equipment	Chemical safety glasses and gloves were required during normal use and handling.
Eye Protection (Specify)	Face shield or chemical goggles were recommended.
Skin Protection (Specify)	Chemical resistant nitrile, neoprene or rubber gloves were recommended if contact to the product directly.
Respiratory (Specify)	Respiratory protection is not normally required. Use NIOSH/MSHA approved respirator if condition warrant.
Other	

PRECAUTION FOR SAFE HANDLING AND USE

Handling Procedure and Equipment	N/A
Storage Requirement	Material should be kept in a closed canteens and stored between 4 – 32°C (40 –90°F)
Spill, Leak or Releases	Wear protective equipment during cleanup.
Waste Disposal	Care should be taken to ensure that the material or it's containers and disposed of in an approved facility, state, provincial and local regulations.
Special Shipping Instructions	DO NOT FREEZE

REGULATION INFORMATION

WHMIS	Not controlled
HMIS	Health 1, Flammability 0, Reactivity 0
TDG Regulation	Not classified as a hazardous material.
TSCA	All ingredients of this product are on the inventory list.
DSL	All ingredients of this product are on the list.

PREPARATION INFORMATION

Prepared by	Chemical Laboratory, Passive Fire Protection Partners
Preparation Date	11 March 2003
Telephone	(604) 515-1788
Reason for Revision	Color was changed to RED, rev 002,May 24, 2005. New updating, rev 003, April 27, 2007 Logo updating, rev 004, June 18, 2007 Spelling mistake on Section of Preventive Measures, rev 005, April 9, 2008 Formulation updating, rev 006, January 16, 2009
Revision Date	January 16, 2009
Abbreviations Used	**% (wt.) =** Weight Percentage **ACGIH** = American Conference of Governmental Industrial Hygienists **CAS Number** = Chemical Abstracts Series Number **DSL** = Domestic Substance List in Canada **H** = Hours **HMIS** = Hazardous Material Identification System **IARC =** International Agency for Research on Cancer **LC_{50} =** Lethal Concentration, 50% **LD_{50} =** Lethal Dose, 50% **MSHA** = Mine Safety and Health Administration **N/A** = Not Applicable or Not Available **N/E** = None Established **NIOSH** = The National Institute for Occupational Safety and Health **NTG** = National Toxicology Program **OSHA** = The Occupational Safety and Administration **STEL** = Short Term Exposure Limit **TDG** = Transportation of Dangerous Goods **TLV** = Threshold Limit Value **TSCA** = Toxic Substance Control Act in US **VOC** = Volatile Organic Compounds **WHMIS** = Workplace Hazardous Material Identification System

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

UL Listing Index
Concrete Construction

Concrete		Penetrants								GrabberGard Products			
		No Penetrants	Metallic Pipe/Conduit	Non-Metallic Pipe	Electrical Cables	Cable Trays	Insulated Pipe	Mechanical Ducts	Multiple Items	IFC	EFC	EFS	Hourly Rating
Floors & Walls	C-AJ-0103	■								✓		✓	2
	C-AJ-0108	■									✓		2
	C-AJ-1494		■							✓		✓	3
	C-AJ-1495		■							✓		✓	3
	C-AJ-1499		■								✓		3
	C-AJ-1500		■								✓		3
	C-AJ-1596		■							✓	✓	✓	2
	C-AJ-2465			■						✓			2
	C-AJ-2470			■							✓		2
	C-AJ-2571			■									2 & 3
	C-AJ-2619			■						✓	✓		2 & 3
	C-AJ-2620			■						✓			2
	C-AJ-3230				■					✓			3
	C-AJ-3233				■						✓		3
	C-AJ-3302				■					✓	✓	✓	3
	C-AJ-5261						■			✓			2
	C-AJ-5262						■			✓			2
	C-AJ-5266						■				✓		2
	C-AJ-5267						■				✓		2
	C-AJ-5326						■			✓			2
	C-AJ-8142								■	✓			2
	C-AJ-8145								■		✓		2
Floors	F-A-1058		■							✓			2
	F-A-1060		■								✓		2
	F-A-2121			■						✓			2
	F-A-2126			■							✓		2
	F-A-7013							■		✓			2
	F-A-7014							■		✓			2
	F-A-7015							■			✓		2
	F-A-7016							■			✓		2
Walls	W-J-1153		■							✓			1, 2, 3 & 4
	W-J-1157		■								✓		1, 2, 3 & 4
	W-J-2149			■						✓			1, 2, 3 & 4
	W-J-2153			■							✓		1, 2, 3 & 4
	W-J-3121				■					✓			2
	W-J-3123				■						✓		2
	W-J-4046					■				✓		✓	2
	W-J-4047					■					✓		2
	W-J-7064							■		✓			2
	W-J-7065							■		✓			2

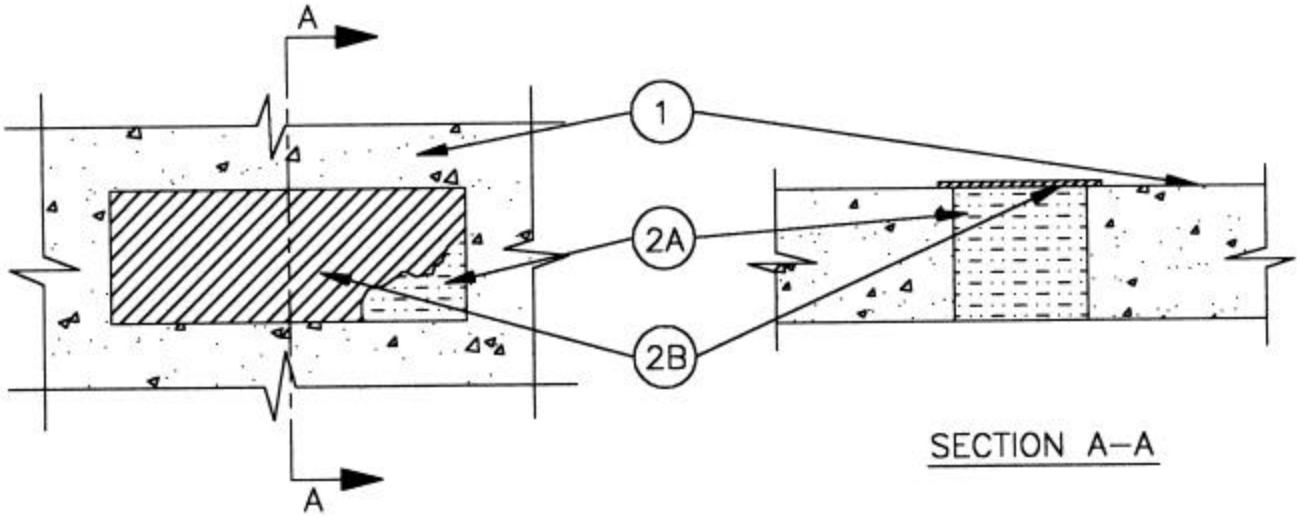
GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

UL Listing Index
Framed Construction

Framed Construction		Penetrants								GrabberGard Products			
		No Penetrants	Metallic Pipe/Conduit	Non-Metallic Pipe	Electrical Cables	Cable Trays	Insulated Pipe	Mechanical Ducts	Multiple Items	IFC	EFC	EFS	Hourly Rating
Floors	F-C-1119		■							✓			1
	F-C-1120		■							✓			2
	F-C-2283			■						✓			1
	F-C-2287			■							✓		1
	F-C-3079				■					✓			1
	F-C-3080				■						✓		1
Walls	W-L-1338		■							✓			1, 2, 3 & 4
	W-L-1342		■								✓		1, 2, 3 & 4
	W-L-1449		■							✓	✓		1 & 2
	W-L-2384			■						✓			1, 2, 3 & 4
	W-L-2387			■							✓		1, 2, 3 & 4
	W-L-2475			■									1 & 2
	W-L-3245				■					✓			1 & 2
	W-L-3247				■						✓		1 & 2
	W-L-3348				■					✓	✓		1 & 2
	W-L-4046					■				✓		✓	1 & 2
	W-L-4047					■					✓		1 & 2
	W-L-5217						■			✓			1 & 2
	W-L-5218						■			✓			1, 2, 3 & 4
	W-L-5219						■				✓		1 & 2
	W-L-7107							■		✓			1 & 2
	W-L-7108							■		✓			1 & 2
	W-L-7109							■			✓		1 & 2
	W-L-7110							■			✓		1 & 2

System No. C-AJ-0103

F Rating – 2 Hr
T Rating – 2 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Min 5 in. thick reinforced Wall may also be constructed of any UL Classified **Concrete Blocks***. Max size of opening to be 4-1/2 by 40 in. or 4-1/2 in diam.

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

2. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 4 in. or 4-1/4 in. thickness of min 4 pcf mineral wool batt insulation for sealants B1 and B2, respectively, compressed 25 percent into opening as a permanent form. Packing material to be recessed from top surface of floor or both surfaces of wall assembly to accommodate the required thickness of fill material (Item 2B).

   B1. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the opening, flush with top surface of floor or surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard IFC

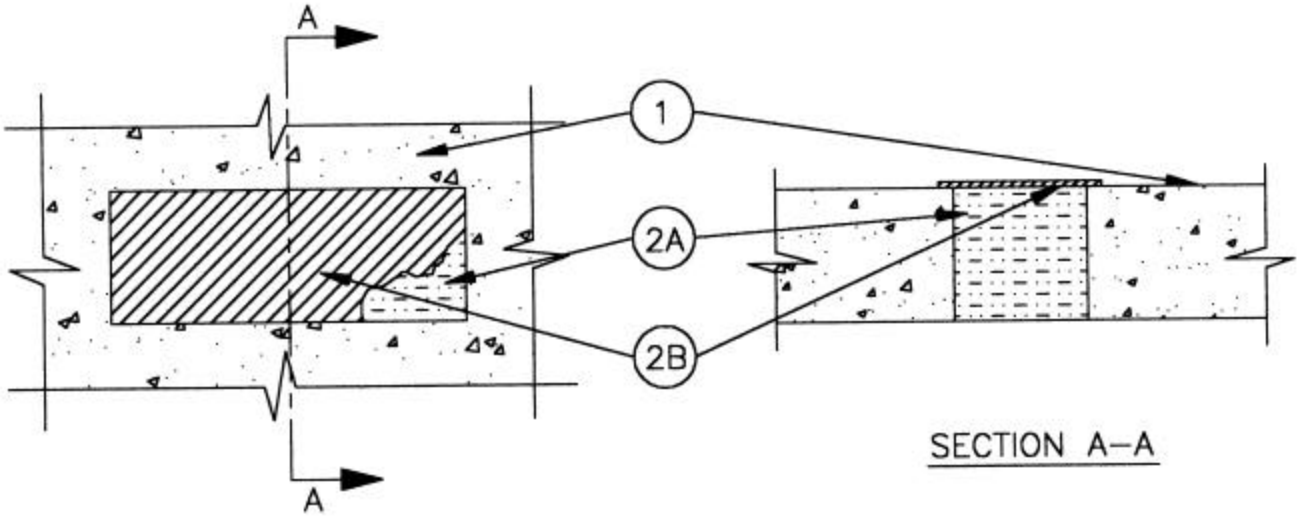
   B2. **Fill, Void or Cavity Material* – Sealant –** As an alternate to the above, min 1/16 in. dry thickness of fill material sprayed or brushed on top surface to completely cover mineral wool and overlap a min 1/2 in. onto concrete floor.

   John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. C-AJ-0108

F Rating – 2 Hr
T Rating – 2 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Min 5 in. thick reinforced Wall may also be constructed of any UL Classified **Concrete Blocks***. Max size of opening to be 4-1/2 by 40 in. or 4-1/2 in diam.

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

2. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf mineral wool batt insulation, compressed 25 percent into opening as a permanent form. Packing material to be recessed from top surface of floor or both surfaces of wall assembly to accommodate the required thickness of fill material (Item 2B).
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the opening, flush with top surface of floor or surfaces of wall assembly.

      John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

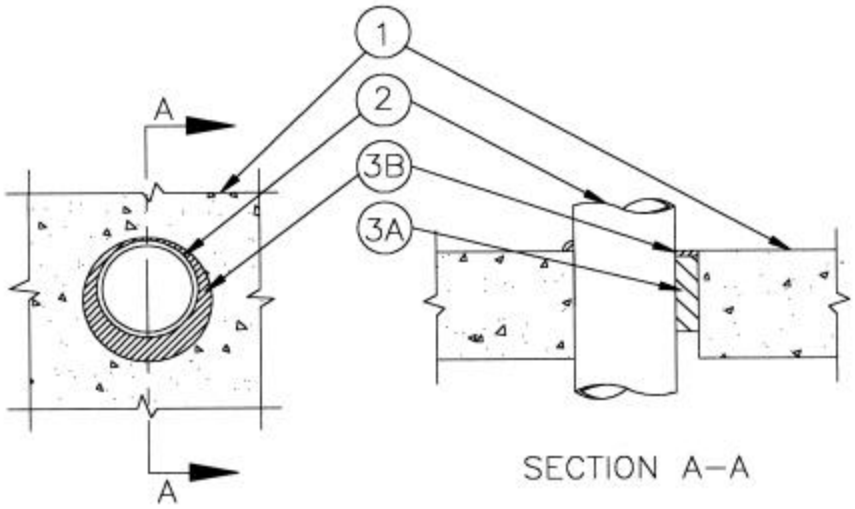
System No. C-AJ-1494

L Rating at Ambient – Less than 1 CFM/ sq. ft.

L Rating at 400° F – Less than 1 CFM/sq. ft.

F Rating – 3 Hr

T Rating – 1/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block. Max diam of opening is 25-1/4 in.

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

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and edge of through opening shall be min 0 in. (point contact) to max 2-1/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   - A. **Steel Pipe –** Nom 24 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   - B. **Conduit –** Nom 6 in. diam (or smaller) rigid steel conduit.
   - C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing.
   - D. **Iron Pipe –** Nom 24 in. diam (or smaller) cast or ductile iron pipe.
   - E. **Copper Tubing –** Nom 6 in. diam (or smaller) Type L (or heavier) copper tube.
   - F. **Copper Pipe –** Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

3. **Firestop System –** The firestop system shall consist of the following:
   - A. **Packing Material –** Min 4 in. or 4-1/4 in. thickness of 4 pcf mineral wool batt insulation for sealants B1 and B2, respectively, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material (Item 3B).
   - B1. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between penetrant and periphery of opening a min 1/2 in. diam bead of fill material shall be applied at the periphery of opening/penetrant interface on top surface of floor assembly or both surfaces of wall assembly.

     John Wagner & Associates Inc. – GrabberGard IFC
   - B2. **Fill Void or Cavity Material* – Sealant –** Min 1/16 in. thickness of fill material applied to completely cover the mineral wool insulation and to overlap the floor or wall surfaces 1/2 in., flush with top surface of floor or both surface of wall.

     John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

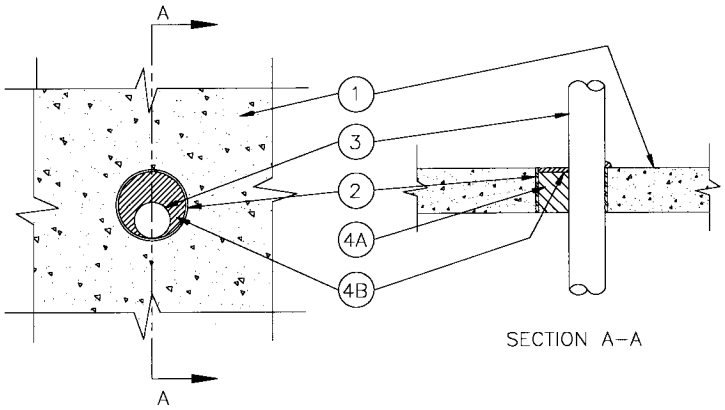
System No. C-AJ-1495

L Rating at Ambient – Less than 1 CFM/ sq. ft.

L Rating at 400° F – Less than 1 CFM/sq. ft.

F Rating – 3 Hr

T Rating – 1/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick lightweight or normal weight concrete (100-150 pcf). Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve –** (Optional) – Sleeve to be cast or grouted into floor or wall assembly, flush with floor or both wall assembly. The following metallic sleeves may be used within the firestop system:
   A. Nom 8 in. diam (or smaller) Schedule 40 (or heavier) steel sleeve.
   B. Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) sleeve.

3. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and sleeve or periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing or rigid steel conduit.
   D. **Copper Tubing –** Nom 3 in. diam (or smaller) Type L (or heavier) copper tube.
   E. **Copper Pipe –** Nom 3 in. diam (or smaller) Regular (or heavier) copper pipe.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. or 4-1/4 in. thickness of min 4 pcf density mineral wool batt insulation for sealants B1 and B2, respectively, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 4B).
   B1. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between penetrant and sleeve or concrete, a 1/2 in. diam bead of fill material shall be applied at the sleeve or concrete/penetrant interface on the top surface of floor or both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard IFC
   B2. **Fill Void or Cavity Material* – Sealant –** Min 1/4 in. thickness of fill material applied within annulus, flush with top surface of floor or min 1/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall. At point contact location between penetrant and sleeve or concrete, a min 1/4 in. diam bead of fill material shall be applied at the sleeve or concrete/penetrant interface on the top surface of floor or both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

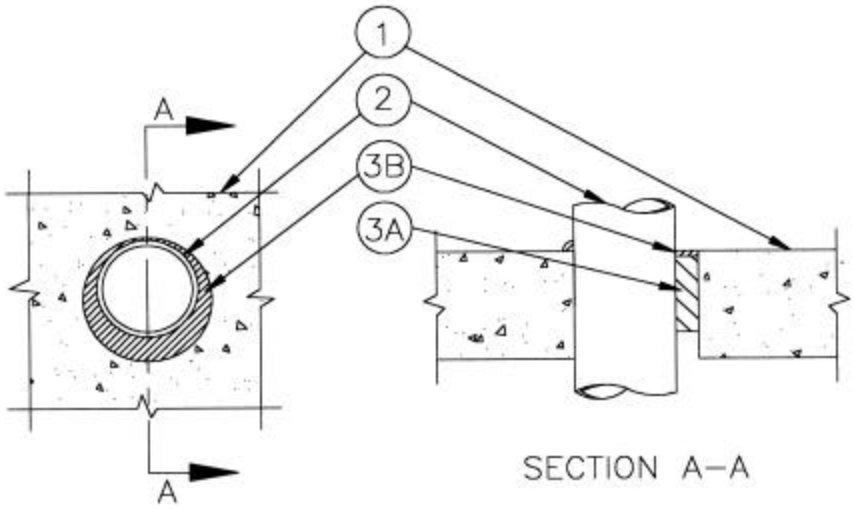
System No. C-AJ-1499

L Rating at Ambient – Less than 1 CFM/ sq. ft.

L Rating at 400° F – Less than 1 CFM/sq. ft.

F Rating – 3 Hr

T Rating – 1/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block. Max diam of opening is 25-1/4 in.

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

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and edge of through opening shall be min 0 in. (point contact) to max 2-1/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   - A. **Steel Pipe –** Nom 24 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   - B. **Conduit –** Nom 6 in. diam (or smaller) rigid steel conduit.
   - C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing.
   - D. **Iron Pipe –** Nom 24 in. diam (or smaller) cast or ductile iron pipe.
   - E. **Copper Tubing –** Nom 6 in. diam (or smaller) Type L (or heavier) copper tube.
   - F. **Copper Pipe –** Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

3. **Firestop System –** The firestop system shall consist of the following:
   - A. **Packing Material –** Min 4 in. thickness of 4 pcf mineral wool batt insulation, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material (Item 3B).
   - B. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between penetrant and periphery of opening a min 1/2 in. diam bead of fill material shall be applied at the periphery of opening/penetrant interface on top surface of floor assembly or both surfaces of wall assembly.

     John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

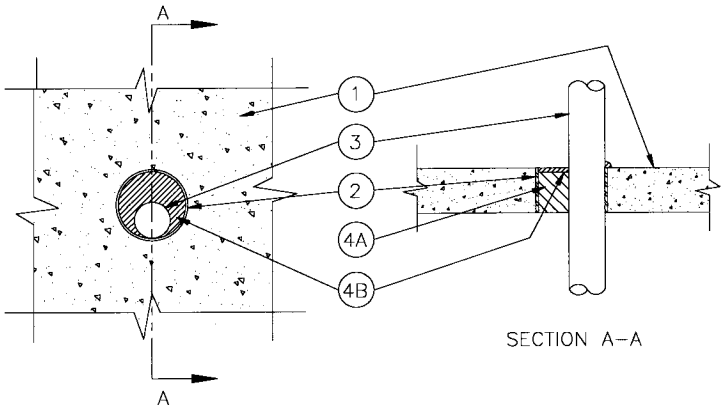
System No. C-AJ-1500

L Rating at Ambient – Less than 1 CFM/ sq. ft.

L Rating at 400° F – Less than 1 CFM/sq. ft.

F Rating – 3 Hr

T Rating – 1/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick lightweight or normal weight concrete (100-150 pcf). Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve –** (Optional) – Sleeve to be cast or grouted into floor or wall assembly, flush with floor or both wall assembly. The following metallic sleeves may be used within the firestop system:
   A. Nom 8 in. diam (or smaller) Schedule 40 (or heavier) steel sleeve.
   B. Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) sleeve.

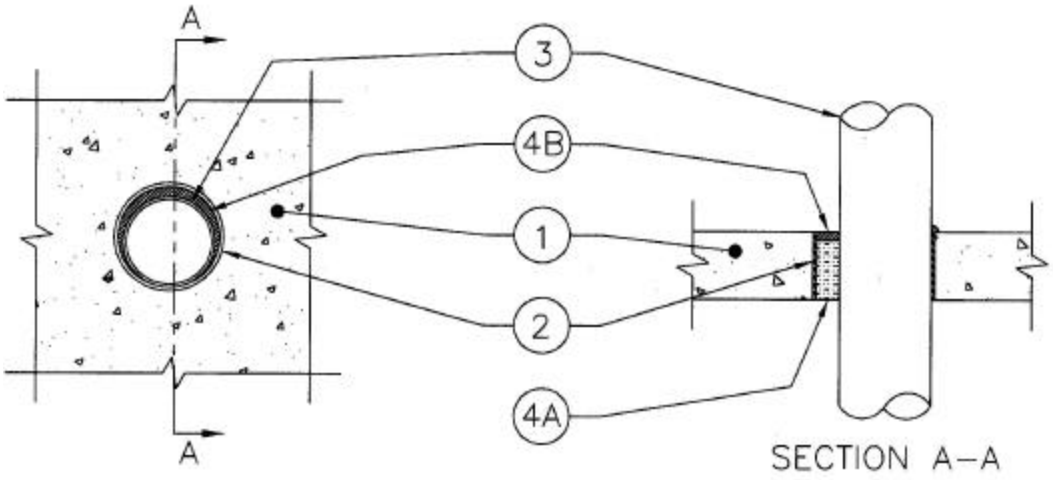
3. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and sleeve or periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing or rigid steel conduit.
   D. **Copper Tubing –** Nom 3 in. diam (or smaller) Type L (or heavier) copper tube.
   E. **Copper Pipe –** Nom 3 in. diam (or smaller) Regular (or heavier) copper pipe.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf density mineral wool batt insulation, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 4B).
   B. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between penetrant and sleeve or concrete, a 1/2 in. diam bead of fill material shall be applied at the sleeve or concrete/penetrant interface on the top surface of floor or both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. C-AJ-1596

F Rating – 2 Hr
T Rating – 1/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. (114 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 26 in.(660 mm).

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

2. **Steel Sleeve –** Cylindrical steel sleeve, friction fit, cast or grouted into floor or wall opening, flush with top surface of floor or both surfaces of wall assembly. The following types and sizes of steel sleeves may be used:
   A. **Sheet Metal –** Nom 8 in. (203 mm) diam (or smaller) 24 gauge (or heavier), galv sheet metal sleeve with min 1 in. (25 mm) overlap along longitudinal seam.
   B. **Steel Pipe –** Nom 26 in. (660 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.

3. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be use:
   A. **Steel Pipe –** Nom 24 in. (660 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 24 in. (660 mm) diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 6 in. (152 mm) diam (or smaller) steel electrical metallic tubing or rigid steel conduit.
   D. **Copper Tubing –** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tube.
   E. **Copper Pipe –** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4-1/4 in. or 4 in. (108 or 102 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation for sealants B1 and B2, respectively, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material (Item 4B)
   B1. **Fill, Void or Cavity Material* – Sealant –** Min 1/4 in. (6 mm) thickness of fill material sprayed or brushed on top surface of floor or each side of wall assembly. At point contact location between penetrant and periphery of opening, a min 1/4 in. (6 mm) diam bead of fill material shall be applied at the concrete/penetrant interface on the top surface of floor or on both sides of wall.

      John Wagner & Associates Inc. – GrabberGard EFS
   B2. **Fill, Void or Cavity Material* – Sealant –** (As an alternative) Min 1/2 in. (13 mm) thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between penetrant and periphery of opening, an additional 1/2 in. (13 mm) diam bead of fill material shall be applied at the concrete/penetrant interface on the top surface of floor or both surfaces of wall.

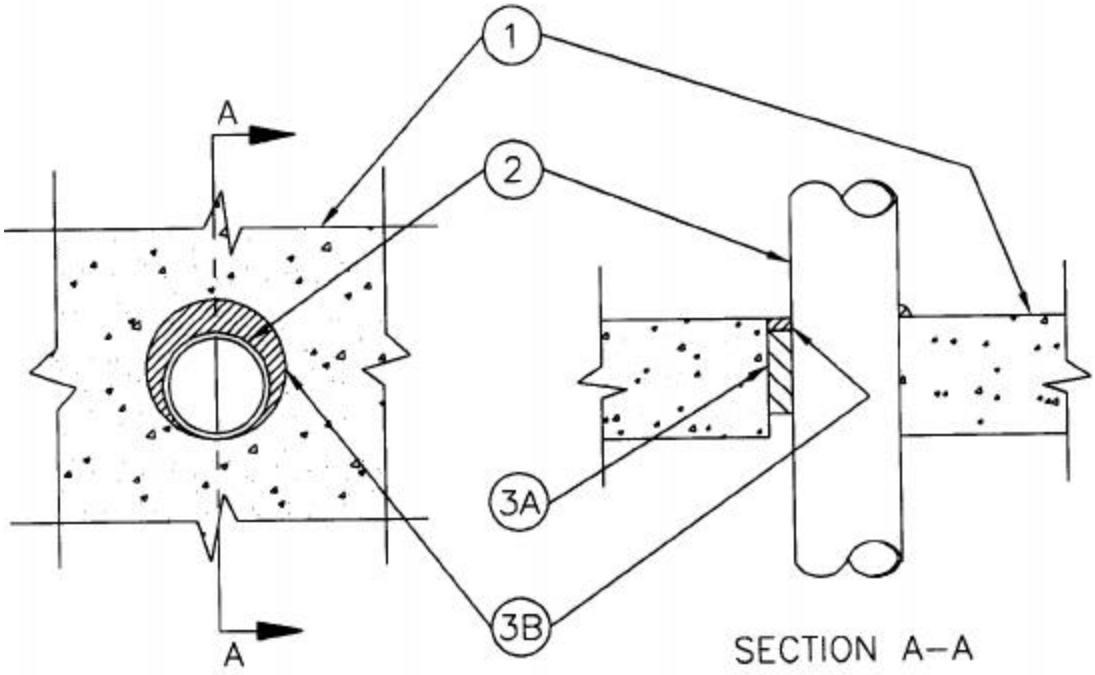
      John Wagner & Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking

System No. C-AJ-2465

F Rating - 2 Hr

T Rating - 2 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick normal weight (150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 3-3/4 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Nonmetallic Pipe –** Nom 2 in. diam (or smaller) SDR 11 chlorinated polyvinyl chloride (CPVC) pipe for use in closed (process or supply) piping systems. One pipe to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 3/8 in. to max 1 in. Pipe to be rigidly supported on both sides of floor or wall assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 3-1/2 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall.

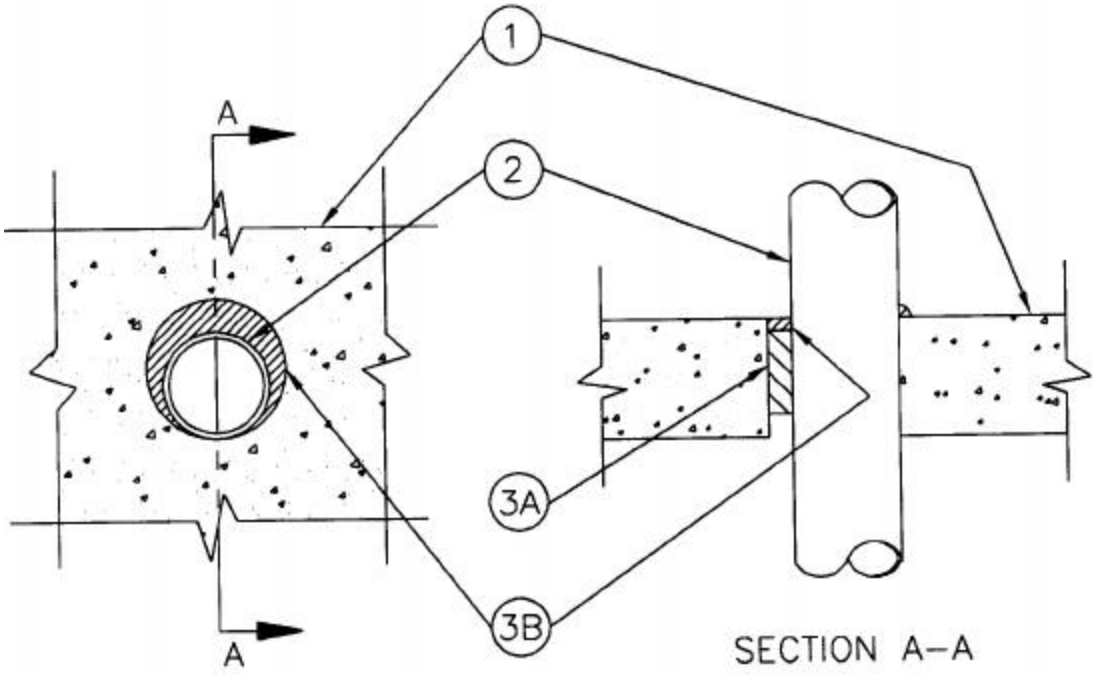
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. C-AJ-2470

F Rating - 2 Hr

T Rating - 2 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick normal weight (150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 3-3/4 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Nonmetallic Pipe –** Nom 2 in. diam (or smaller) SDR 11 chlorinated polyvinyl chloride (CPVC) pipe for use in closed (process or supply) piping systems. One pipe to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 3/8 in. to max 1 in. Pipe to be rigidly supported on both sides of floor or wall assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 3-1/2 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall.

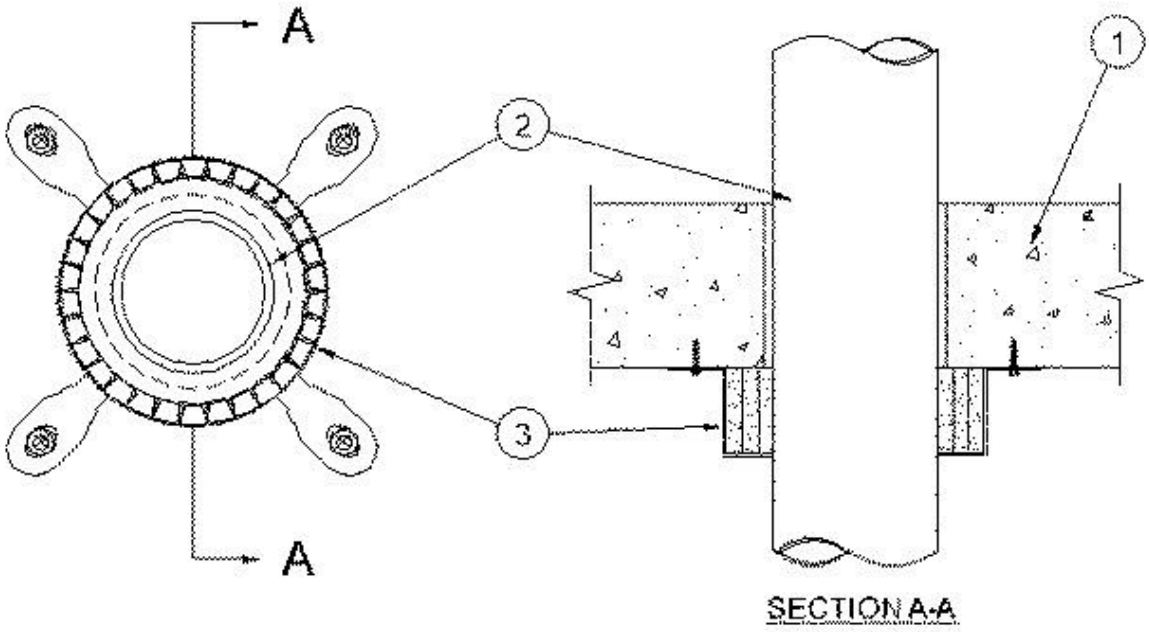
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. C-AJ-2571

F Rating – 2 and 3 Hr (See Item 2)

T Rating – 1-1/2, 2 and 3 Hr (See Item 2)



SECTION A-A

1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 5 in.

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

2. **Through Penetrants –** One nonmetallic pipe or conduit to be centered within the firestop system. The annular space between the pipe or conduit and the periphery of the opening is dependent upon the type and nom diam of the pipe or conduit as shown in the table below. The pipe or conduit to be rigidly supported on both sides of floor or wall. The following types and sizes of pipes or conduits may be used:

   A. **Polyvinyl Chloride (PVC) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.

   B. **Rigid Nonmetallic Conduit+ –** Nom 4 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code (NFPA No. 70).

   C. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 4 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

   D. **Acrylonitrile Butadiene Styrene (ABS) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

The F and T Ratings of the firestop system are dependent upon the type and max diam of the through penetrant and the nom annular space within the opening as shown in the table below:

Max Diam of Penetrant [in.]	Type of Through Penetrant	Nom Annular Space [in.]	F Rating, [Hr]	T Rating, [Hr]
2	PVC Pipe or PVC Conduit	3/16	3	3
2	CPVC Pipe	3/16	3	3
2	ABS Pipe	3/16	2	2
4	PVC Pipe or PVC Conduit	1/4	2	1-1/2
4	CPVC Pipe	1/4	2	1-1/2
4	ABS Pipe	1/4	2	2

3. **Firestop Device* –** Steel collar lined with an intumescent insert sized to fit the specific diam of the through penetrant. Device shall be wrapped around the outer circumference of the through penetrant and secured to the underside of the floor or both surfaces of the wall in accordance with the accompanying installation instructions. Device secured to concrete at each tab by means of min 1/4 in. by 1-1/4 in. steel anchor bolts or 3/16 in. diam by 1-3/4 in. long masonry steel screws in conjunction with 1/4 in. by 1-1/2 in. diam steel fender washers.

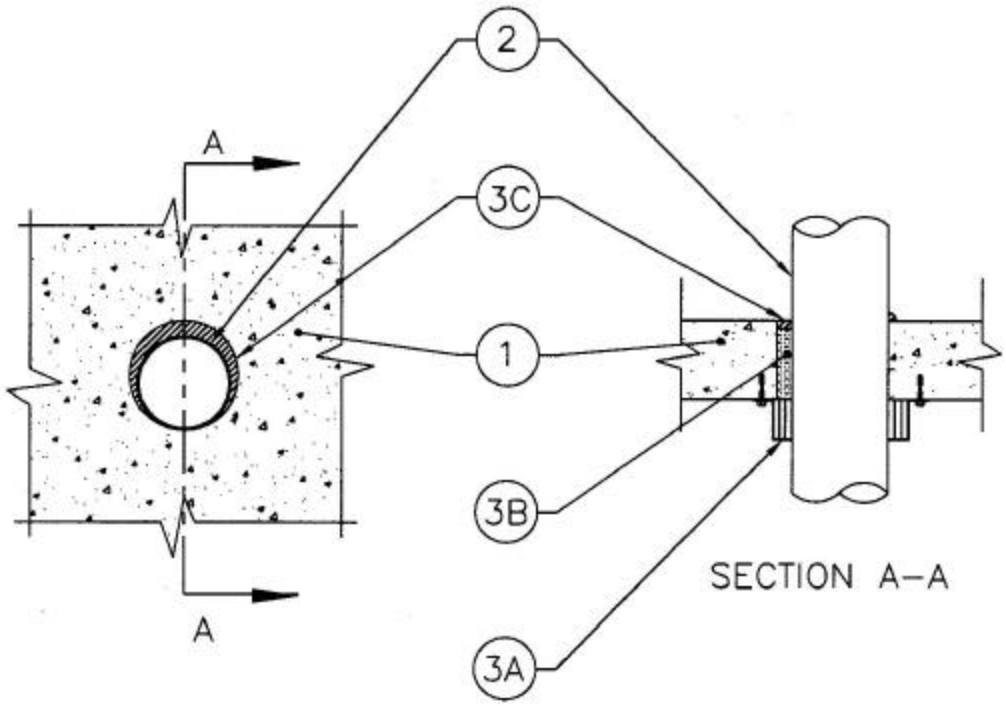
John Wagner & Associates Inc. – GPC

*Bearing the UL Classification Mark
+Bearing the UL Listing Mark

System No. C-AJ-2619

F Rating – 2 and 3 Hr (See Item 2)

T Rating – 2 and 2-3/4 Hr (See Item 2)



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/m^3) concrete floor or min 5 in. (127 mm) thick reinforced lightweight or normal weight concrete wall. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 7 in. (178 mm). See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufactures.

2. **Through Penetrants** – One nonmetallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system for used in closed (process or supply) or vented (drain waste or vent) piping systems. The annular space between pipe or conduit and periphery of the opening shall be min 0 in. (point contact) to max 1/2 in. (13 mm). Pipe or conduit to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes or conduit may be used; solid core polyvinyl chloride (PVC, cellular core polyvinyl chloride (ccPVC), chlorinated polyvinyl chloride (CPVC), solid core acrylonitrile butadiene styrene (ABS), cellular core acrylonitrile butadiene styrene (ccABS), Fire Retardant Polypropylene (FRPP).

Pipe Type	**Nom Diam, In. (mm)**	**F**	**T**
PVC, ABS or FRPP	1-1/2 to 2 (38 to 51)	3	2-3/4
PP	1-1/2 to 2 (38 to 51)	3	3
PVC, ccPVC, ccABS or FRPP	3 to 4 (76 to 102)	2	2
PP	3 to 4 (76 to 102)	3	2-3/4
ABS, CPVC or Rigid Nonmetallic Conduit++	6 (152)	2	2

3. **Firestop System –** The firestop system shall consist of the following:

A. **Firestop Device* – Collar**– Collar to be installed in accordance with the accompanying installation instructions. Collar to be installed and latched around pipes such that collar completely overlaps periphery of opening. Collar secured to underside of floor or both sides of wall with min 3/16 in. (4.8 mm) diam by min 1-1/4 in. (32 mm) long steel expansion. Min of two, three or four anchor bolts, symmetrically located, for nom 2 in. (51 mm) diam (and smaller), nom 3 in. (76 mm) diam and nom 4 and 6 in. (102 and 152 mm) diam pipes, respectively.

John Wagner Associates Inc. – GrabberGard GPC Collar

B. **Packing Material –** Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form, flush with bottom surface of floor assembly or both sides of wall. Packing material to be recessed from top surface of floor or both surfaces of wall assembly to accommodate the required thickness of fill material.

C. **Fill Void or Cavity Material* – Sealant** – Min 1/2 in. (13 mm) thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of the wall assembly. At point contact location between penetrant and periphery of opening, an additional 1/2 in. (13 mm) diam bead of fill material shall be applied at the concrete penetrant interface on top surface of floor assembly.

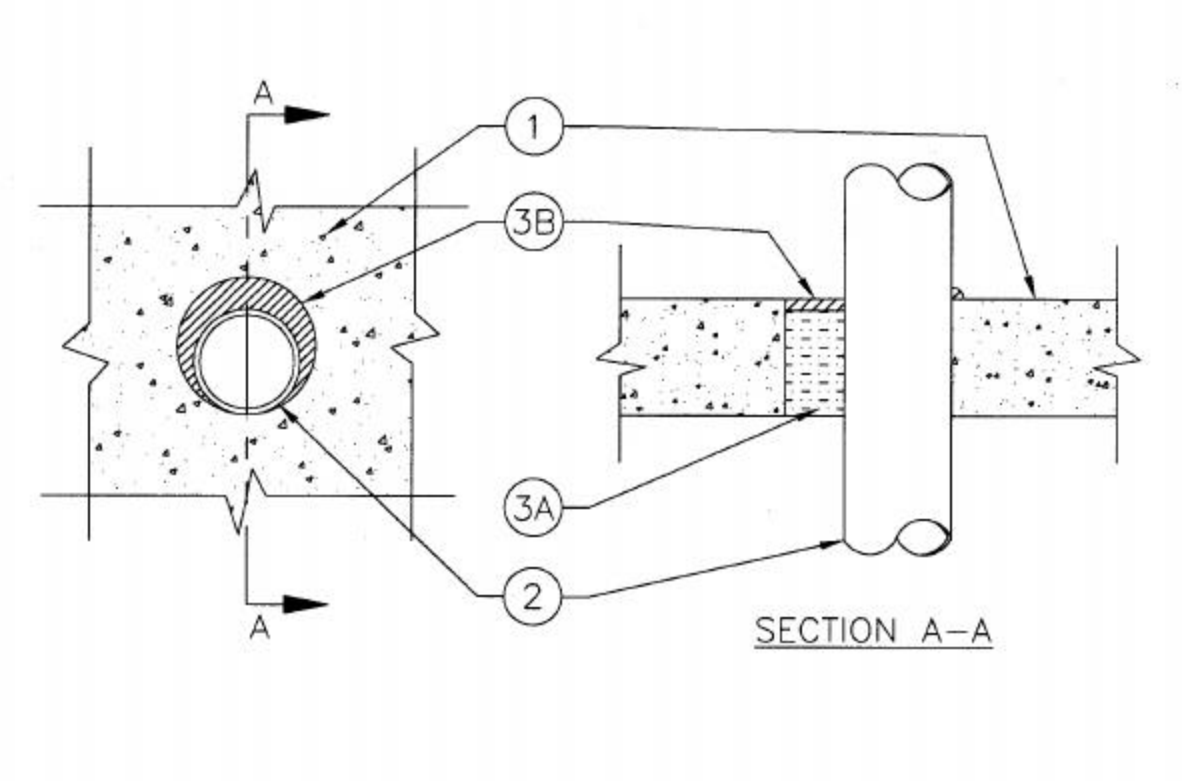
John Wagner Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking
++Bearing the UL Listing Mark

System No. C-AJ-2620

F Rating – 2 Hr

T Rating – 3/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. (114 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete or min 5 in. (127 mm) thick lightweight or normal weight concrete wall. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 8 in. (203 mm).

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

2. **Through Penetrant* – Glass Pipe –** Nom 6 in. (152 mm) diam (or smaller) glass pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems. One pipe to be installed concentrically or eccentrically within the firestop system. Pipe coupling to be located a min. of 12 in. (305 mm) from floor or wall surfaces. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 1-5/8 in. (41 mm). Pipe to be rigidly supported on both sides of floor or wall.

   SCHOTT NORTH AMERICA INC

3. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. (13 mm) thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between pipe and periphery of opening, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the periphery of concrete/pipe interface on the top surface of floor or both surfaces of wall.

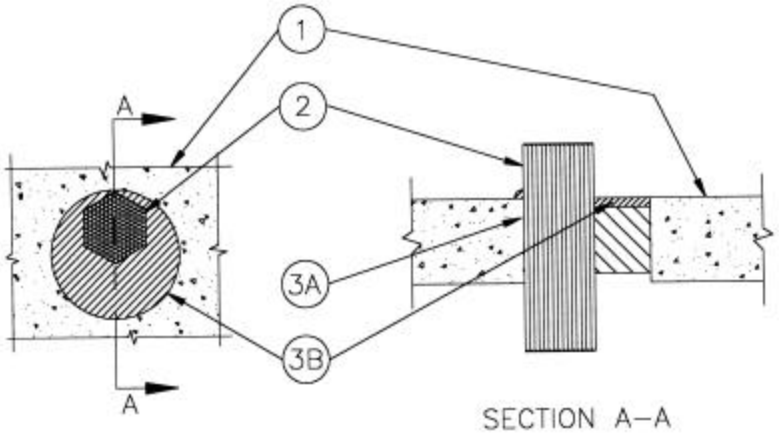
      John Wagner Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. C-AJ-3230

F Rating - 3 Hr

T Rating - 1/2 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick normal weight (150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 10-1/4 in.

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

2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 27 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 3-1/2 in. Cables to be rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:

   A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.

   B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

   C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

   D. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.

   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.

   F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation

   G. **Through Penetration Product*** – Max 3/C No. 2 AWG (or smaller) aluminum or steel clad **Armored Cable** or aluminum or steel clad **Metal Clad Cable** with copper conductors.

   ALFEX CORP

3. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 3-1/2 in thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. Sealant to be forced into interstices of cable group to max extent possible.

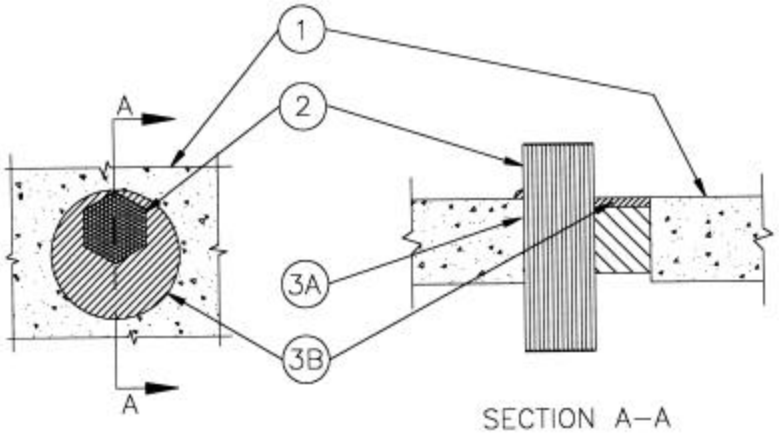
   John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. C-AJ-3233

F Rating - 3 Hr

T Rating - 1/2 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick normal weight (150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 10-1/4 in.

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

2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 27 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 3-1/2 in. Cables to be rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:

   A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.

   B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

   C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

   D. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.

   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.

   F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation

   G. **Through Penetration Product*** – Max 3/C No. 2 AWG (or smaller) aluminum or steel clad **Armored Cable** or aluminum or steel clad **Metal Clad Cable** with copper conductors.

   ALFEX CORP

3. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 3-1/2 in thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. Sealant to be forced into interstices of cable group to max extent possible.

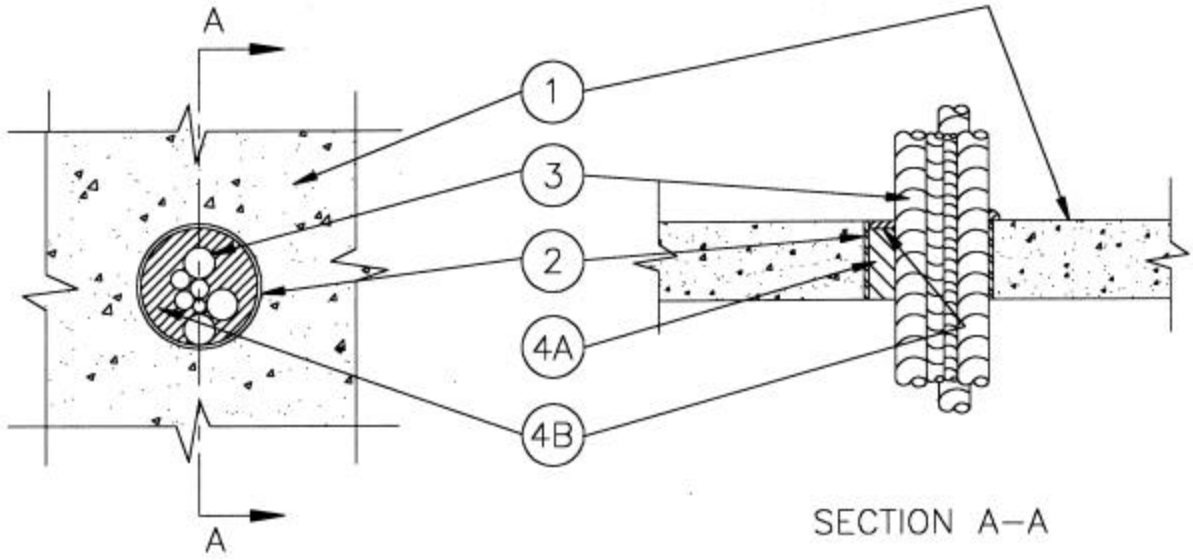
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. C-AJ-3302

F Rating – 3 Hr

T Rating – 1 Hr



1. **Floor or Wall Assembly –** Min 4 1/2 in. (114 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 8 in. (203 mm).

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

2. **Metallic Sleeve –** (Optional) – Nom 8 in. (203 mm) (or smaller) Schedule 40 (or heavier) steel sleeve, cast or grouted into wall or floor assembly, flush with both surfaces of floor or wall assembly.

3. **Cables –** Aggregate cross sectional area of cables in opening to be max 27 percent of the cross sectional area of the opening. Cables installed either concentrically or eccentrically within the firestop system. The annular space between cables and sleeve or periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. (89 mm). Cables to be rigidly supported on both sides of wall assembly. The following types and sizes of cables may be used:

   A. 1/C 750 kcmil (or smaller) copper conductor aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation, with or without PVC jacket.

   B. 3/C 350 kcmil (or smaller) copper conductor aluminum clad or steel clad TEK cable with XLPE insulation, with or without PVC jacket.

   C. 4/C No. 14 AWG (or smaller) copper conductor aluminum clad or steel clad TEK cable with XLPE insulation, with or without PVC jacket.

   D. Max 25 pair No. 20 AWG (and smaller) copper conductor cable with PVC insulation, with or without PVC jacket.

   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation, with or without PVC jacket.

   F. 4/C No. 6 AWG (or smaller) copper conductor cable with XLPE insulation, with or without PVC jacket.

   G. **Through Penetrating Product*** – Max 3/C No. 2 AWG (or smaller) aluminum or steel clad **Armored Cable*** or aluminum or steel clad **Metal Clad Cable*** with copper conductors

      ALFLEX CORP

   H. **Through Penetrating Product* –** Max four copper conductor No. 2/0 AWG (or smaller) aluminum or steel **Metal-Clad Cable** or max four copper conductor No. 1 AWG (or smaller) aluminum **Armored Cable** or max 750 kcmil (or smaller) aluminum or copper Type THHN or XHHW conductors, jacketed or unjacketed aluminum or steel **Metal Clad Cable.**

      SOUTHWIRE CO — Type MC, Type AC

4. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 4 in. (102 mm) or 4-1/4 in. (104 mm) thickness of min 4 pcf (64 kg/m^3) density mineral wool batt insulation for sealants B1 and B2, respectively, firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as to accommodate the required thickness of fill material (Item 4B).

B1. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. (13 mm) thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. At point contact location between cables and sleeve or concrete, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the sleeve or concrete/cable interface on top surface of floor or both surfaces of wall.

John Wagner Associates Inc. – GrabberGard IFC, EFC

B2. **Fill Void or Cavity Material* – Sealant –** Min 1/4 in. (6 mm) thickness of fill material applied within annulus, flush with top surface of floor or min 1/8 in. (3.2 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening a min 1/4 in. (6 mm) diam bead of fill material shall be applied at the sleeve or concrete/cable interface on top surface of floor or both surfaces of wall assembly.

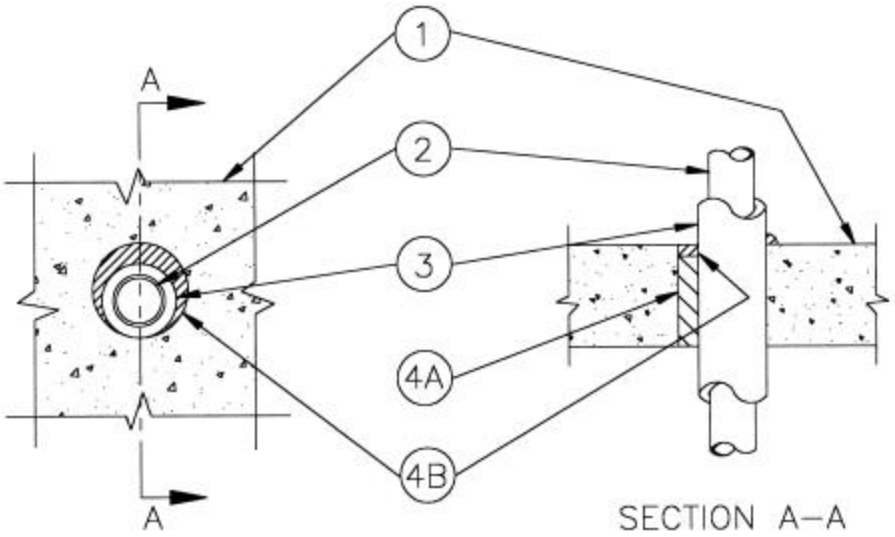
John Wagner Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. C-AJ-5261

F Rating - 2 Hr

T Rating - 3/4 & 1-1/4 Hr (See Item 2)



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4-1/2 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 2 in. diam (or smaller) Schedule ST 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 2 in. diam (or smaller) cast or ductile iron pipe.
   C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

   T Rating is 1-1/4 Hr for penetrants A, B. T Rating is 3/4 Hr for penetrants C and D.

3. **Tube Insulation – Plastics+ –** Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between the insulated pipe and the edge of the through opening shall be min 0 in. (point contact) to max 7/8 in.
   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 94-5VA may be used.

4. **Firestop System** – The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

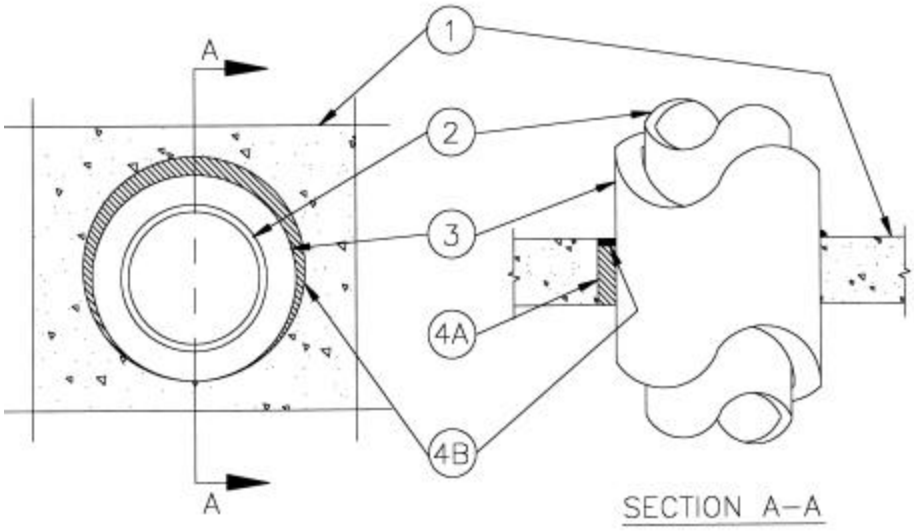
   John Wagner & Associates Inc. – GrabberGard IFC

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

System No. C-AJ-5262

F Rating - 2 Hr

T Rating - 1-3/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 18 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 12 in. diam (or smaller) Schedule ST 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 12 in. diam (or smaller) cast or ductile iron pipe.
   C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

3. **Pipe Covering* –** Max 2 in. thick hollow cylindrical heavy density (min 3.5 pcf) 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 tape supplied with the product. The annular space between the insulated pipe and the edge of the through opening shall be min 0 in. (point contact) to max 1-1/4 in.
   See **Pipe and Equipment Covering – Materials** (BRGU) category in the 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.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall. At the point contact location between pipe and concrete, a min 3/8 in. diam bead of fill material shall be applied at the concrete/pipe-covering interface on the top surface of floor and on both surfaces of wall.

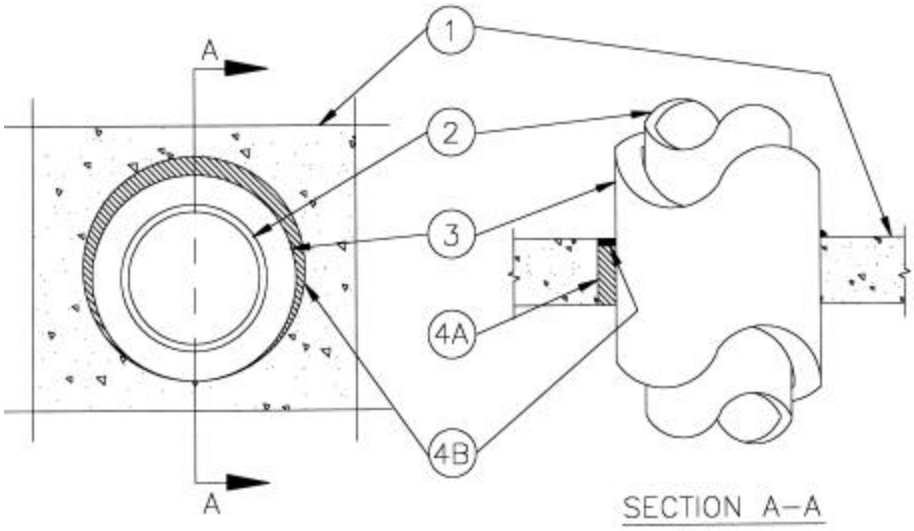
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. C-AJ-5266

F Rating - 2 Hr

T Rating - 1-3/4 Hr



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 18 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 12 in. diam (or smaller) Schedule ST 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 12 in. diam (or smaller) cast or ductile iron pipe.
   C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

3. **Pipe Covering* –** Max 2 in. thick hollow cylindrical heavy density (min 3.5 pcf) 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 tape supplied with the product. The annular space between the insulated pipe and the edge of the through opening shall be min 0 in. (point contact) to max 1-1/4 in.
   See **Pipe and Equipment Covering – Materials** (BRGU) category in the 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.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 4B).
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall. At the point contact location between pipe and concrete, a min 3/8 in. diam bead of fill material shall be applied at the concrete/pipe-covering interface on the top surface of floor and on both surfaces of wall.

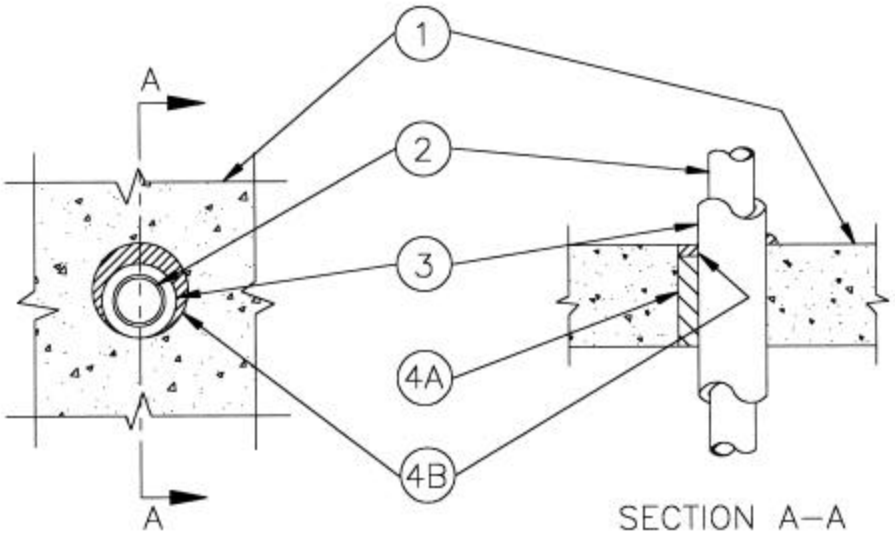
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. C-AJ-5267

F Rating - 2 Hr

T Rating - 3/4 & 1-1/4 Hr (See Item 2)



1. **Floor or Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4-1/2 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 2 in. diam (or smaller) Schedule ST 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 2 in. diam (or smaller) cast or ductile iron pipe.
   C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

   T Rating is 1-1/4 Hr for penetrants A, B. T Rating is 3/4 Hr for penetrants C and D.

3. **Tube Insulation – Plastics+ –** Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between the insulated pipe and the edge of the through opening shall be min 0 in. (point contact) to max 7/8 in.
   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 94-5VA may be used.

4. **Firestop System** – The firestop system shall consist of the following:
   A. **Packing Material –** Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

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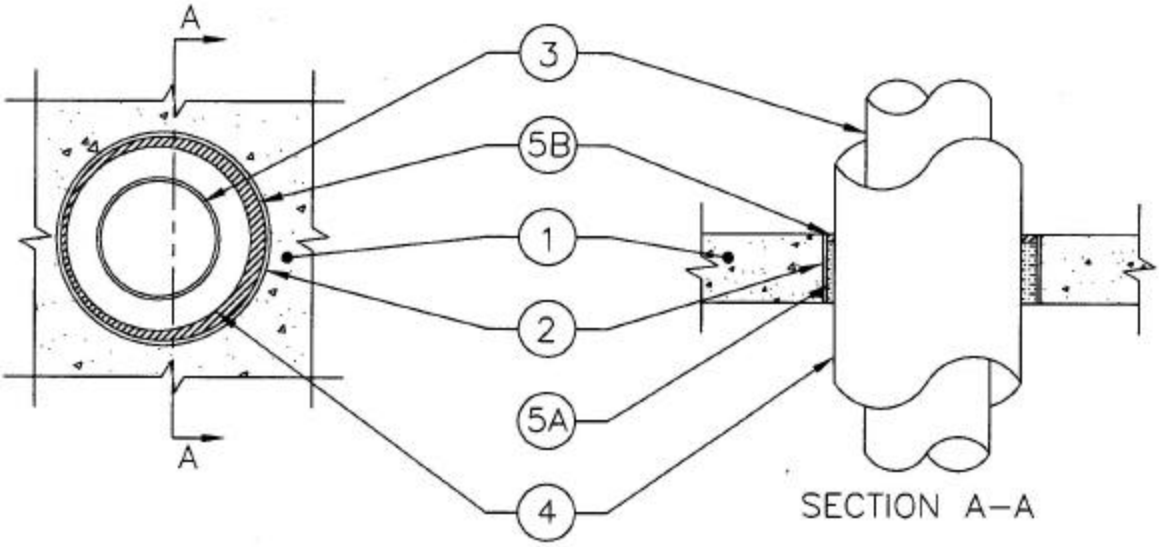
+Bearing the UL Recognized Component Mark
*Bearing the UL Classification Marking

System No. C-AJ-5326

F Rating - 2 Hr

T Rating – 2 Hr



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/m^3) structural concrete floor. Min. 5 in. (127 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete wall. Wall may also be constructed of any UL Classified **Concrete Blocks**.* Max diam of opening to be 18 in. (457 mm).

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

2. **Metallic Sleeve –** Cylindrical steel sleeve fabricated from 24 gauge (or heavier) galv sheet metal and having a min 1 in. (25 mm) overlap along longitudinal seam. Sleeve friction fit, cast or grouted into opening, flush with the top and bottom surfaces of floor or both sides of wall assembly.

3. **Through Penetrant –** One metallic pipe to be installed either concentrically or eccentrically within the firestop system. Pipe to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes may be used:

   A. **Steel Pipe –** Nom 12 in. (305 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.

   B. **Iron Pipe –** Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.

4. **Pipe Covering* –** Max 2 in. (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 tape supplied with the product. The annular space between the insulated pipe and periphery of opening shall be min 1/2 in. (13 mm) to max 3/4 in. (19 mm).

   See **Pipe and Equipment Covering – Materials** (BRGU) category in the Building Materials Directory for names of manufactures. 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 Development Index of 50 or less may be used.

   The hourly F Rating of the firestop system is 2 Hr when 2 in. (51 mm) thick pipe covering is used. The hourly F Rating of the firestop system is 0 Hr when pipe covering is less than 2 in. (51 mm) thick.

5. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m^3)density mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or both surfaces of wall to accommodate the required thickness of fill material.

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. (13 mm) thickness of sealant applied within the annulus, flush with top surface of the floor or with both surfaces of wall.

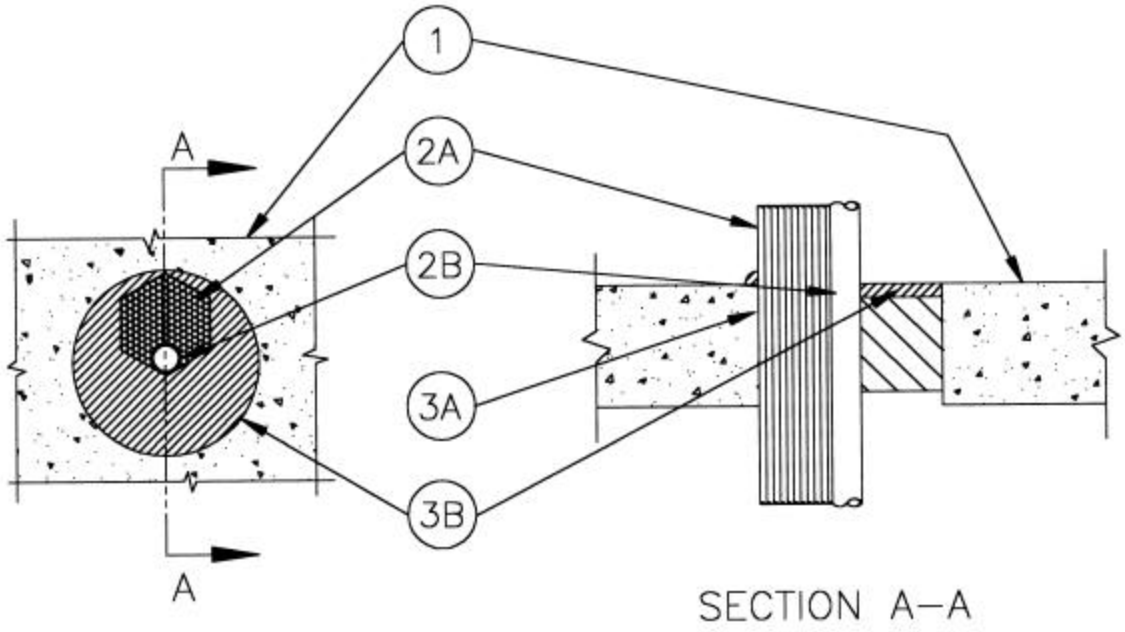
   John Wagner Associates Inc. – GrabberGard IFC

* Bearing the UL Classification Marking

System No. C-AJ-8142

F Rating - 2 Hr

T Rating - 0 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 10-1/4 in.

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

2. **Through Penetrants –** Pipes, conduits or cables to be bundled within the opening such that the aggregate cross-sectional area of penetrants in opening to be max 27 percent of the cross-sectional area of the opening in floor or wall. The space between penetrants and periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. Penetrants to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of penetrants may be used:

   A. **Metallic Pipes –** The following types and sizes of metallic pipes, conduits or tubing may be used:

      A1. **Steel Pipe –** Nom 2 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.

      A2. **Conduit –** Nom 2 in. diam (or smaller) steel electrical metallic tubing or steel conduit.

   B. **Cables –** Any combination of the following types and sizes of cables may be used:

      B1. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.

      B2. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

      B3. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

      B4. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.

      B5. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.

      B6. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

3. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 3-1/2 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).

B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. Sealant to be forced into interstices of penetrants to max extent possible.

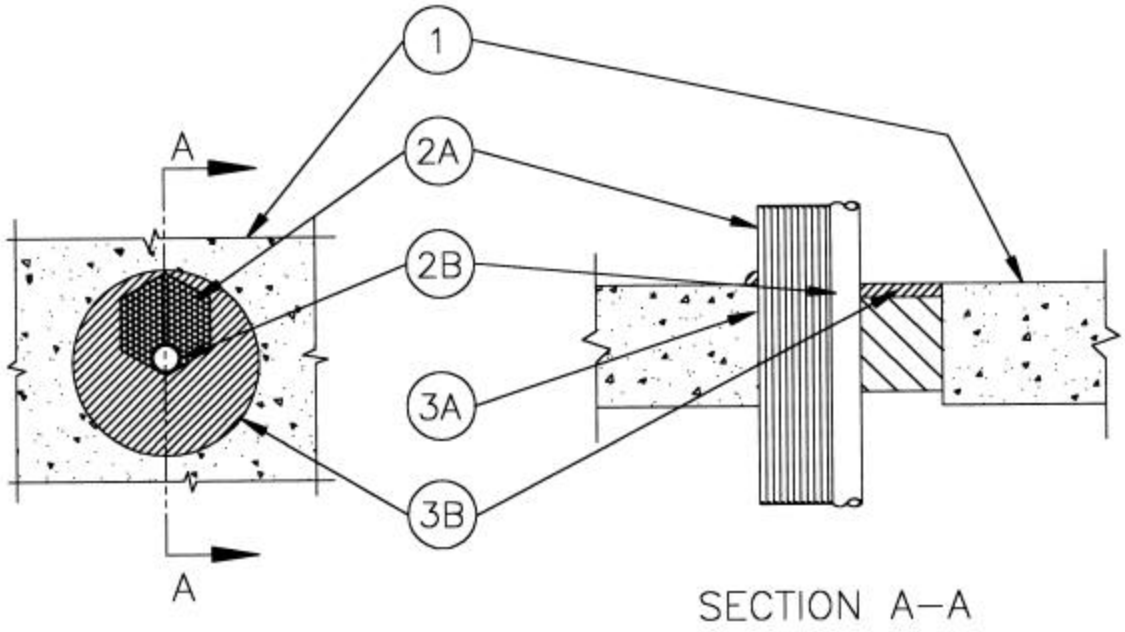
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. C-AJ-8145

F Rating - 2 Hr

T Rating - 0 Hr



1. **Floor or Wall Assembly –** Min 5 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 10-1/4 in.

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

2. **Through Penetrants –** Pipes, conduits or cables to be bundled within the opening such that the aggregate cross-sectional area of penetrants in opening to be max 27 percent of the cross-sectional area of the opening in floor or wall. The space between penetrants and periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. Penetrants to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of penetrants may be used:

   A. **Metallic Pipes –** The following types and sizes of metallic pipes, conduits or tubing may be used:

      A1. **Steel Pipe –** Nom 2 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.

      A2. **Conduit –** Nom 2 in. diam (or smaller) steel electrical metallic tubing or steel conduit.

   B. **Cables –** Any combination of the following types and sizes of cables may be used:

      B1. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.

      B2. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

      B3. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.

      B4. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.

      B5. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.

      B6. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

3. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 3-1/2 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material (Item 3B).

B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. Sealant to be forced into interstices of penetrants to max extent possible.

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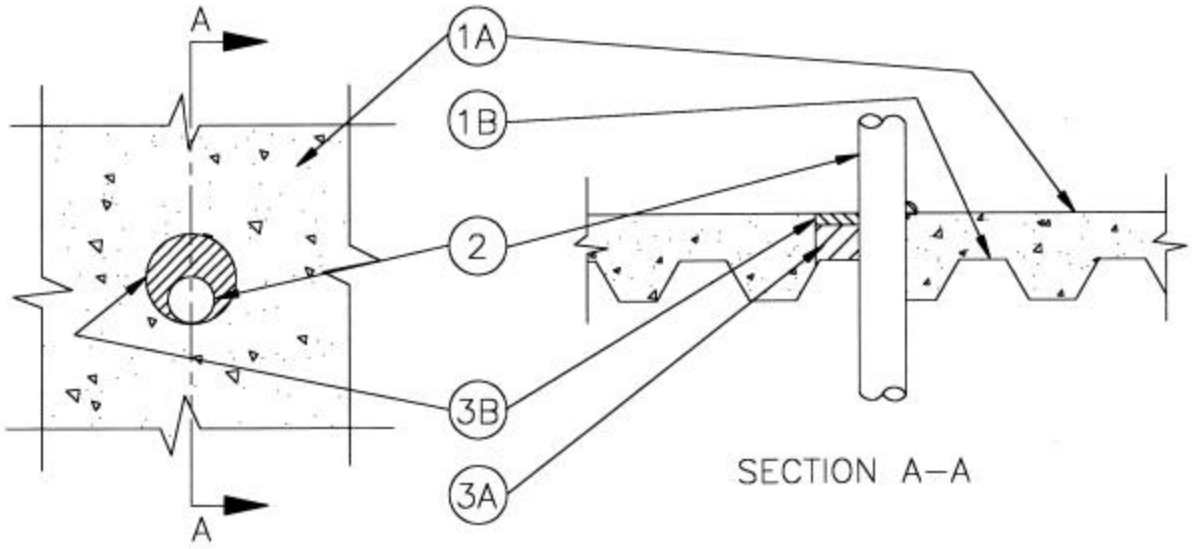
*Bearing the UL Classification Marking

System No. F-A-1058

L Rating at Ambient – Less than 1 CFM/ sq. ft.
L Rating at 400° F – Less than 1 CFM/sq. ft.
F Rating – 2 Hr
T Rating – 1/4 & 1/2 Hr (See Item 2)



1. **Floor Assembly –** The fire-rated unprotected concrete and steel floor assembly shall be constructed of the materials and in the manner specified in the individual D900 Series designs in the UL Fire Resistance Directory and as summarized below:
   A. **Concrete –** Min 2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.
   B. **Steel Floor and Form Units* –** Composite or non-composite max 3 in. deep galv fluted units as specified in the individual Floor-Ceiling Design. Max diam of opening is 6 in.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and edge of through opening shall be min 0 in. (point contact) to max 1-7/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 4 in. diam (or smaller) rigid steel conduit or steel electrical metallic tubing.
   D. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.

   T rating is 1/2 hour for pipes/conduits A, B, and C. T rating is 1/4 hour for pipes/tubing D and E.

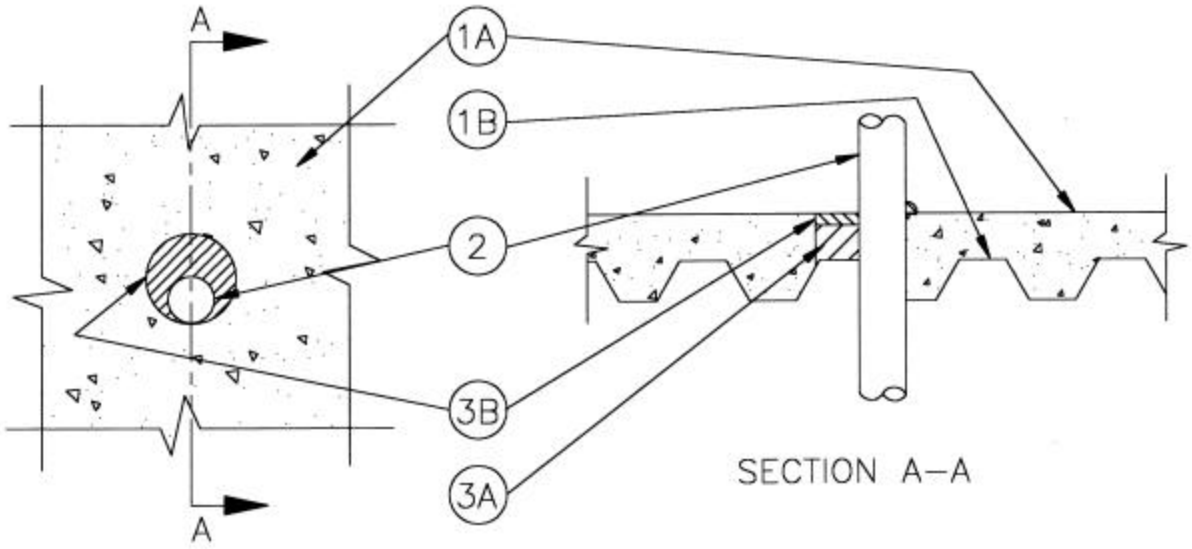
3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 1-1/2 in. thickness of min 4 pcf density mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor as to accommodate the required thickness of fill material (Item 3B).
   B. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor. At point contact location between penetrant and concrete, a min 1/2 in. diam bead of fill material shall be applied at the concrete/penetrant interface on top surface of floor.

John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. F-A-1060

L Rating at Ambient – Less than 1 CFM/ sq. ft.
L Rating at 400° F – Less than 1 CFM/sq. ft.
F Rating – 2 Hr
T Rating – 1/4 & 1/2 Hr (See Item 2)



1. **Floor Assembly –** The fire-rated unprotected concrete and steel floor assembly shall be constructed of the materials and in the manner specified in the individual D900 Series designs in the UL Fire Resistance Directory and as summarized below:
   A. **Concrete –** Min 2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.
   B. **Steel Floor and Form Units* –** Composite or non-composite max 3 in. deep galv fluted units as specified in the individual Floor-Ceiling Design. Max diam of opening is 6 in.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and edge of through opening shall be min 0 in. (point contact) to max 1-7/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 4 in. diam (or smaller) rigid steel conduit or steel electrical metallic tubing.
   D. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.

   T rating is 1/2 hour for pipes/conduits A, B, and C. T rating is 1/4 hour for pipes/tubing D and E.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 1-1/2 in. thickness of min 4 pcf density mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor as to accommodate the required thickness of fill material (Item 3B).
   B. **Fill Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor. At point contact location between penetrant and concrete, a min 1/2 in. diam bead of fill material shall be applied at the concrete/penetrant interface on top surface of floor.

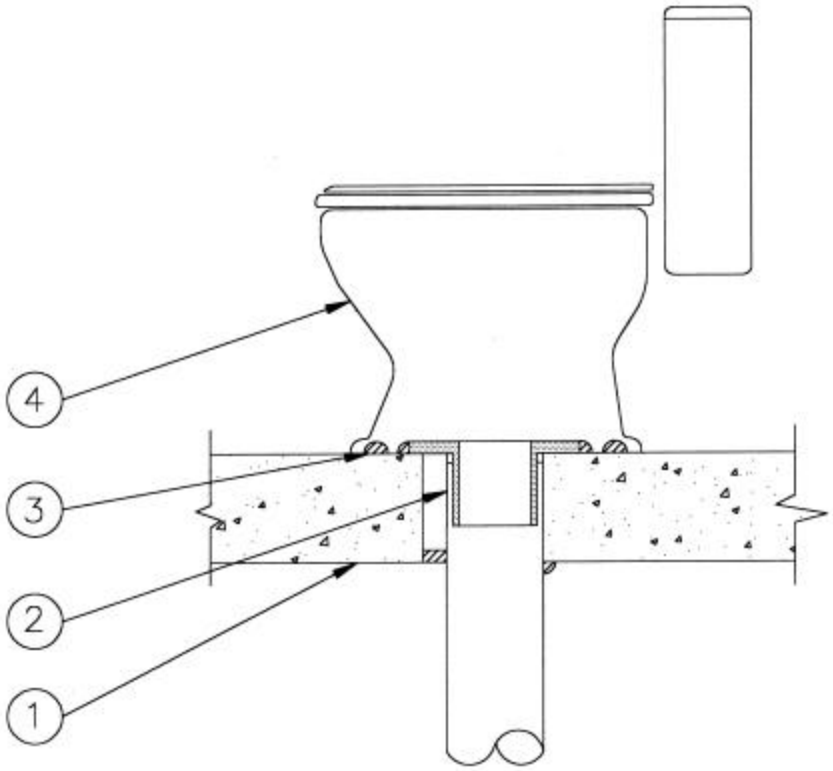
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. F-A-2121

F Rating – 2 Hr

T Rating – 2 Hr



1. **Floor Assembly –** Min 4-1/2 in. thick lightweight or normal weight concrete (100-150 pcf). Max diam of opening is 6 in.

2. **Nonmetallic Pipe –** One nonmetallic drain pipe with max 4 in. diam toilet flange installed either concentrically or eccentrically within the firestop system. The annular space between drain pipe and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. Pipe to be rigidly supported on lower side of floor assembly. The following types and sizes of nonmetallic pipes, fittings and flanges may be used:
   A. **Polyvinyl Chloride (PVC) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 solid core or cellular core PVC pipe for use in vented (drain, waste or vent) piping system.
   B. **Acrylonitrile Butadiene Styrene (ABS) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 cellular core or solid core ABS pipe for use in vented (drain, waste or vent) piping systems.

3. **Fill, Void or Cavity Material* – Sealant –** Min 1 in. thickness of fill material applied within the annulus, flush with bottom surface of floor. At point contact location between concrete and pipe, a min 1/2 in diam bead of fill material shall be applied at the pipe/concrete interface on bottom surface of floor assembly. A min 1/2 in. diam bead of fill material shall be applied around top edge of toilet flange. Prior to placement of water closet, a min 1/2 in. diam bead of fill material shall be applied to the bottom surface of the outer rim of the water closet.

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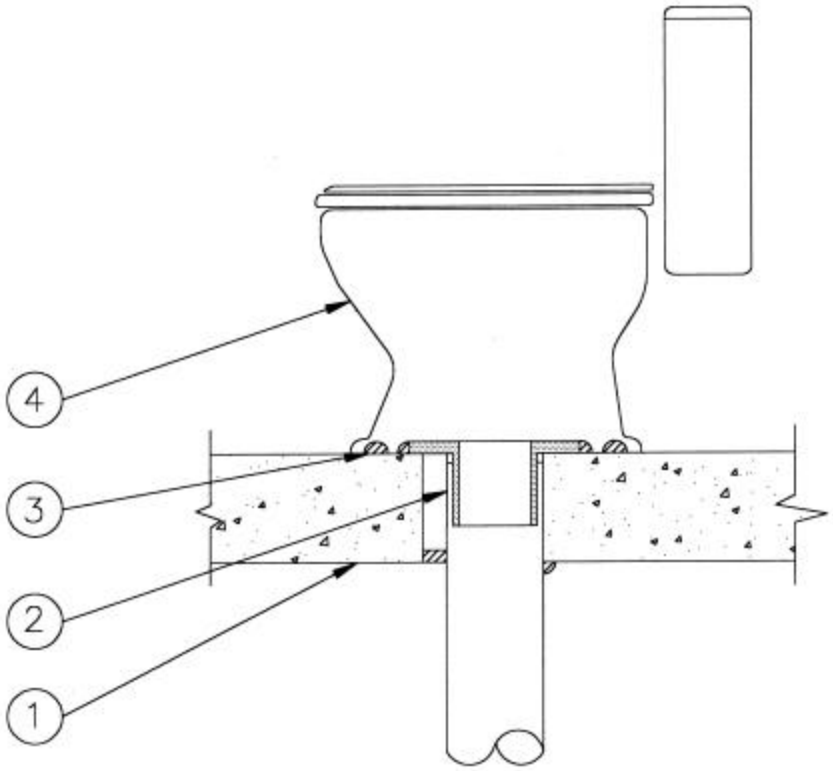
4. **Water Closet –** Floor mounted vitreous china water closet.

*Bearing the UL Classification Marking

System No. F-A-2126

F Rating – 2 Hr

T Rating – 2 Hr



1. **Floor Assembly –** Min 4-1/2 in. thick lightweight or normal weight concrete (100-150 pcf). Max diam of opening is 6 in.

2. **Nonmetallic Pipe –** One nonmetallic drain pipe with max 4 in. diam toilet flange installed either concentrically or eccentrically within the firestop system. The annular space between drainpipe and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. Pipe to be rigidly supported on lower side of floor assembly. The following types and sizes of nonmetallic pipes, fittings and flanges may be used:
   A. **Polyvinyl Chloride (PVC) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 solid core or cellular core PVC pipe for use in vented (drain, waste or vent) piping system.
   B. **Acrylonitrile Butadiene Styrene (ABS) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 cellular core or solid core ABS pipe for use in vented (drain, waste or vent) piping systems.

3. **Fill, Void or Cavity Material* – Sealant –** Min 1 in. thickness of fill material applied within the annulus, flush with bottom surface of floor. At point contact location between concrete and pipe, a min 1/2 in diam bead of fill material shall be applied at the pipe/concrete interface on bottom surface of floor assembly. A min 1/2 in. diam bead of fill material shall be applied around top edge of toilet flange. Prior to placement of water closet, a min 1/2 in. diam bead of fill material shall be applied to the bottom surface of the outer rim of the water closet.

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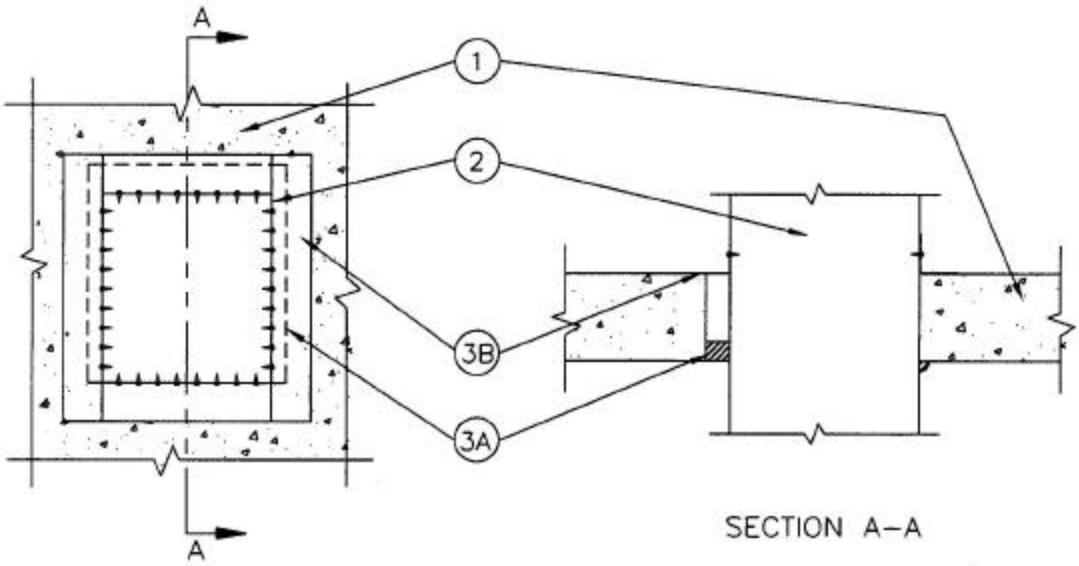
4. **Water Closet –** Floor mounted vitreous china water closet.

*Bearing the UL Classification Marking

System No. F-A-7013

F Rating – 2 Hr

T Rating – 1/2 Hr



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Max area of opening is 625 sq in. with a max dimension of 25 in.

2. **Through Penetrant –** Nom 24 by 24 in. (or smaller) 26 ga. (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1 in. is required within the firestop system. Steel duct to be rigidly supported on top surface of floor assembly.

3. **Firestop System –** The firestop system shall consist of the following:

   A. **Fill, Void or Cavity Material* – Sealant –** Min 1 in. thickness of fill material applied within annulus, flush with bottom surface of floor. At the point contact location between penetrant and periphery of opening, min 1/2 in. diam bead of fill material shall be applied at the concrete/duct interface on exposed surface of floor.

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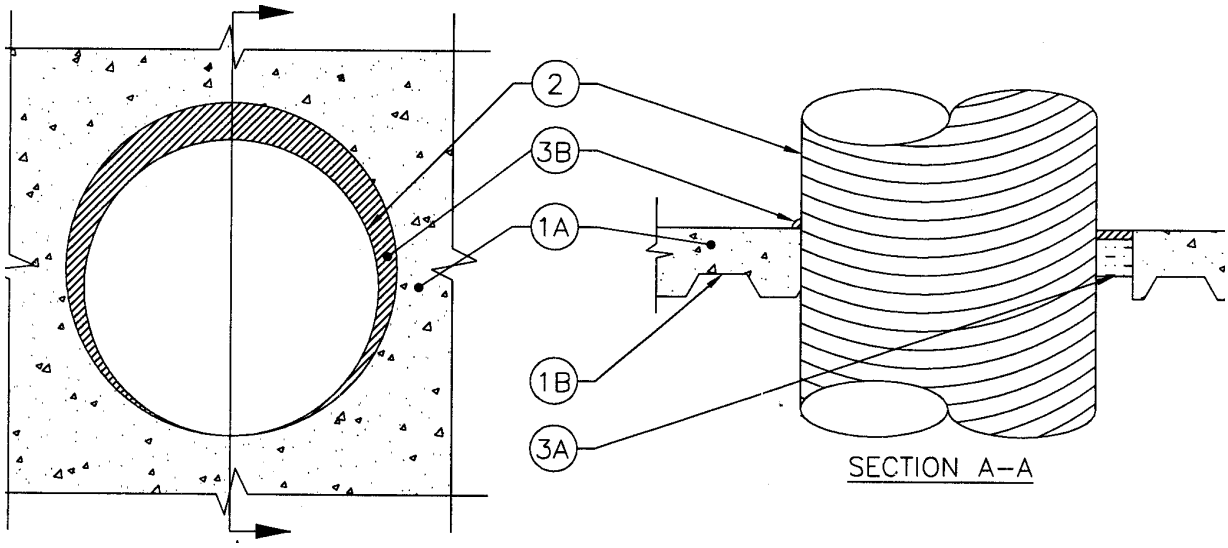
   B. **Retaining Angles –** Min 16 gauge 1-1/2 in. by 1-1/2 in. galv steel angles. Angles attached to duct on unexposed side of floor with min 1/2 in. long, No. 8 (or larger) sheet metal screws, spaced max 4 in. OC.

*Bearing the UL Classification Marking

System No. F-A-7014

F Rating – 2 Hr

T Rating – 1/2 Hr



1. **Floor Assembly –** The fire-rated unprotected concrete and steel floor assembly shall be constructed of the materials and in the manner described in the individual D900 Series Floor -Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Concrete –** Min 2-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.
   B. **Steel Floor and Form Units* –** Composite or non-composite max 3 in. deep fluted galv units as specified in the individual Floor-Ceiling design. Max diam of opening is 18 in.

2. **Steel Duct –** Nom 16 in. diam (or smaller) No. 22 gauge (or heavier) spiral wound steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between the duct and the periphery of the opening shall be min. 0 in. (point contact) to max 2 in. Duct to be rigidly supported on both sides of floor assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 2 in. thickness of min 4 pcf density mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed form top surface of floor as required to accommodate required thickness of fill material.
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of sealant applied within the annulus, flush with top surface of floor. Min 1/2 in. diam bead of sealant shall be applied at the duct/concrete interface at point contact location on the top surface of floor.

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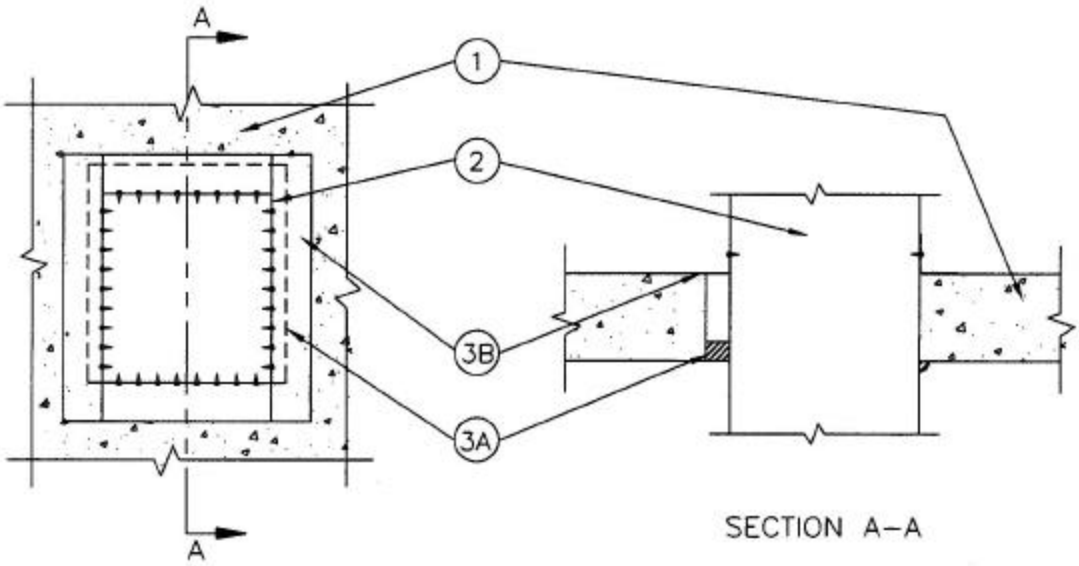
*Bearing the UL Classification Marking

System No. F-A-7015

F Rating – 2 Hr

T Rating – 1/2 Hr



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Max area of opening is 625 sq in. with a max dimension of 25 in.

2. **Through Penetrant –** Nom 24 by 24 in. (or smaller) 26 ga. (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1 in. is required within the firestop system. Steel duct to be rigidly supported on top surface of floor assembly.

3. **Firestop System –** The firestop system shall consist of the following:

   A. **Fill, Void or Cavity Material* – Sealant –** Min 1 in. thickness of fill material applied within annulus, flush with bottom surface of floor. At the point contact location between penetrant and periphery of opening, min 1/2 in. diam bead of fill material shall be applied at the concrete/duct interface on exposed surface of floor.

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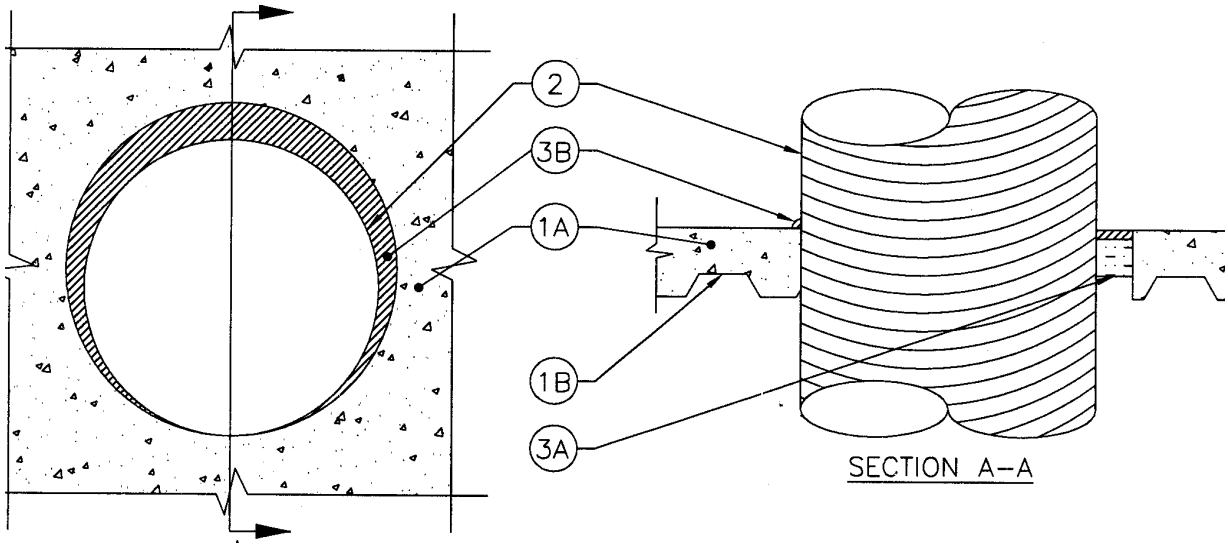
   B. **Retaining Angles –** Min 16 gauge 1-1/2 in. by 1-1/2 in. galv steel angles. Angles attached to duct on unexposed side of floor with min 1/2 in. long, No. 8 (or larger) sheet metal screws, spaced max 4 in. OC.

*Bearing the UL Classification Marking

System No. F-A-7016

F Rating – 2 Hr

T Rating – 1/2 Hr



1. **Floor Assembly –** The fire-rated unprotected concrete and steel floor assembly shall be constructed of the materials and in the manner described in the individual D900 Series Floor -Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Concrete –** Min 2-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.
   B. **Steel Floor and Form Units* –** Composite or non-composite max 3 in. deep fluted galv units as specified in the individual Floor-Ceiling design. Max diam of opening is 18 in.

2. **Steel Duct –** Nom 16 in. diam (or smaller) No. 22 gauge (or heavier) spiral wound steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between the duct and the periphery of the opening shall be min. 0 in. (point contact) to max 2 in. Duct to be rigidly supported on both sides of floor assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 2 in. thickness of min 4 pcf density mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed form top surface of floor as required to accommodate required thickness of fill material.
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. thickness of sealant applied within the annulus, flush with top surface of floor. Min 1/2 in. diam bead of sealant shall be applied at the duct/concrete interface at point contact location on the top surface of floor.

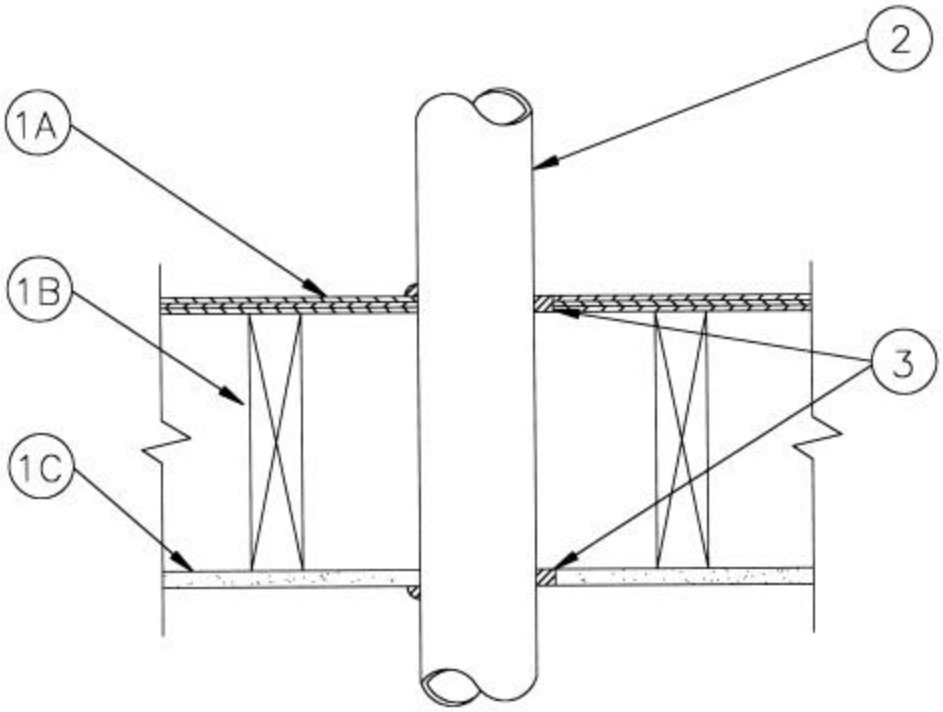
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. F-C-1119

F Rating – 1 Hr

T Rating – 1/4 Hr



1. **Floor-Ceiling Assembly –** The fire rated wood truss or combination wood and steel truss Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture-*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 5-1/8 in.
   B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   C. **Gypsum Board * –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed concentrically or eccentrically within the firestop system, The annular space between pipe, conduit or tubing and periphery of opening shall be min 1/4 in. to max 3/4 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor assembly. The following types and sizes of metallic pipe, conduit or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Conduit –** Nom 4 in. diam (or smaller) electrical metallic tubing (EMT) or steel conduit.
   C. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe
   E. **Iron Pipe –** Nom 4 in. diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 4 in. (or smaller) or Class 50 (or heavier) ductile iron pressure pipe.

3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. applied within the annulus, flush with the surface of ceiling.

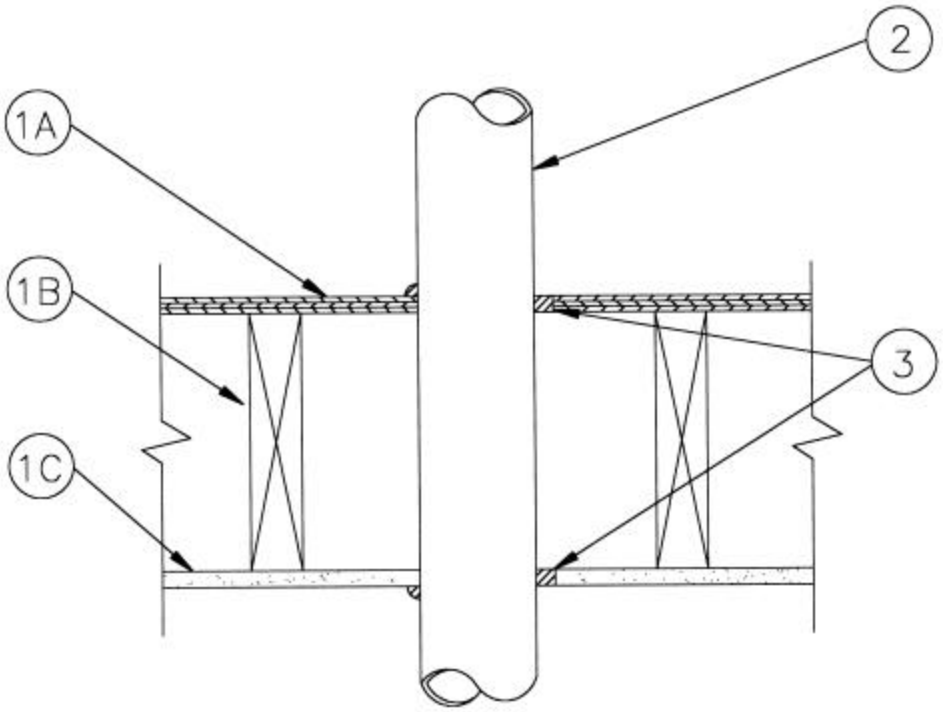
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classified Marking

System No. F-C-1122

F Rating – 1 Hr

T Rating – 1/4 Hr



1. **Floor-Ceiling Assembly –** The fire rated wood truss or combination wood and steel truss Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture-*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 5-1/8 in.
   B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   C. **Gypsum Board * –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed concentrically or eccentrically within the firestop system, The annular space between pipe, conduit or tubing and periphery of opening shall be min 1/4 in. to max 3/4 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor assembly. The following types and sizes of metallic pipe, conduit or tubing may be used:
   A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Conduit –** Nom 4 in. diam (or smaller) electrical metallic tubing (EMT) or steel conduit.
   C. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
   D. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe
   E. **Iron Pipe –** Nom 4 in. diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 4 in. (or smaller) or Class 50 (or heavier) ductile iron pressure pipe.

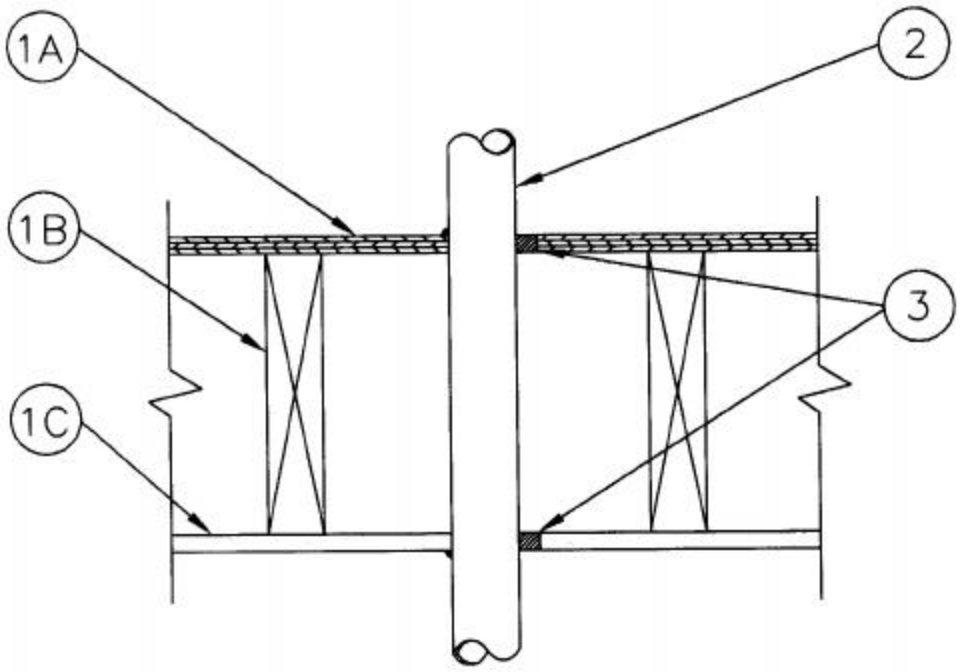
3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. applied within the annulus, flush with the surface of ceiling.

John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classified Marking

System No. F-C-2283

F Rating – 1 Hr
T Rating – 1 Hr



1. **Floor-Ceiling Assembly –** The fire rated wood truss or combination wood and steel truss Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3-1/8 in.
   B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC, with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   C. **Gypsum Board* –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design. Max diam of opening is 3-1/8 in.

2. **Through Penetrant –** One non-metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 7/8 in. Pipe to be rigidly supported on both sides of floor assembly.
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 cellular or solid core chlorinated polyvinyl chloride (CPVC) pipe for use in closed (process or supply) piping systems.
   B. **Polyvinyl Chloride (PVC) Pipe –** Nom 2 in. diam (or smaller) Schedule 40 (or heavier) PVC pipe for use in closed (process or supply) piping systems.
   C. **Rigid Nonmetallic Conduit+ –** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code (NFPA No. 70).

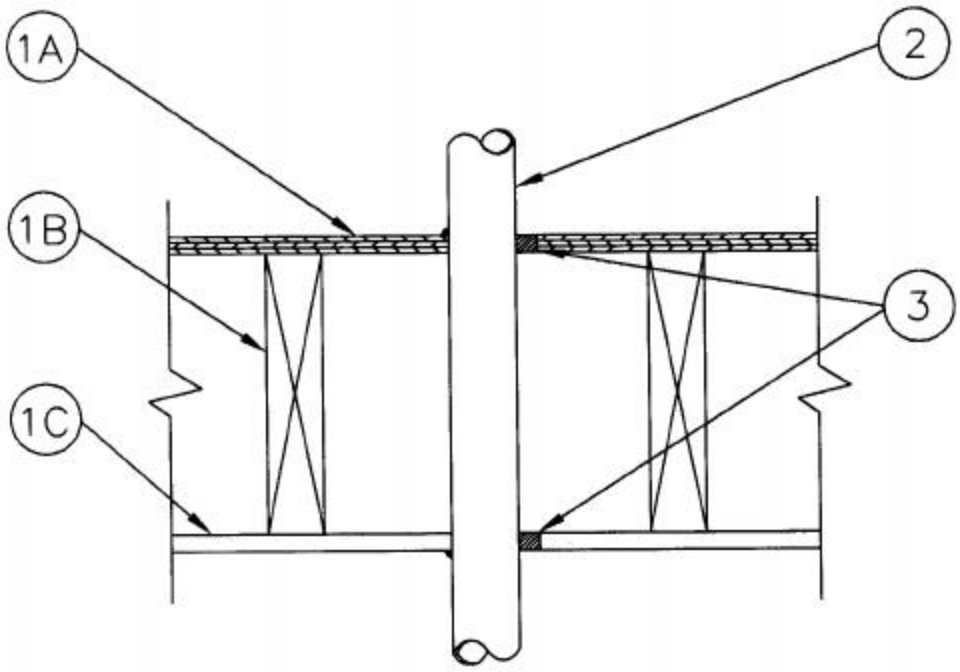
3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Min 1/2 in. diam bead of fill material applied at the penetrant/floor and penetrant/ceiling interfaces at point contact locations on both sides of assembly.

John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking
+Bearing the UL Listing Mark

System No. F-C-2287

F Rating – 1 Hr
T Rating – 1 Hr



1. **Floor-Ceiling Assembly –** The fire rated wood truss or combination wood and steel truss Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3-1/8 in.
   B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC, with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   C. **Gypsum Board* –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design. Max diam of opening is 3-1/8 in.

2. **Through Penetrant –** One non-metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 7/8 in. Pipe to be rigidly supported on both sides of floor assembly.
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 cellular or solid core chlorinated polyvinyl chloride (CPVC) pipe for use in closed (process or supply) piping systems.
   B. **Polyvinyl Chloride (PVC) Pipe –** Nom 2 in. diam (or smaller) Schedule 40 (or heavier) PVC pipe for use in closed (process or supply) piping systems.
   C. **Rigid Nonmetallic Conduit+ –** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code (NFPA No. 70).

3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Min 1/2 in. diam bead of fill material applied at the penetrant/floor and penetrant/ceiling interfaces at point contact locations on both sides of assembly.

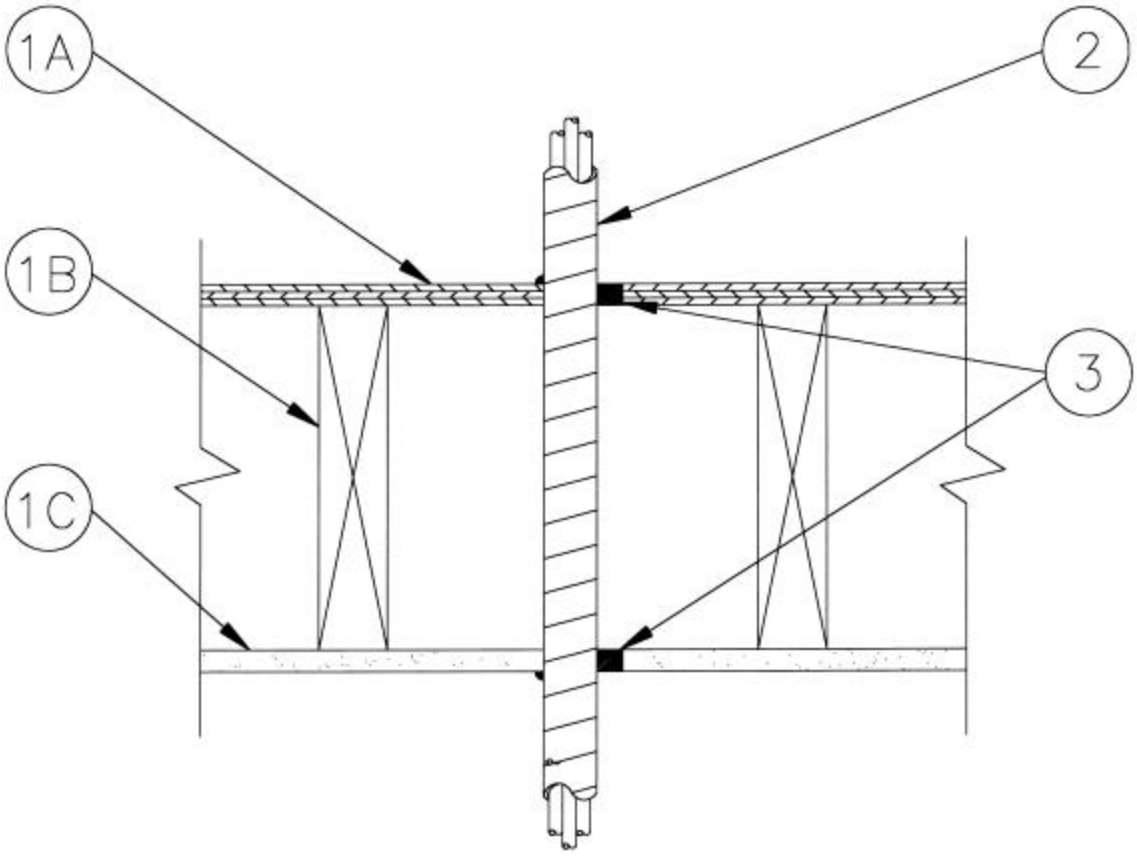
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking
+Bearing the UL Listing Mark

System No. F-C-3079

F Rating – 1 Hr

T Rating – 1 Hr



1. **Floor-Ceiling Assembly –** The 1 hr fire rated wood truss or combination wood and steel truss floor-ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   - A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of opening is 5-1/8 in.
   - B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   - C. **Gypsum Board* –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design. Max diam of opening is 5-1/8 in.

2. **Cables –** Max 3/C No. 3/0 AWG with 1 No, 8 AWO bare copper ground, aluminum-clad or steel-clad TEK cable, with or without polyvinyl chloride PVC jacket. The annular space between cable and periphery of opening shall be min 0 in. (point contact) to max 3/4 in. Cable to be rigidly supported on both side of wall.

3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Min 1/4 in. diam bead of fill material shall be applied at the cable/floor and cable/ceiling interfaces at point contact locations on both sides of assembly.

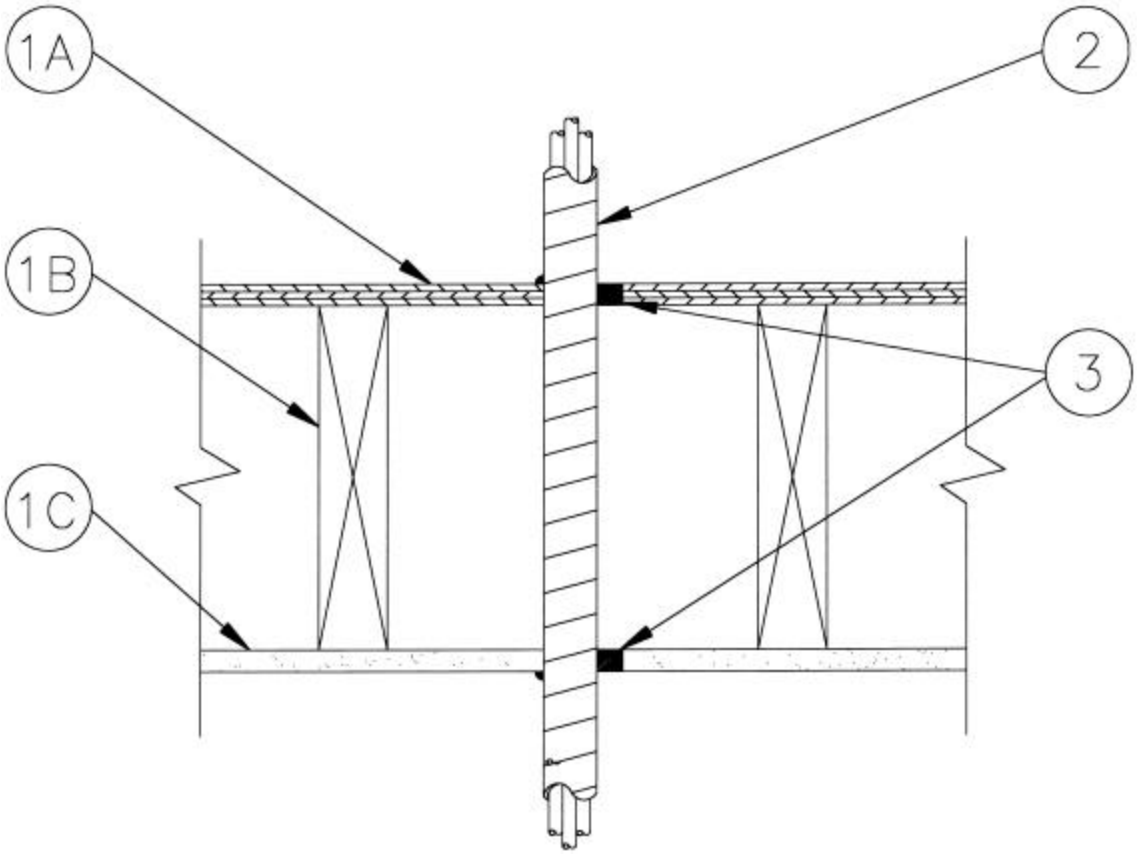
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classified Marking

System No. F-C-3080

F Rating – 1 Hr

T Rating – 1 Hr



1. **Floor-Ceiling Assembly –** The 1 hr fire rated wood truss or combination wood and steel truss floor-ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Flooring System –** Lumber of plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of opening is 5-1/8 in.
   B. **Wood Joists* –** Nom 2 by 10 in. deep (or deeper) lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.
   C. **Gypsum Board* –** Nom 5/8 in. thick as specified in the individual Floor-Ceiling Design. Max diam of opening is 5-1/8 in.

2. **Cables –** Max 3/C No. 3/0 AWG with 1 No, 8 AWO bare copper ground, aluminum-clad or steel-clad TEK cable, with or without polyvinyl chloride PVC jacket. The annular space between cable and periphery of opening shall be min 0 in. (point contact) to max 3/4 in. Cable to be rigidly supported on both side of wall.

3. **Fill, Void or Cavity Material* – Sealant –** Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Min 1/4 in. diam bead of fill material shall be applied at the cable/floor and cable/ceiling interfaces at point contact locations on both sides of assembly.

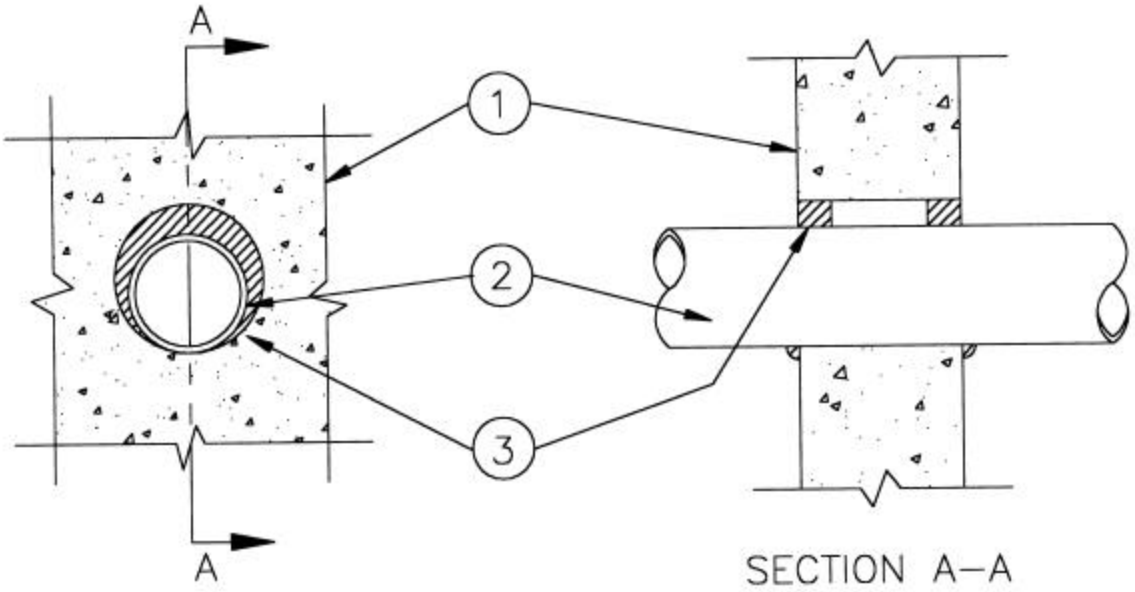
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classified Marking

System No. W-J-1153

F Ratings – 1, 2, 3 and 4 Hr (Item 1)

T Ratings – 0 & 1/4 Hr (See Item 2)



1. **Wall Assembly –** Min 4-7/8, 6-1/8, 7-3/8, 8-5/8 in. thick normal weight or lightweight (100-150 pcf) concrete for 1, 2, 3, 4 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 14-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

   The F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. to max 1-3/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** The following types and sizes of steel pipes may be used:
      1A. Nom 4 in. diam (or smaller) Schedule 7 (or heavier) steel pipe.
      2A. Nom 8 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
      3A. Nom 10 in. diam (or smaller) Schedule 20 (or heavier) steel pipe.

      When steel pipe is used, T Rating is 1/4 hr for nom 4 in. diam (or smaller) and 0 hr for steel pipes greater than nom 4 in. diam.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe. When iron pipe is used T Rating is 1/4 hr.
   C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT). When EMT is used T Rating is 1/4 hr.
   D. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing. When copper tube is used T Rating is 0 hr.
   E. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe. When copper pipe is used T Rating is 0 hr.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of sealant for 1 rated wall assembly, and min 1 in. thickness of sealant for 2, 3 and 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be installed at the concrete/penetrant interface on both surfaces of wall.

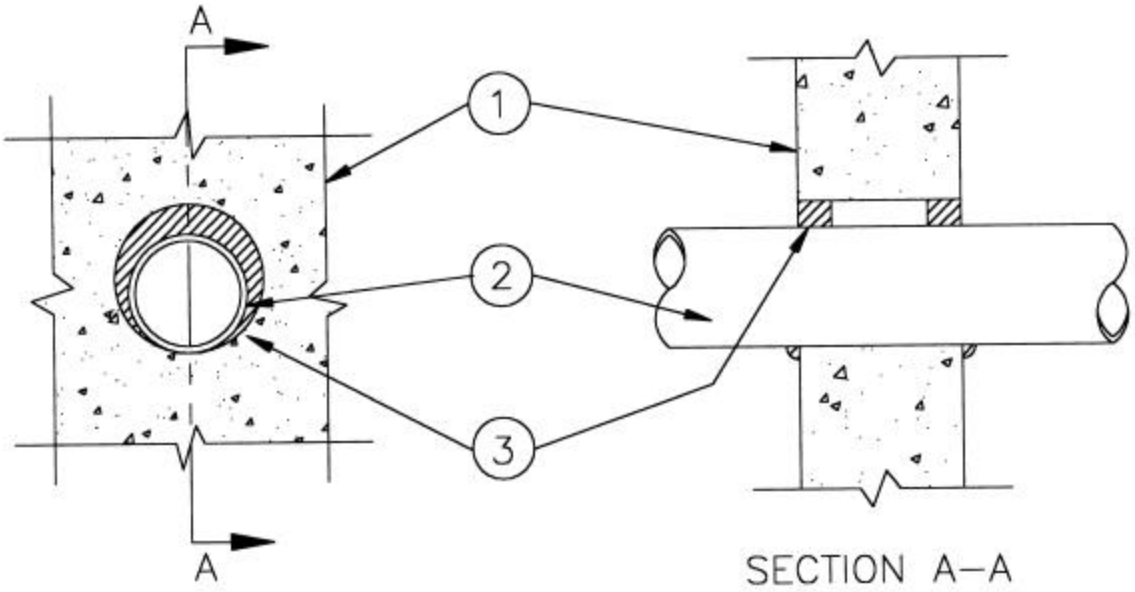
   John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-J-1157

F Ratings – 1, 2, 3 and 4 Hr (Item 1)

T Ratings – 0 & 1/4 Hr (See Item 2)



1. **Wall Assembly –** Min 4-7/8, 6-1/8, 7-3/8, 8-5/8 in. thick normal weight or lightweight (100-150 pcf) concrete for 1, 2, 3, 4 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 14-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

   The F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. to max 1-3/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** The following types and sizes of steel pipes may be used:
      1A. Nom 4 in. diam (or smaller) Schedule 7 (or heavier) steel pipe.
      2A. Nom 8 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
      3A. Nom 10 in. diam (or smaller) Schedule 20 (or heavier) steel pipe.
      When steel pipe is used, T Rating is 1/4 hr for nom 4 in. diam (or smaller) and 0 hr for steel pipes greater than nom 4 in. diam.
   B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe. When iron pipe is used T Rating is 1/4 hr.
   C. **Conduit –** Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT). When EMT is used T Rating is 1/4 hr.
   D. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing. When copper tube is used T Rating is 0 hr.
   E. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe. When copper pipe is used T Rating is 0 hr.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of sealant for 1 rated wall assembly, and min 1 in. thickness of sealant for 2, 3 and 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be installed at the concrete/penetrant interface on both surfaces of wall.

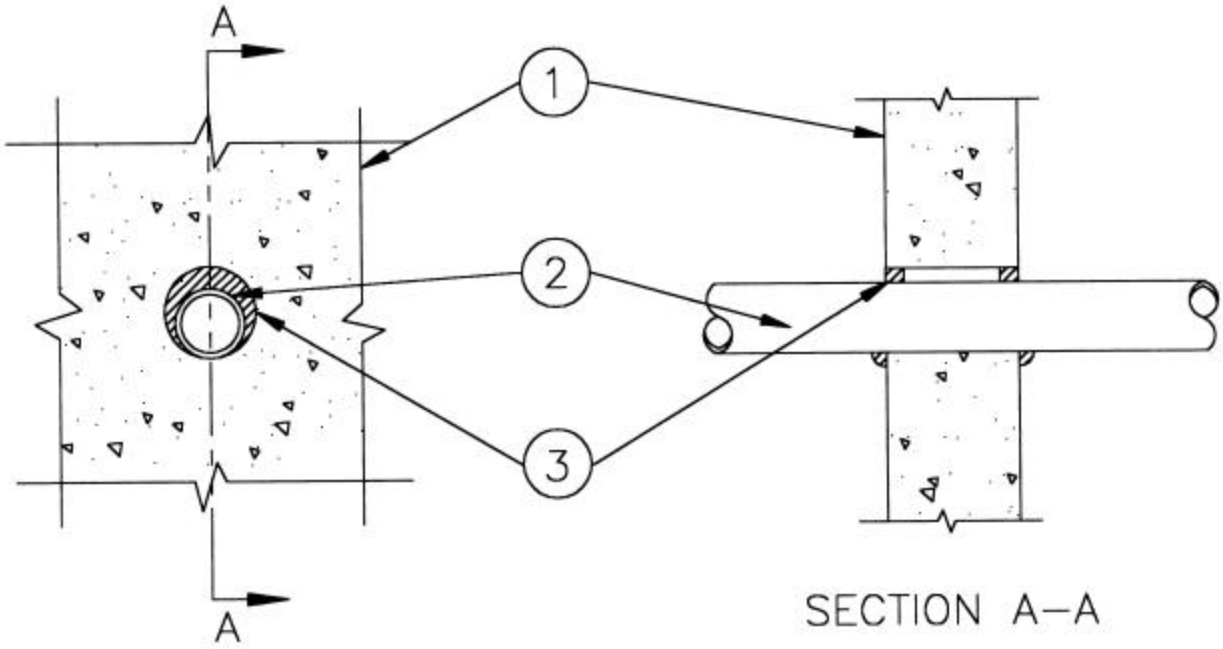
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-J-2149

F Rating – 1, 2, 3 & 4 Hr (See Item 1)

T Rating – 1, 2, 3 & 4 Hr



1. **Wall Assembly –** Min 4-7/8, 6-1/8, 7-3/8 or 8-5/8 in. thick lightweight or normal weight (100- 150 pcf) concrete for 1, 2, 3 or 4 hour rated wall assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks.** Max diam of opening is 3-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
   The F and T Ratings of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed

2. **Through Penetrants –** One nonmetallic pipe or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 0 in. to max 7/8 in. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or tubing may be used:
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems.
   B. **Polyvinyl Chloride (PVC) Pipe –** Nom 2 in. diam (or smaller) Schedule 40 (or heavier) cellular or solid core PVC pipe for use in closed (process or supply) piping systems.
   C. **Crosslinked Polyethylene (PEX) Tubing –** Nom 1-1/2 in. diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness for 1 hr rated wall assemblies and 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the concrete/penetrant interface on both surfaces of wall.

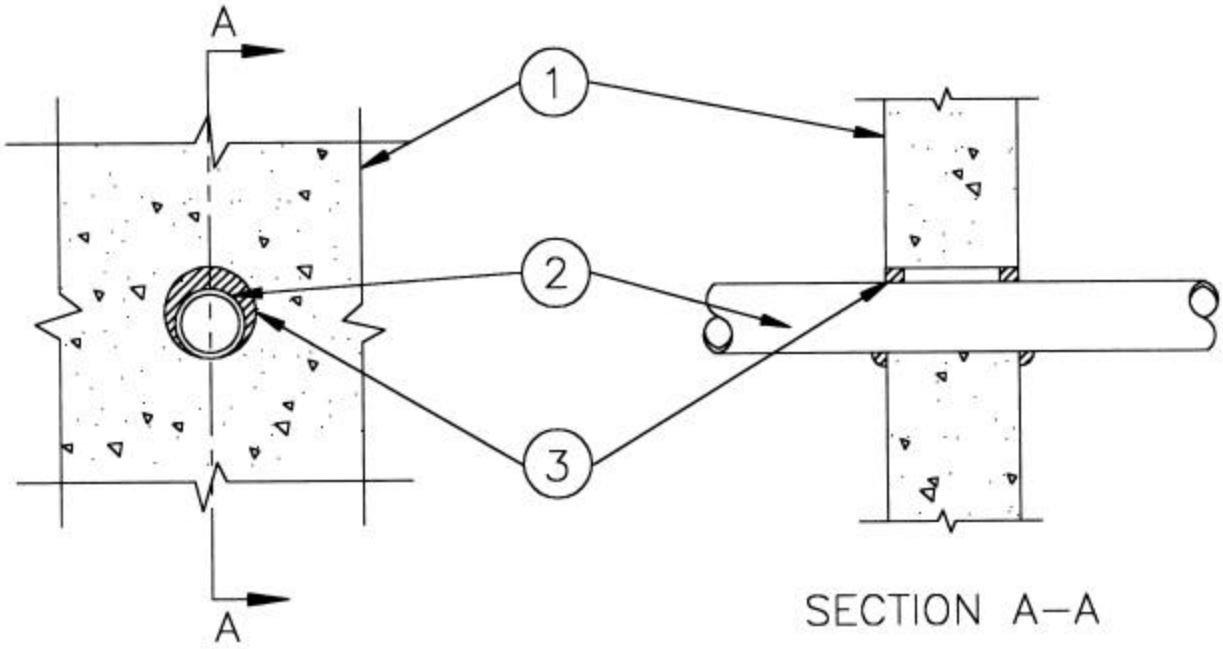
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-J-2153

F Rating – 1, 2, 3 & 4 Hr (See Item 1)

T Rating – 1, 2, 3 & 4 Hr



1. **Wall Assembly –** Min 4-7/8, 6-1/8, 7-3/8 or 8-5/8 in. thick lightweight or normal weight (100- 150 pcf) concrete for 1, 2, 3 or 4 hour rated wall assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks.** Max diam of opening is 3-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
   The F and T Ratings of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed

2. **Through Penetrants –** One nonmetallic pipe or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 0 in. to max 7/8 in. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or tubing may be used:
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems.
   B. **Polyvinyl Chloride (PVC) Pipe –** Nom 2 in. diam (or smaller) Schedule 40 (or heavier) cellular or solid core PVC pipe for use in closed (process or supply) piping systems.
   C. **Crosslinked Polyethylene (PEX) Tubing –** Nom 1-1/2 in. diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness for 1 hr rated wall assemblies and 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the concrete/penetrant interface on both surfaces of wall.

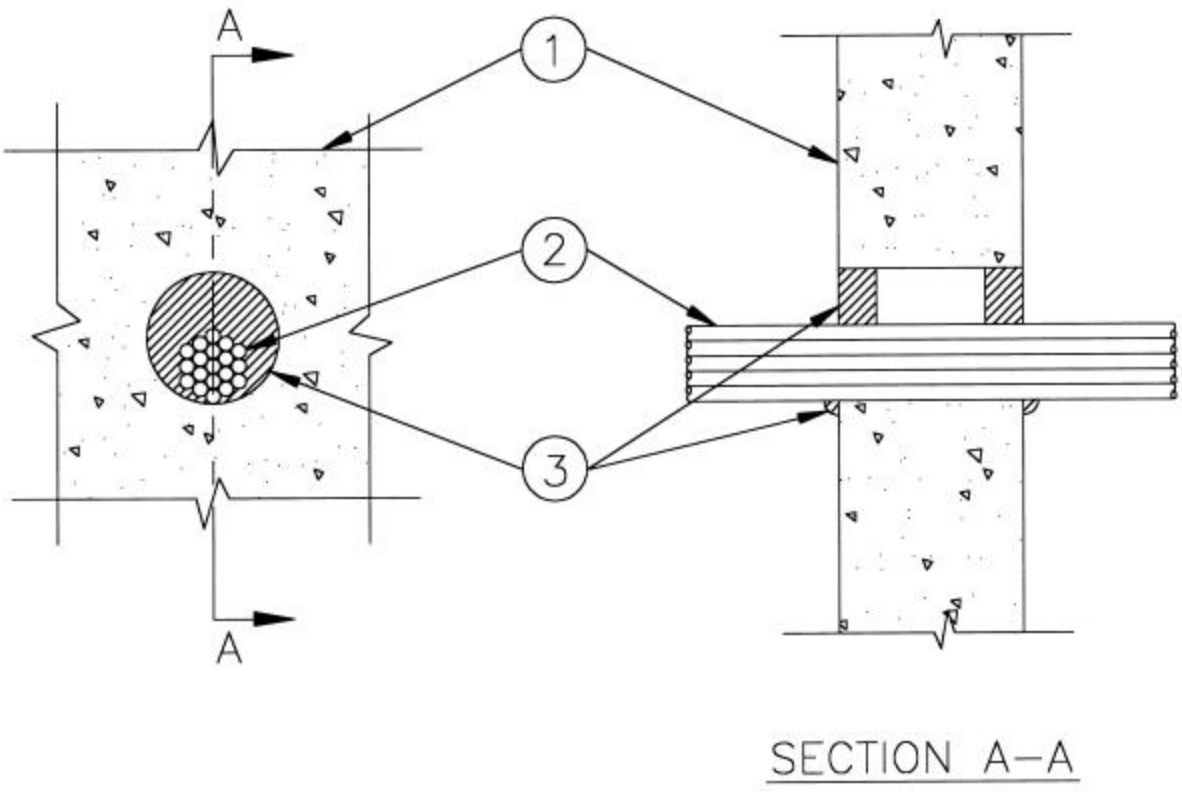
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-J-3121

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 3/4 Hr



SECTION A–A

1. **Wall Assembly –** Min 4-7/8 or 6-1/8 in. thick lightweight or normal weight (100-150 pcf) concrete for 1 or 2 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 3-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 44 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 1-1/2 in. Cables to be rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
   A. 3/C No. 3/0 (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   B. 2/C No. 10 AWG (or smaller) copper conductor PVC cable with XLPE insulation.

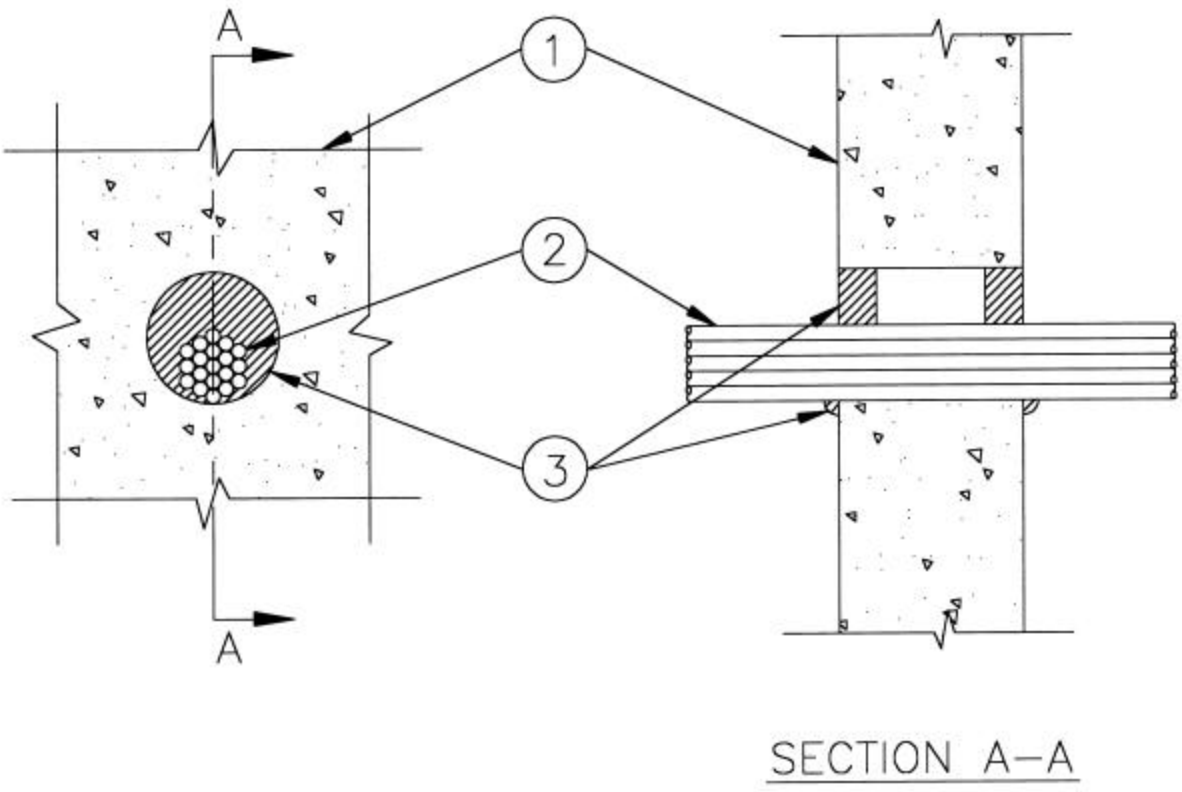
3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 or 1-1/4 in. thickness of fill material for 1 or 2 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. Sealant to be forced into interstices of cable group to max extent possible. At the point contact location between cable(s) and concrete, a min 1/2 in. diam bead of fill material shall be applied at the concrete/cable interface on both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-J-3123

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 3/4 Hr



SECTION A–A

1. **Wall Assembly –** Min 4-7/8 or 6-1/8 in. thick lightweight or normal weight (100-150 pcf) concrete for 1 or 2 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 3-1/8 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 44 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 1-1/2 in. Cables to be rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
   A. 3/C No. 3/0 (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   B. 2/C No. 10 AWG (or smaller) copper conductor PVC cable with XLPE insulation.

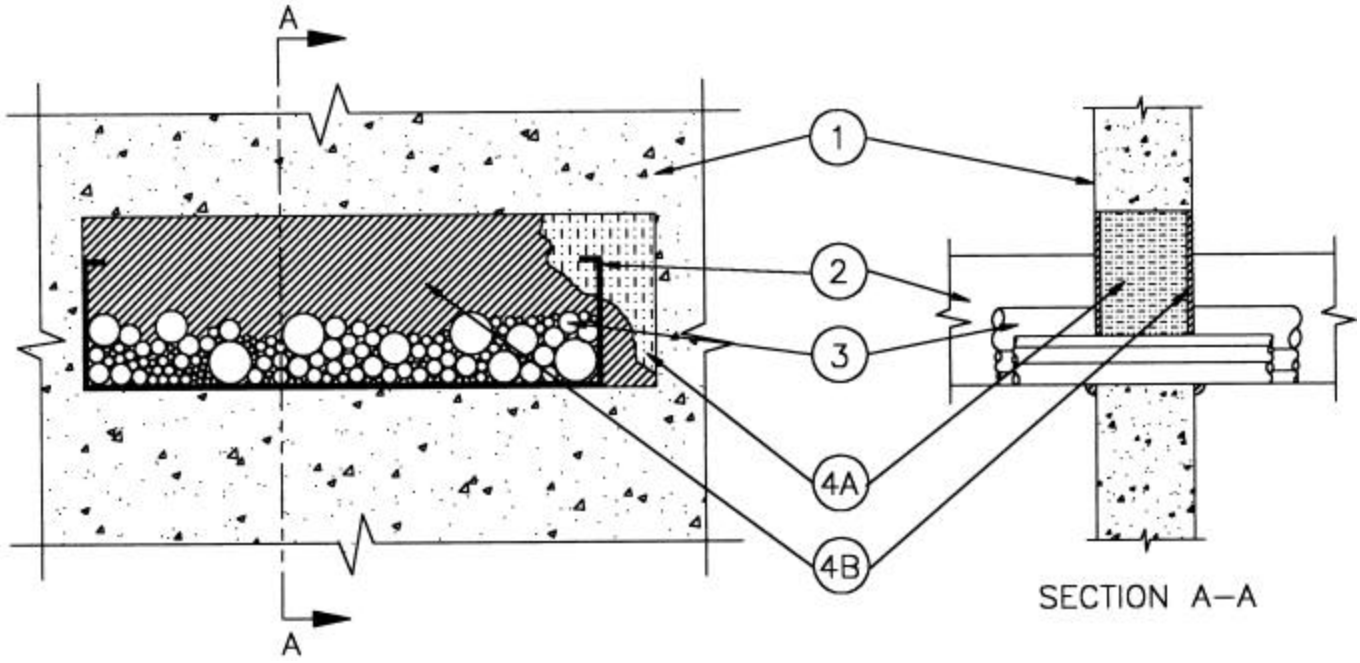
3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 or 1-1/4 in. thickness of fill material for 1 or 2 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. Sealant to be forced into interstices of cable group to max extent possible. At the point contact location between cable(s) and concrete, a min 1/2 in. diam bead of fill material shall be applied at the concrete/cable interface on both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-J-4046

F-Rating – 2 Hr

T-Rating – 3/4 Hr



1. **Wall Assembly –** Min 4-7/8 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max opening size to be 26 in. by 8 in. (208 sq. in.). See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cable Tray+ –** Max 24 in. wide by max 6 in. deep 15 gauge (or heavier) aluminum or steel cable tray installed within the opening. The annular space between the cable tray and the periphery of the opening shall be min 0 in. (point contact) to max 2 in. Cable tray to be rigidly supported on both sides of wall assembly.

3. **Cables –** Aggregate cross-sectional area of cables in opening to be max 40 percent of the cross-sectional area of the opening. The annular space between cables and periphery of opening shall be shall be min 0 in. (point contact) to max 5-3/4 in. Cables to be rigidly supported on both sides of wall assembly. The following types and sizes of cables may be used:
   - A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.
   - B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   - C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   - D. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.
   - E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.
   - F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

4. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 4-3/8 in. thickness of min 4 pcf mineral wool batt insulation packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as to accommodate the required thickness of fill material (Item B1 and B2).

B1. **Fill, Void or Cavity Material* – Sealant –** Min 1/8 in. thickness of fill material sprayed or brushed on each side of wall assembly completely covering mineral wool, overlapping a min 1/2 in. onto concrete. At point contact location between penetrant and periphery of opening, a min 1/2 in. overlap of fill material shall be applied onto penetrant and concrete on both surfaces of wall.

John Wagner & Associates Inc. – GrabberGard EFS

B2. **Fill, Void or Cavity Material* – Sealant –** As an alternative to Item B1, min 1/4 in. thickness of fill material applied within annulus, flush with both sides of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the periphery of opening/penetrant interface on both surfaces of wall.

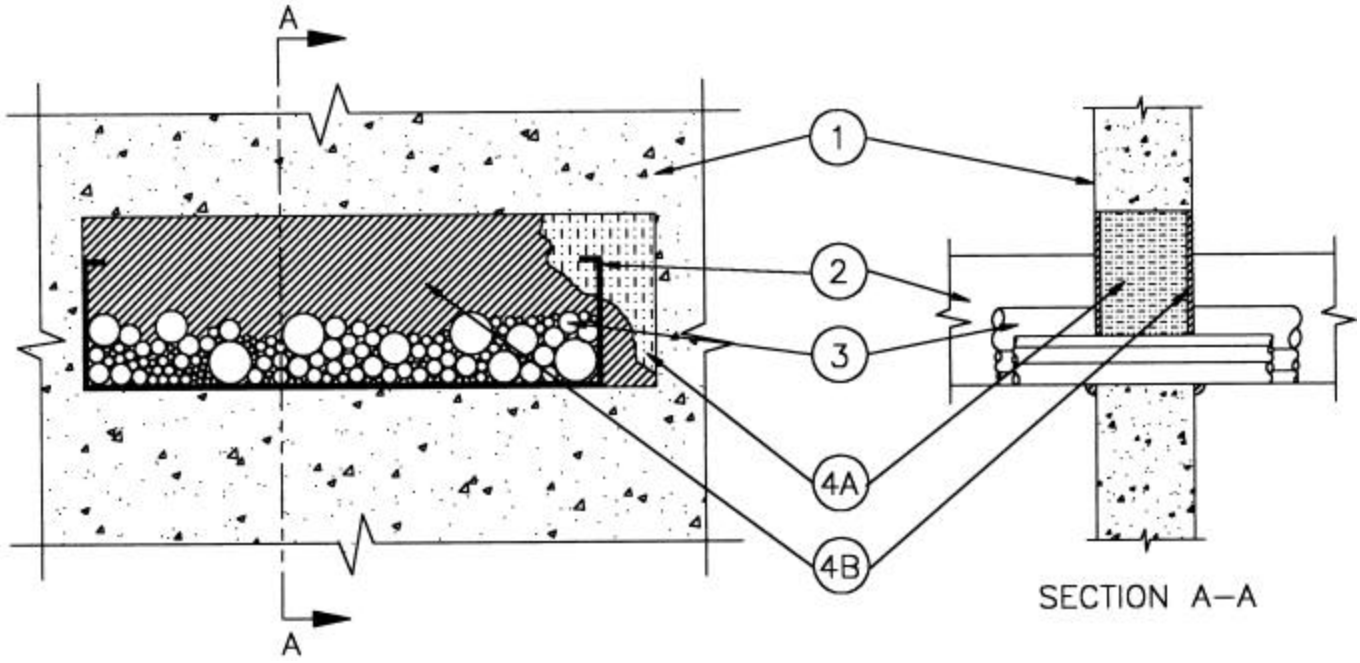
John Wagner & Associates Inc. – GrabberGard IFC

+Bearing the UL Listing Marking
*Bearing the UL Classification Marking

System No. W-J-4047

F-Rating – 2 Hr

T-Rating – 3/4 Hr



1. **Wall Assembly –** Min 4-7/8 in. thick lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max opening size to be 26 in. by 8 in. (208 sq. in.). See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cable Tray+ –** Max 24 in. wide by max 6 in. deep 15 gauge (or heavier) aluminum or steel cable tray installed within the opening. The annular space between the cable tray and the periphery of the opening shall be min 0 in. (point contact) to max 2 in. Cable tray to be rigidly supported on both sides of wall assembly.

3. **Cables –** Aggregate cross-sectional area of cables in opening to be max 40 percent of the cross-sectional area of the opening. The annular space between cables and periphery of opening shall be shall be min 0 in. (point contact) to max 5-3/4 in. Cables to be rigidly supported on both sides of wall assembly. The following types and sizes of cables may be used:
   - A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.
   - B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   - C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   - D. Max 25 pair No. 20 AWG (and smaller) copper conductor PVC jacketed cable with PVC insulation.
   - E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.
   - F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

4. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 4-3/8 in. thickness of min 4 pcf mineral wool batt insulation packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as to accommodate the required thickness of fill material (Item B).

B. **Fill, Void or Cavity Material* – Sealant –** Min 1/4 in. thickness of fill material applied within annulus, flush with both sides of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the periphery of opening/penetrant interface on both surfaces of wall.

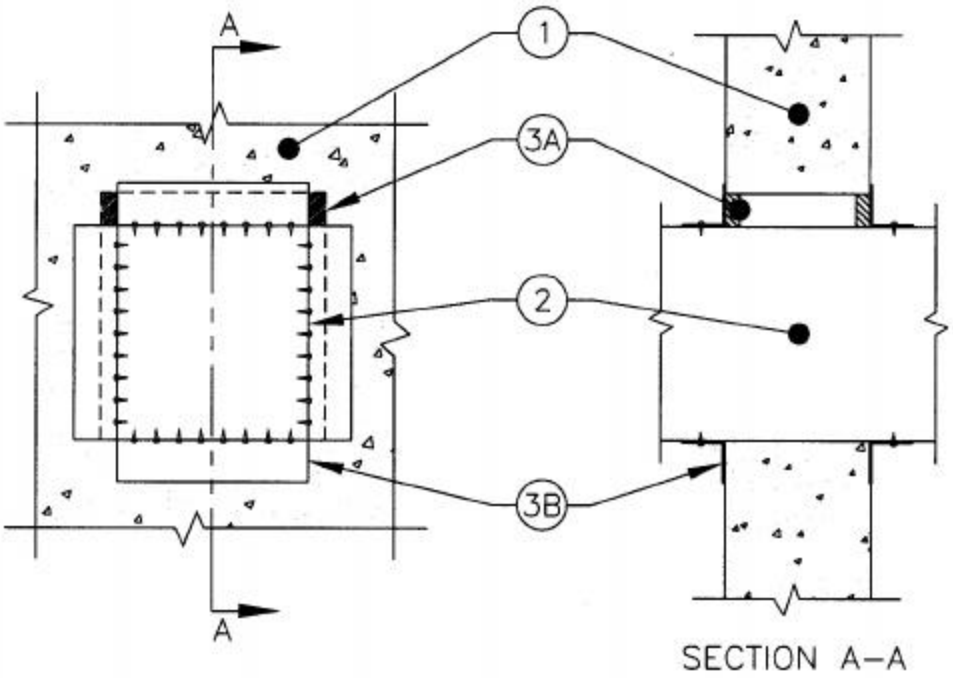
John Wagner & Associates Inc. – GrabberGard EFC

+Bearing the UL Listing Marking
*Bearing the UL Classification Marking

System No. W-J-7064

F Rating – 2 Hr

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max size of opening to be 957 sq. in. with a max dimension of 33 in.

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

2. **Steel Duct –** Nom 26 in. by 30 (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System** – The firestop system shall consist of the following:

   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact location between duct and concrete, a min 1/4 in. diam bead of sealant shall be applied at the concrete/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard IFC

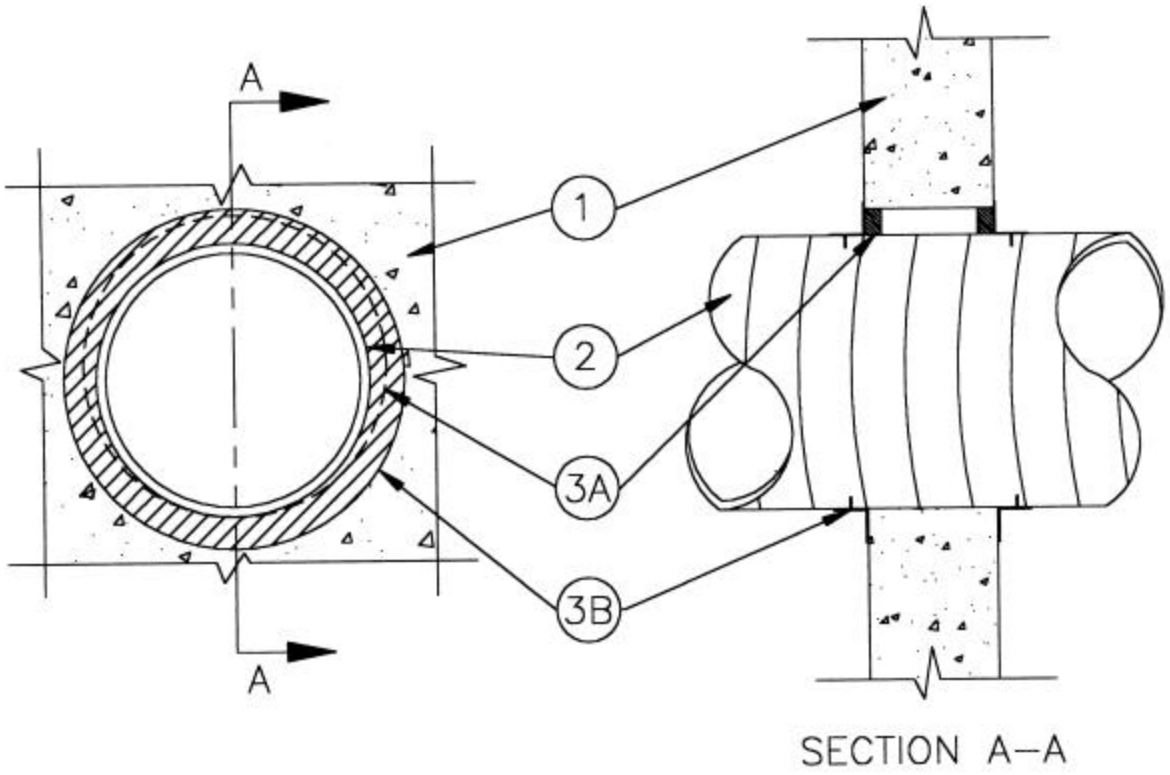
   B. **Retaining Angles –** Min 16 gauge galv steel angles sized to lap duct a min of 2 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 1 in. from each end of duct and spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-J-7065

F Rating – 1 & 2 Hr

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 17 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct –** Nom 16 in. diam (or smaller) No. 26 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in. (point contact) to max 1 in. Duct to be rigidly supported on both sides of wall assembly.

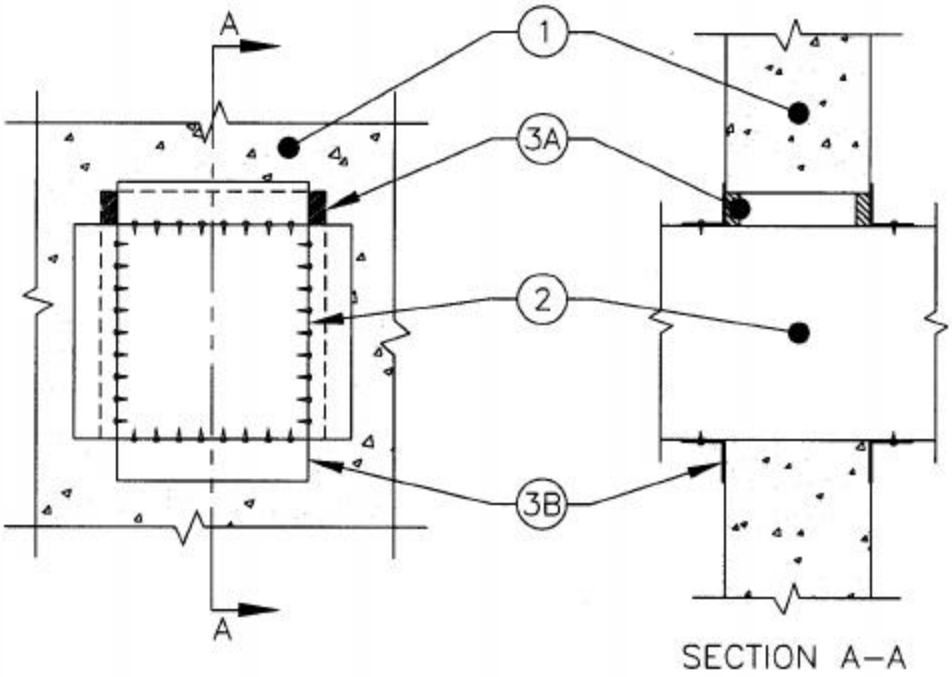
3. **Firestop System** – The firestop system shall consist of the following:
   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and concrete, a min 1/4 in. diam bead of sealant shall be applied at the concrete/duct interface on both surfaces of wall assembly.
   John Wagner & Associates Inc. – GrabberGard IFC
   B. **Retaining Angles –** Min 16 gauge galv steel angles roll-formed and sized to lap duct a min of 1 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-J-7066

F Rating – 2 Hr

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max size of opening to be 957 sq. in. with a max dimension of 33 in.

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

2. **Steel Duct –** Nom 26 in. by 30 (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System** – The firestop system shall consist of the following:

   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact location between duct and concrete, a min 1/4 in. diam bead of sealant shall be applied at the concrete/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard EFC

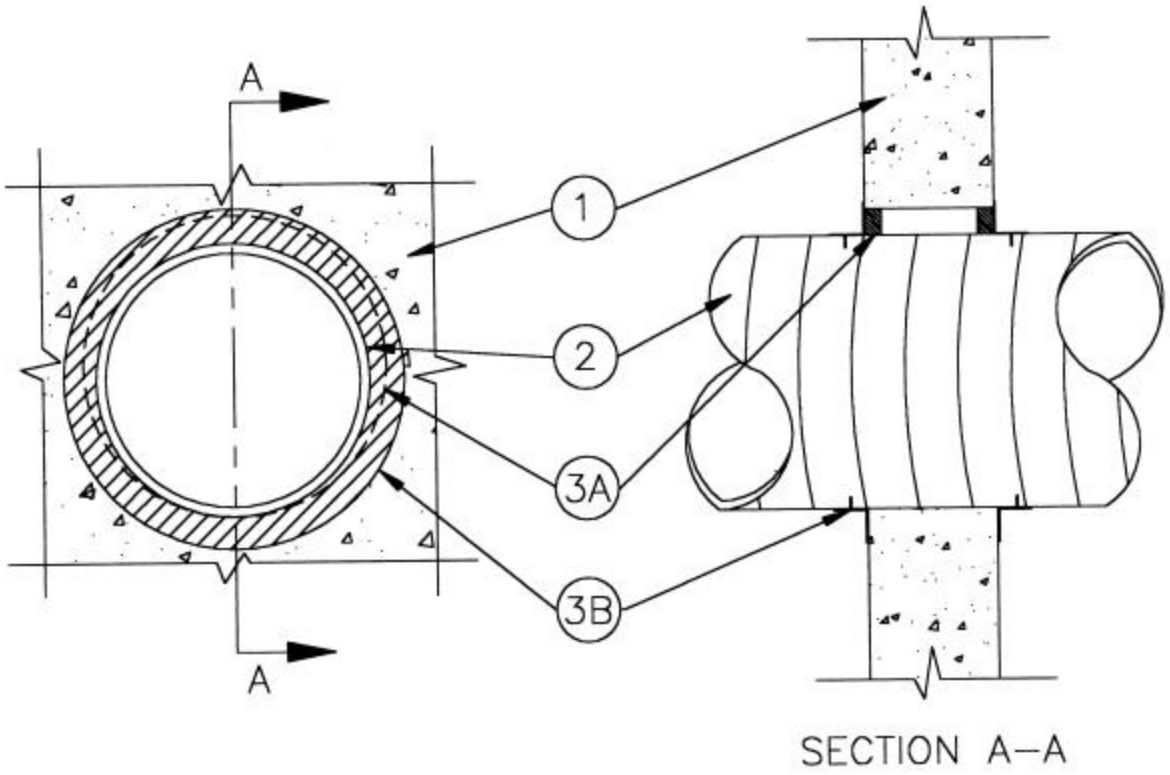
   B. **Retaining Angles –** Min 16 gauge galv steel angles sized to lap duct a min of 2 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 1 in. from each end of duct and spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-J-7067

F Rating – 1 & 2 Hr

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 17 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct –** Nom 16 in. diam (or smaller) No. 26 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in. (point contact) to max 1 in. Duct to be rigidly supported on both sides of wall assembly.

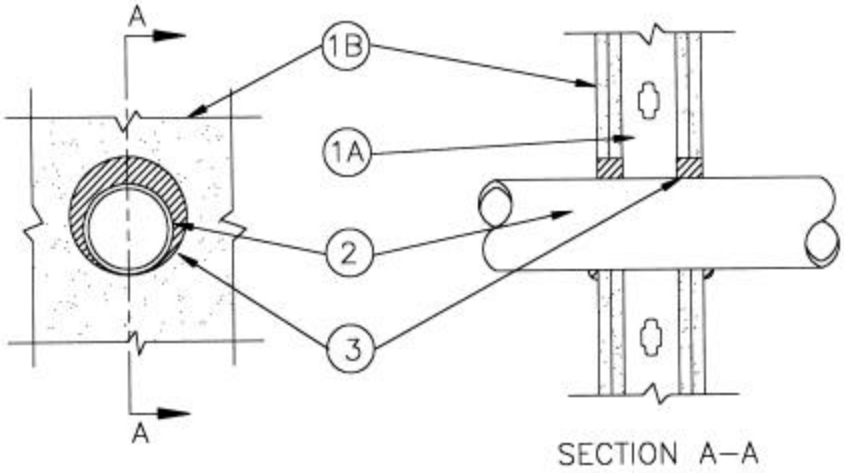
3. **Firestop System** – The firestop system shall consist of the following:
   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and concrete, a min 1/4 in. diam bead of sealant shall be applied at the concrete/duct interface on both surfaces of wall assembly.
   John Wagner & Associates Inc. – GrabberGard EFC
   B. **Retaining Angles –** Min 16 gauge galv steel angles roll-formed and sized to lap duct a min of 1 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-L-1338

F Rating – 1, 2, 3 & 4 Hr (See Item 1)

T Rating – 0 & 1/4 Hr (See Item 2)



1. **Wall Assembly –** The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 25-3/8 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 (point contact) in. to max 1-1/4 in. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** The following types and sizes of steel pipes may be used:
      1A. Nom 12 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
      2A. Nom 24 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.

      When steel pipe is used, T Rating is 1/4 hr for nom 4 in. diam (or smaller) and 0 hr for steel pipes greater than nom 4 in. diam.
   B. **Iron Pipe –** Nom 24 in. diam (or smaller) cast or ductile iron pipe. When iron pipe is used T Rating is 1/4 hr. **When iron pipe is used, T Rating is 1/4 hr.**
   C. **Conduit** – Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or steel conduit. **When EMT or steel conduit is used, T Rating is 1/4 hr.**
   D. **Copper Tubing** – Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing. **When copper tube is used, T Rating is 0 hr.**
   E. **Copper Pipe** – Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe. **When copper pipe is used, T Rating is 0 hr.**

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material for 1 hr rated wall assemblies and 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and gypsum board, a min 1/2 in. diam bead of fill material shall be installed at the gypsum board/penetrant interface on both surfaces of wall.

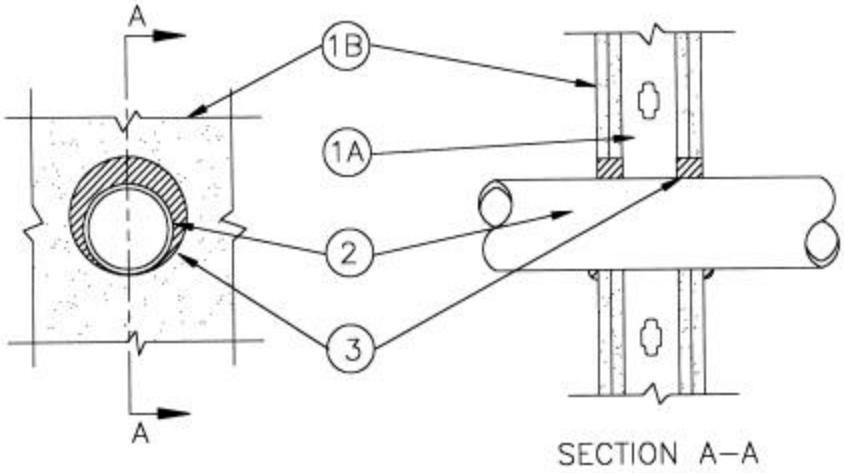
   John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-L-1342

F Rating – 1, 2, 3 & 4 Hr (See Item 1)

T Rating – 0 & 1/4 Hr (See Item 2)



1. **Wall Assembly –** The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 25-3/8 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 (point contact) in. to max 1-1/4 in. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** The following types and sizes of steel pipes may be used:
      1A. Nom 12 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
      2A. Nom 24 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.

      When steel pipe is used, T Rating is 1/4 hr for nom 4 in. diam (or smaller) and 0 hr for steel pipes greater than nom 4 in. diam.
   B. **Iron Pipe –** Nom 24 in. diam (or smaller) cast or ductile iron pipe. When iron pipe is used T Rating is 1/4 hr. **When iron pipe is used, T Rating is 1/4 hr.**
   C. **Conduit** – Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or steel conduit. **When EMT or steel conduit is used, T Rating is 1/4 hr.**
   D. **Copper Tubing** – Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing. **When copper tube is used, T Rating is 0 hr.**
   E. **Copper Pipe** – Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe. **When copper pipe is used, T Rating is 0 hr.**

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material for 1 hr rated wall assemblies and 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and gypsum board, a min 1/2 in. diam bead of fill material shall be installed at the gypsum board/penetrant interface on both surfaces of wall.

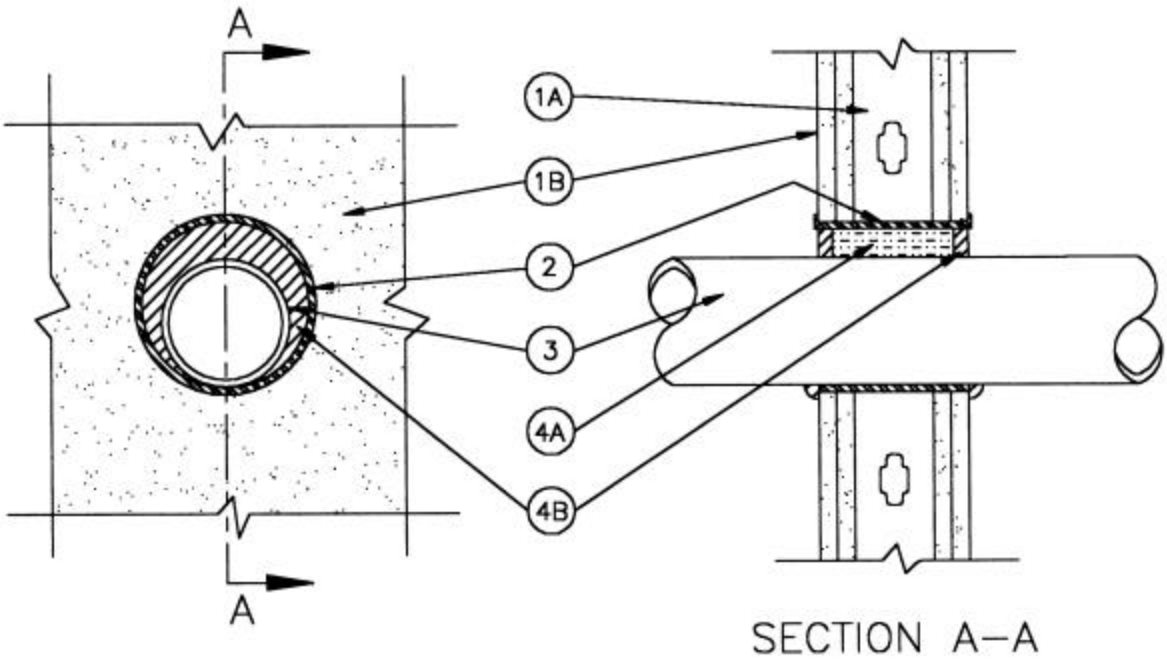
   John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-L-1449

F Rating – 1 & 2 Hr (See Item 1B)

T Rating –1/4 Hr



1. **Wall Assembly –** The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 in. by 4 in. (38 mm by 89 mm) lumber spaced max 16 in. (406 m) OC. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 8-1/2 in. (216 mm).

   The hourly F Rating of the firestop system is equal to the hourly rating of the wall in which it is installed.

2. **Metallic Sleeve –** Outside diam of sleeve to be tightly fitted with inside diam of opening, flush with both surfaces of wall assembly. The following metallic sleeves may be used:
   A. **Sheet Metal Sleeve –** Cylindrical sleeve fabricated from 24 gauge or heavier galv steel and having a min 1 in. (25 mm) overlap along longitudinal seam.
   B. **Steel Sleeve –** Nom 8 in. (203 mm) diam (or smaller) schedule 40 (or lighter) steel cast or ductile iron sleeve.

3. **Through Penetrants –** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of sleeve shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 6 in. (152 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 6 in. (152 mm) diam (or smaller) cast or ductile iron pipe.
   C. **Conduit –** Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or steel conduit.
   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.

4. **Firestop System –** The firestop system shall consist of the following:

   A. **Packing Material –** Min 3-5/8 in. or 4-7/8 in. (92 or 124 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation for 1 and 2 hr rated assemblies respectively, firmly packed into opening, with approximately 25 percent compression within the metallic sleeve. Packing material to be recessed from both surfaces of wall assembly to accommodate the required thickness of fill material (Item 4B).

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location between metallic sleeve and penetrant, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the metallic sleeve/penetrant interface on both surfaces of wall. Min 1/16 in. (1.6 mm) thickness of fill material applied over edge of sleeve, overlapping wallboard surface a min 1/4 in. (6 mm)

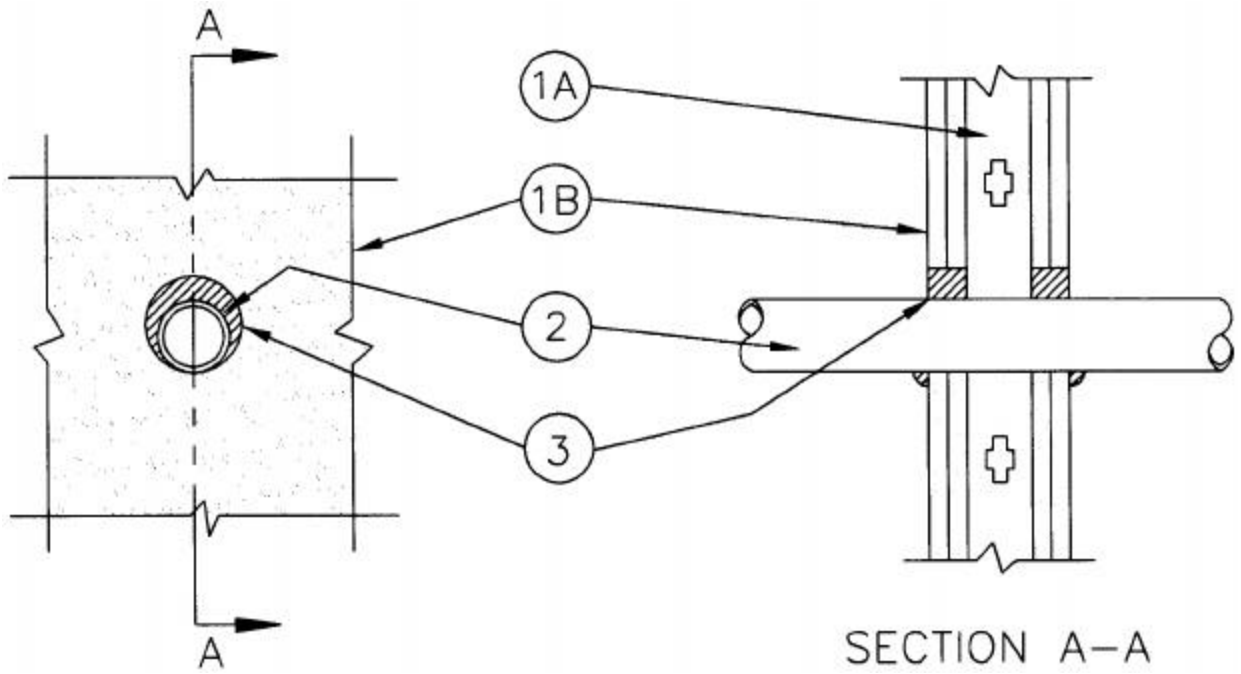
      John Wagner & Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-L-2384

F Rating – 1, 2, 3 & 4 Hr (See Item 1B)

T Rating – 1, 2, 3 & 4 Hr



1. **Wall Assembly –** The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 3-1/8 in.

   The hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the assembly in which it is installed.

2. **Through Penetrants –** One nonmetallic pipe or tubing installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or tubing may be used:
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems. The annular space between pipe and periphery of opening shall be min 1/4 in. to max 1/2 in.
   B. **Crosslinked Polyethylene (PEX) Tubing -** Nom 1-1/2 in. diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems. The annular space between tubing and periphery of opening shall be min 1/4 in. to max 3/8 in.
   C. **Polyvinyl Chloride (PVC) Pipe** - Nom 2 in. diam (or smaller) Schedule 40 solid core or cellular core PVC pipe for use in closed (process or supply) piping system. The annular space between pipe and periphery of opening shall be min 1/4 in. to max 1/2 in.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material for 1 hr rated wall assemblies and min 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall.

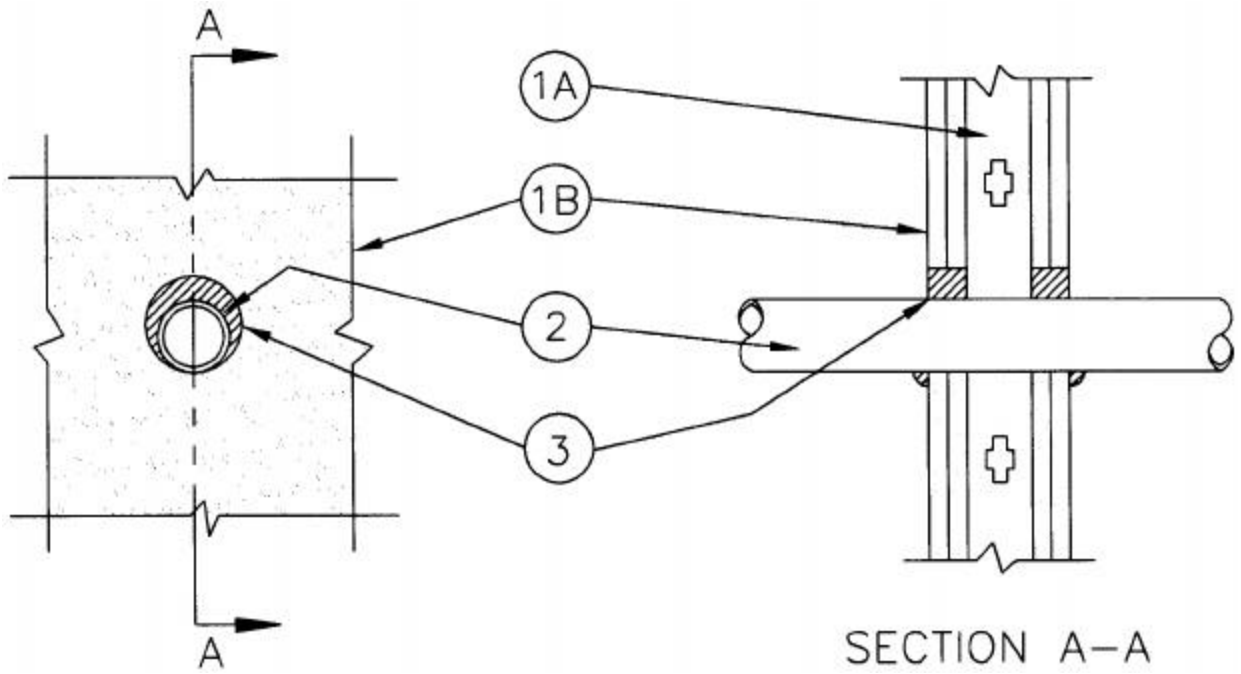
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-L-2387

F Rating – 1, 2, 3 & 4 Hr (See Item 1B)

T Rating – 1, 2, 3 & 4 Hr



1. **Wall Assembly –** The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 3-1/8 in.

   The hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the assembly in which it is installed.

2. **Through Penetrants –** One nonmetallic pipe or tubing installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or tubing may be used:
   A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 2 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems. The annular space between pipe and periphery of opening shall be min 1/4 in. to max 1/2 in.
   B. **Crosslinked Polyethylene (PEX) Tubing -** Nom 1-1/2 in. diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems. The annular space between tubing and periphery of opening shall be min 1/4 in. to max 3/8 in.
   C. **Polyvinyl Chloride (PVC) Pipe** - Nom 2 in. diam (or smaller) Schedule 40 solid core or cellular core PVC pipe for use in closed (process or supply) piping system. The annular space between pipe and periphery of opening shall be min 1/4 in. to max 1/2 in.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material for 1 hr rated wall assemblies and min 1 in. thickness of fill material for 2, 3 or 4 hr rated wall assemblies, applied within the annulus, flush with both surfaces of wall.

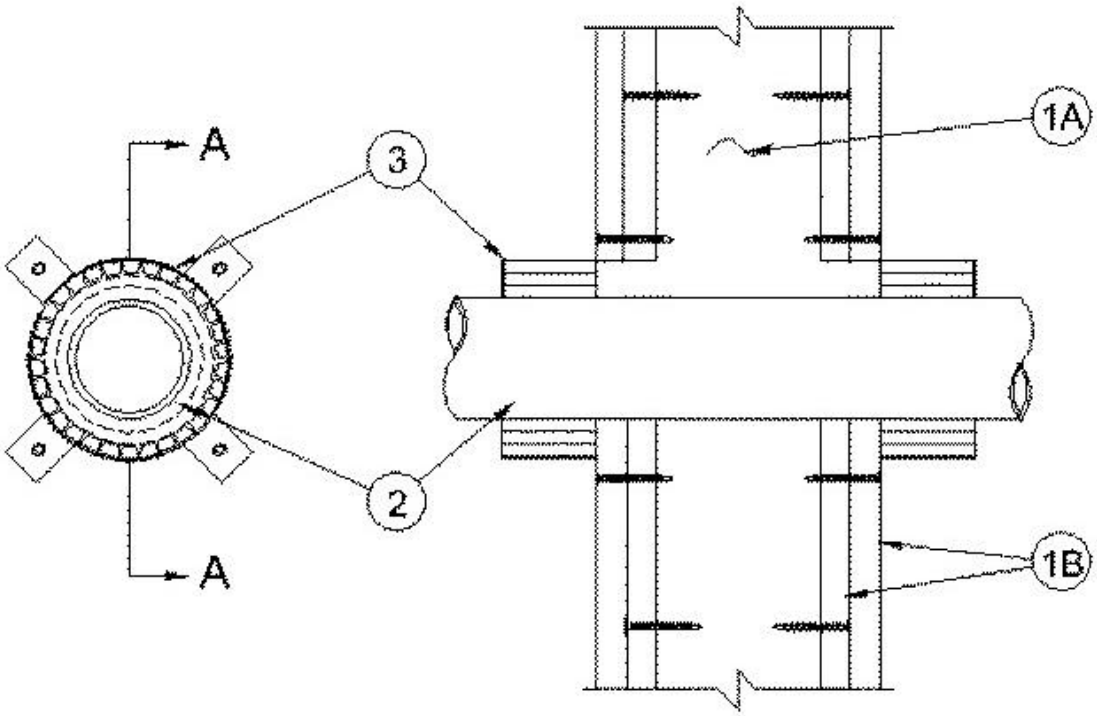
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-L-2475

F Rating – 1 and 2 Hr (See Item 2)

T Rating – 1 and 1-1/2 Hr (See Item 2)



SECTION A-A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
   B. **Gypsum Board* –** 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 4-3/4 in.

   The hourly F and T Ratings of the firestop system are equal dependent upon the hourly fire rating of the wall assembly in which it is installed and the type of through penetrant within the opening as shown in Item 2.

2. **Through Penetrants –** One nonmetallic pipe to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe or conduit and periphery of opening shall be min 0 in. (point contact) to max 1/4 in. Pipe or conduit to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or conduit may be used:
   A. **Polyvinyl Chloride (PVC) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 solid or cellular core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
   B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe –** Nom 4 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems.
   C. **Acrylonitrile Butadiene Styrene (ABS) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 solid or cellular core ABS Pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
   D. **Rigid Nonmetallic Conduit+ –** Nom 4 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code (NFPA No. 70).
   E. **Flame Retardant Polypropylene (FRPP) Pipe –** Nom 4 in. diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

The F and T Ratings of the firestop system are dependent upon the hourly fire rating of the wall assembly and the type of penetrant installed within the firestop system as shown in the following table:

Rating of Wall, hr	Type of Through Penetrant	F Rating, hr	T Rating, hr
1	PVC Conduit, ABS pipe, CPVC pipe or FRPP pipe	1	1
2	PVC Conduit, ABS pipe, CPVC pipe or FRPP pipe	2	1
2	PVC pipe	2	1-1/2

3. **Firestop Device* –** Steel collar lined with an intumescent material sized to fit specific daim of the through penetrant. Device to be installed around through penetrant in accordance with accompanying installation instructions. Device incorporates anchor tabs for securement to both surfaces of wall by means of No. 10 by 1-1/2 in. long laminate steel screws and 1/4 in. by 1-1/2 in. diam steel fender washers at each anchor tab.

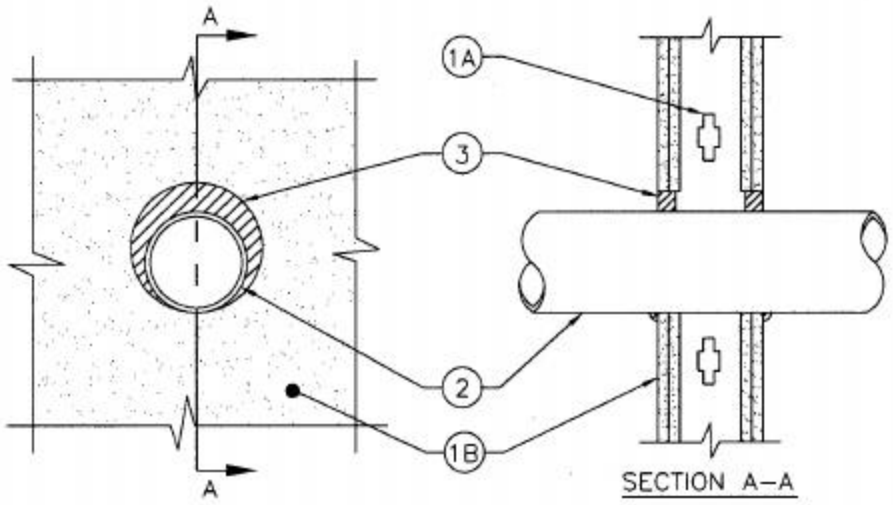
John Wagner & Associates Inc. – GPC

*Bearing the UL Classification Mark
+Bearing the UL Listing Mark

System No. W-L-2540

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 1/2 Hr



1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-5/8 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 7-1/2 in. (191 mm).

2. **Nonmetallic Pipe* – Glass Pipe –** Nom 6 in. (152 mm) diam (or smaller) glass pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Pipe to be rigidly supported on both sides of wall assembly.
   SCHOTT NORTH AMERICA INC

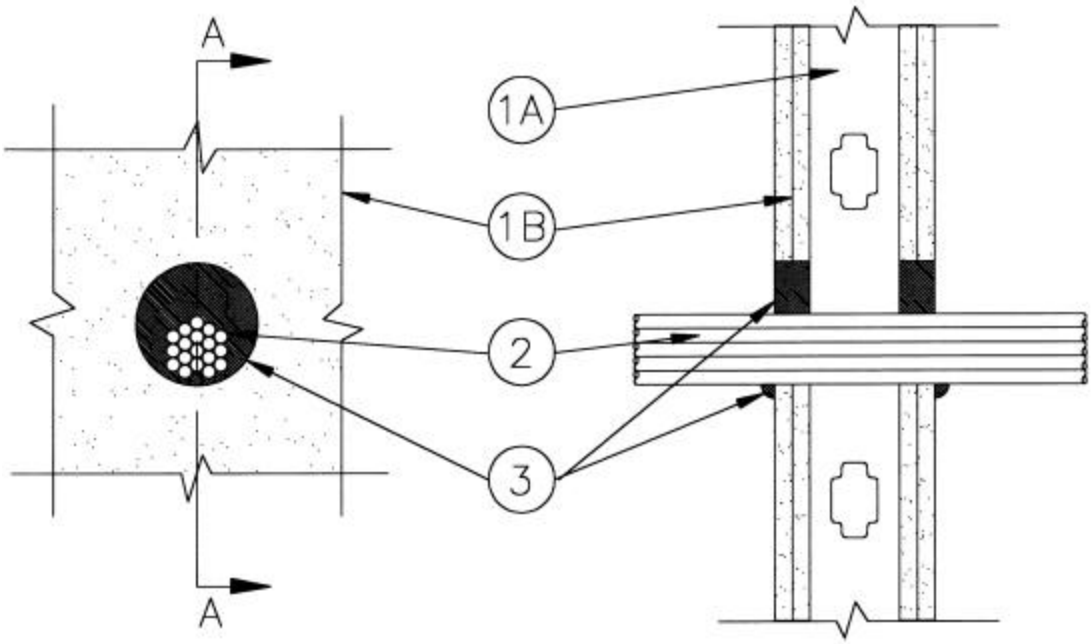
3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 or 1 in. (16 or 25 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall, for 1 or 2 hr rated walls respectively. At point contact location between penetrant and wallboard, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the penetrant/wallboard interface on both surfaces of wall.
   John Wagner Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-L-3245

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 3/4 Hr (See Item 1)



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 3-1/8 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 44 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 1-1/2 in. Cables to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
   A. 3/C No. 3/0 (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with XLPE insulation
   B. 2/C No. 10 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.
   C. **Through Penetration Product*** – Max 3/C No. 2/0 (or smaller) aluminum or steel clad **Armored Cable*** or aluminum or steel clad **Metal Clad Cable*** with copper conductors.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 or 1-1/4 in. thickness of fill material for 1 or 2 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. Caulk to be forced into interstices of cable group to max extent possible. At the point contact location between cable(s) and gypsum board, a min 1/2 in. diam bead of fill material shall be applied at the gypsum board/cable interface on both surfaces of wall.

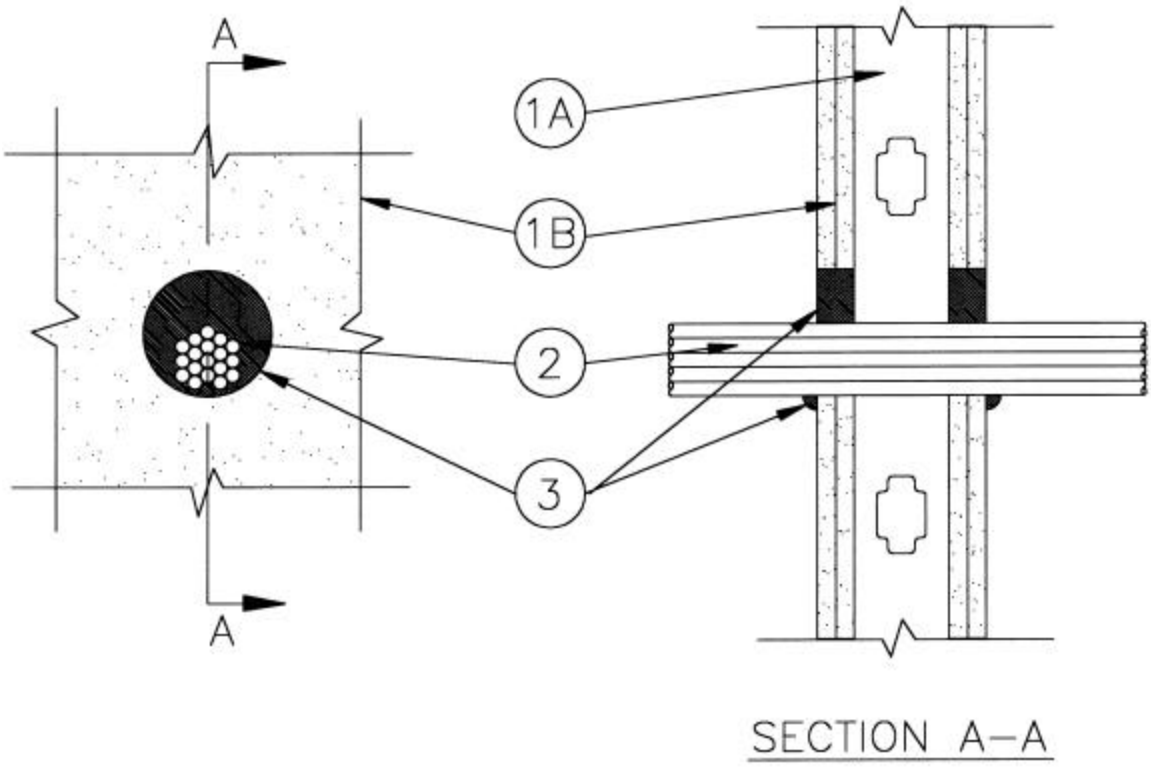
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-L-3247

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 3/4 Hr (See Item 1)



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 3-1/8 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Cables –** Aggregate cross-sectional area of cable in opening to be max 44 percent of the cross-sectional area of the opening. The annular space between cables and periphery shall be min 0 in. (point contact) to max 1-1/2 in. Cables to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
   A. 3/C No. 3/0 (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with XLPE insulation
   B. 2/C No. 10 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.
   C. **Through Penetration Product*** – Max 3/C No. 2/0 (or smaller) aluminum or steel clad **Armored Cable*** or aluminum or steel clad **Metal Clad Cable*** with copper conductors.
3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 or 1-1/4 in. thickness of fill material for 1 or 2 hr rated wall assemblies, respectively, applied within the annulus, flush with both surfaces of wall. Caulk to be forced into interstices of cable group to max extent possible. At the point contact location between cable(s) and gypsum board, a min 1/2 in. diam bead of fill material shall be applied at the gypsum board/cable interface on both surfaces of wall.

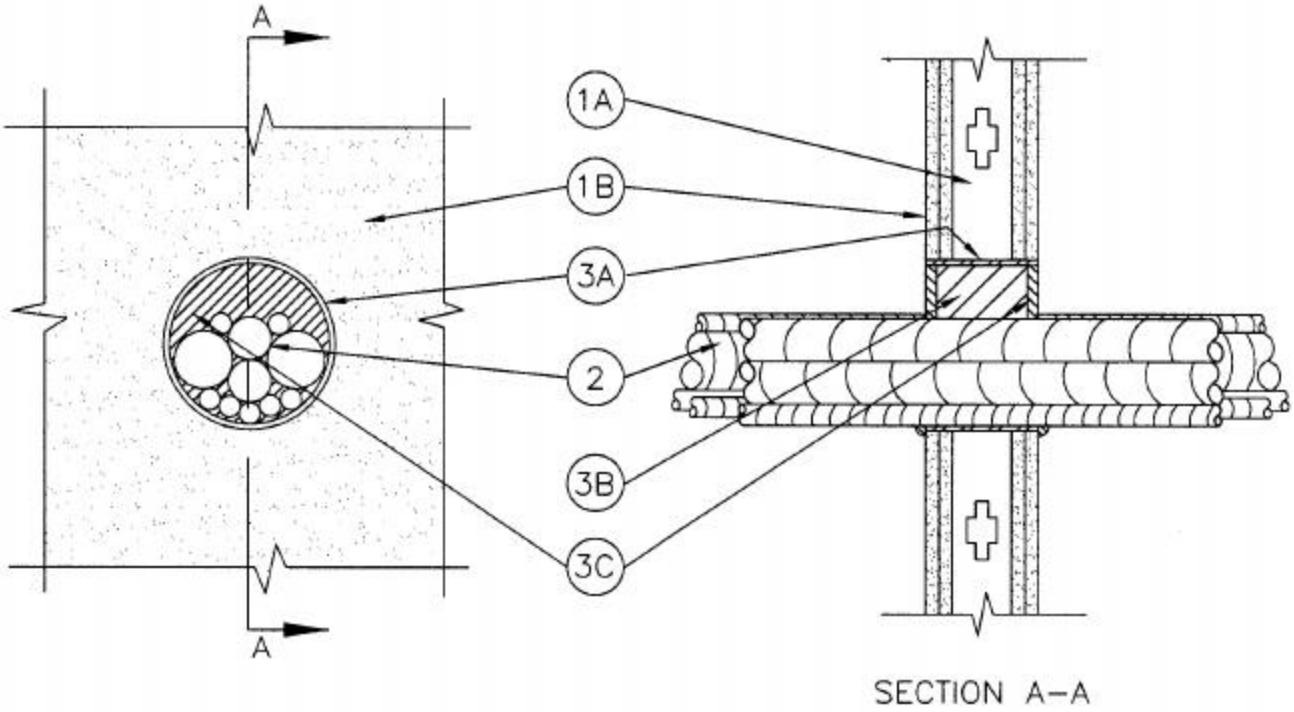
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-L-3348

F Rating – 1 & 2 Hr (See Item 1B)

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 in. by 4 in. (38 mm by 89 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 8-1/2 in. (216 mm).

   The F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Cables –** Aggregate cross sectional area of cables in opening to be max 27 percent of the cross sectional area of the opening. Cables installed either concentrically or eccentrically within the firestop system. The annular space between cables and periphery of sleeve shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Cables to be rigidly supported on both sides of wall assembly. The following types and sizes of cables may be used:
   A. 1/C 750 kcmil (or smaller) copper conductor aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation, with or without PVC jacket.
   B. 3/C 3 50 kcmil (or smaller) copper conductor aluminum clad or steel clad TEK cable with XLPE insulation, with or without PVC jacket
   C. 4/C No. 14 AWG (or smaller) copper conductor aluminum clad or steel clad TEK cable with XLPE insulation, with or with out PVC jacket.
   D. Max 25 pair No. 20 AWG (and smaller) copper conductor cable with XLPE/PVC insulation, with or without PVC jacket.
   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation, with or without PVC jacket.
   F. 4/C No. 6 AWG (or smaller) copper conductor cable with XLPE insulation, with or without PVC jacket.
   G. **Through Penetrating Product*** – Max 3/C No. 2/0 (or smaller) aluminum or steel clad **Armored Cable*** or aluminum or steel clad **Metal Clad Cable*** with copper conductors.

   ALFLEX CORP

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Metallic Sleeve –** (Optional) – Outside diam of sleeve to be tightly fitted with inside diam of opening, flush with both surfaces of wall assembly. The following metallic sleeves may be used:
      1. **Sheet Metal Sleeve –** Cylindrical sleeve fabricated from 24 gauge (or heavier) galv steel and having a min 1 in. (25 mm) overlap along longitudinal seam.
      2. **Steel Sleeve –** Max 8 in. (203 mm) diam (or smaller) Schedule 40 steel sleeve.
   B. **Packing Material –** (Optional when sleeve is used) – Min 3-7/8 (92 mm) or 5-1/8 in. (130 mm) thickness of min 4 pcf (64 kg/m^3)mineral wool batt insulation for 1 and 2 hr rated assemblies, respectively, approximately 25 percent larger than the area within the metallic sleeve cavity, firmly packed into opening. Packing material to be recessed from both surfaces of wall assembly to accommodate the required thickness of fill material (Item 3C).
   C. **Fill, Void or Cavity Material* – Sealant –** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location between metallic sleeve and cable, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the metallic sleeve or wallboard/cable interface on both surfaces of wall. Min 1/16 in. (1.6 mm) thick layer of fill material applied over edge of sleeve overlapping wallboard surface min 1/4 in. (6 mm).

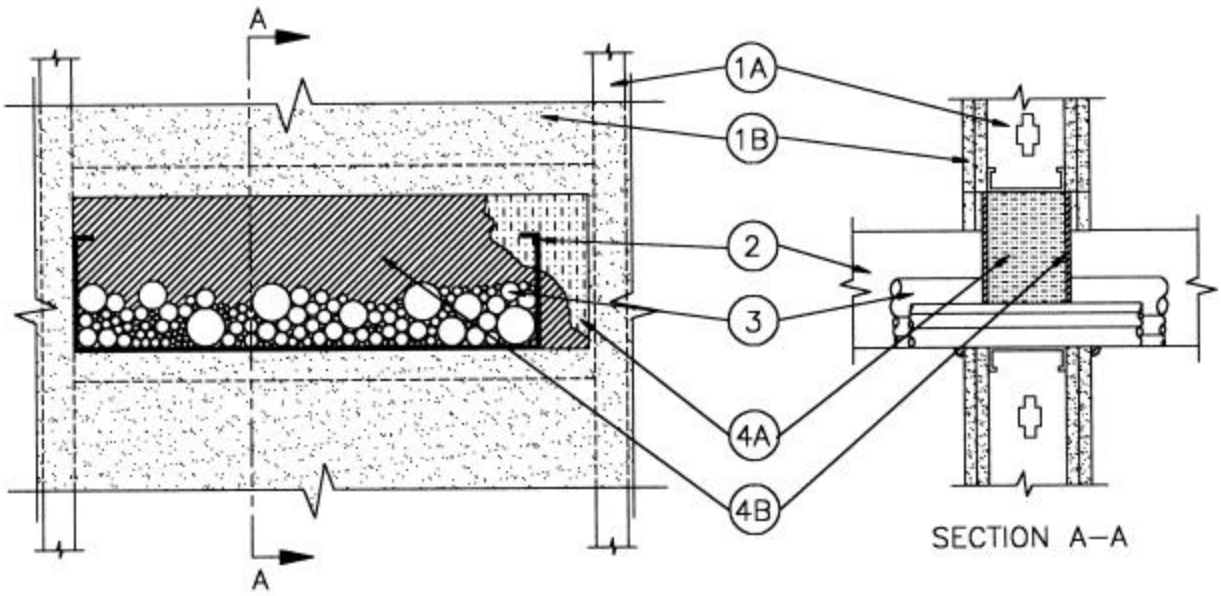
      John Wagner & Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking

System No. W-L-4046

F Rating – 1 & 2 Hr (See Item 1B)

T Rating – 3/4 Hr



1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC. Additional framing members may be installed in stud cavity containing cable tray (Item2) to form a rectangular box around cable tray.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners, as specified in the individual Wall and Partition Design. Max opening size to be 26 in. by 8 in. (208 sq. in.).

   The hourly F Rating of the firestop system is equal to the hourly F Rating of the wall assembly in which it is installed.

2. **Cable Tray+ –** Max 24 in. wide by max 6 in. deep 15 ga. (or heavier) aluminum or steel cable tray installed within the opening. The annular space between the cable tray and periphery of the opening shall be min 0 in. (point contact) to max 2 in. Cable tray to be rigidly supported on both sides of wall assembly.

3. **Cables –** Aggregate cross-sectional area of cables in cable tray to be max 40 percent of the cross-sectional area of the opening. The annular space between cables and periphery of opening shall be min 0 in. (point contact) to max 5-3/4 in. Cables to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:
   A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.
   B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   D. Max 25 pair No. 20 AWG (or smaller) copper conductor PVC jacketed cable with PVC insulation.
   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.
   F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

4. **Firestop System –** The firestop system shall consist of the following:

A. **Packing Material –** Min 3-5/8 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be flush with both sides of studs (Item 1A). Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material (Items B1 and B2).

B1. **Fill, Void or Cavity Material* – Sealant –** Min 1/8 in. thickness of fill material sprayed or brushed on each side of wall assembly, completely covering mineral wool insulation, overlapping a min 1/2 in. onto wallboard, cable tray and cables. At point contact location between penetrant and periphery of opening, a min 1/2 in. overlap of fill material shall be applied at the penetrant and gypsum board on both surfaces of wall assembly.

John Wagner & Associates Inc. – GrabberGard EFS

B2. **Fill, Void or Cavity Material* – Sealant –** As an alternative to Item B1, min 1/4 in. thickness of fill material applied within annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the gypsum board/penetrant interface on both surfaces of wall assembly.

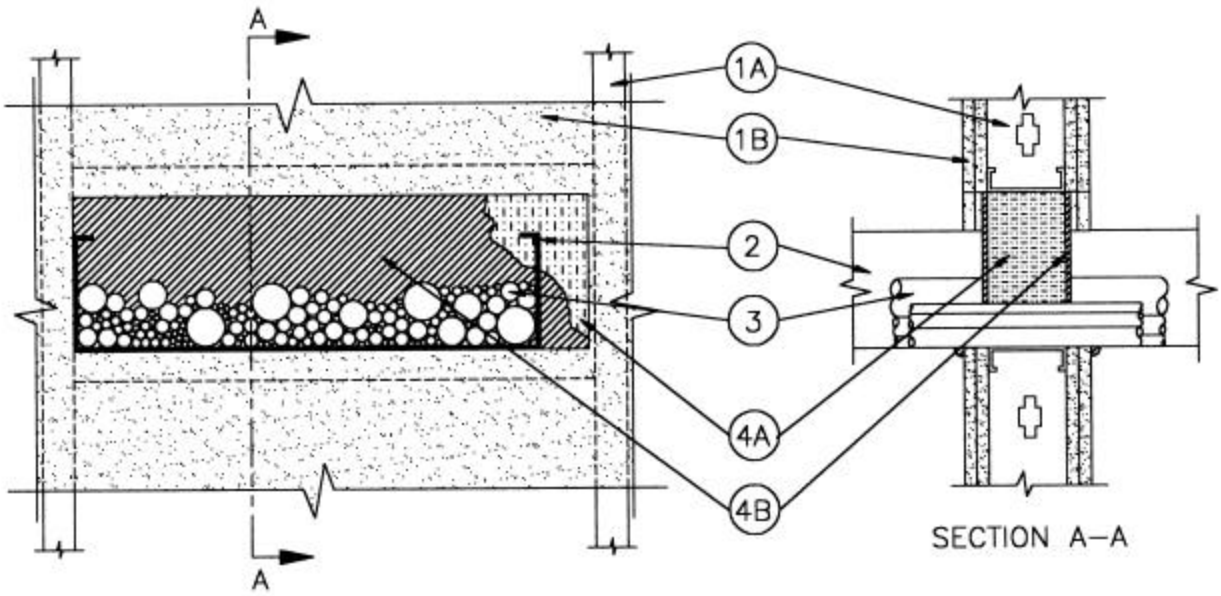
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking
+Bearing the UL Listing Marking

System No. W-L-4047

F Rating – 1 & 2 Hr (See Item 1B)

T Rating – 3/4 Hr



1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC. Additional framing members may be installed in stud cavity containing cable tray (Item2) to form a rectangular box around cable tray.
   B. **Wallboard, Gypsum* –** Thickness, type, number of layers and fasteners, as specified in the individual Wall and Partition Design. Max opening size to be 26 in. by 8 in. (208 sq. in.).

   The hourly F Rating of the firestop system is equal to the hourly F Rating of the wall assembly in which it is installed.

2. **Cable Tray+ –** Max 24 in. wide by max 6 in. deep 15 ga. (or heavier) aluminum or steel cable tray installed within the opening. The annular space between the cable tray and periphery of the opening shall be min 0 in. (point contact) to max 2 in. Cable tray to be rigidly supported on both sides of wall assembly.

3. **Cables –** Aggregate cross-sectional area of cables in cable tray to be max 40 percent of the cross-sectional area of the opening. The annular space between cables and periphery of opening shall be min 0 in. (point contact) to max 5-3/4 in. Cables to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:
   A. 1/C 750 kcmil (or smaller) copper conductor polyvinyl chloride (PVC) jacketed aluminum clad or steel clad TEK cable with cross-linked polyethylene (XLPE) insulation.
   B. 3/C 350 kcmil (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   C. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
   D. Max 25 pair No. 20 AWG (or smaller) copper conductor PVC jacketed cable with PVC insulation.
   E. 1/C 400 kcmil (or smaller) aluminum or copper conductor cable with XLPE insulation.
   F. 4/C No. 6 AWG (or smaller) copper conductor PVC jacketed cable with XLPE insulation.

4. **Firestop System –** The firestop system shall consist of the following:
   A. **Packing Material –** Min 3-5/8 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be flush with both sides of studs (Item 1A). Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material (Items 4B).
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/4 in. thickness of fill material applied within annulus, flush with both surfaces of wall. At point contact location between penetrant and periphery of opening, a min 1/2 in. diam bead of fill material shall be applied at the gypsum board/penetrant interface on both surfaces of wall assembly.

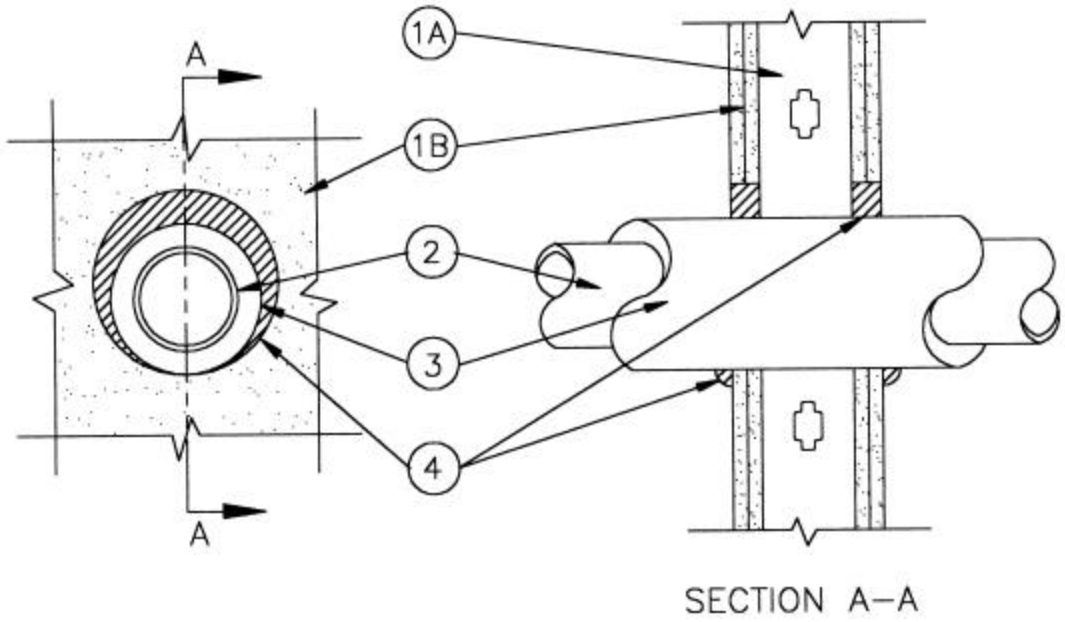
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking
+Bearing the UL Listing Marking

System No. W-L-5217

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 1/2, 1 & 2 Hr (See Item 3)



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   - A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   - B. **Gypsum Board* –** Nom 5/8 in. by 4 ft. wide with square or tapered edges. The gypsum wallboard type, number of layers, and fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 7-1/2 in.

     The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes and tubing may be used:
   - A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe
   - B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe
   - C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tube
   - D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe

3. **Tube Insulation – Plastic+ –** Nom 1/2 or 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between tube insulation and the periphery of opening shall be min 0 in. (point contact) to max 1 in.

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 94-5VA may be used.

The T Rating is dependant on the hourly F Rating, type of penetrant and thickness of insulation, as shown below.

F Rating	Penetrant	Insulation Thickness, Inches	T Rating
1 Hr	A and B	1/2	1/2 Hr
1 Hr	A and B	3/4	1 Hr
1 Hr	C and D	1/2 and 3/4	1/2 Hr
2 Hr	A and B	1/2	1/2 Hr
2 Hr	A and B	3/4	2 Hr
2 Hr	C and D	1/2 and 3/4	1/2 Hr

4. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. or 1-1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall, for 1 and 2 hr. rated assemblies, respectively. At the point contact location between insulation/wallboard interface, a min. 1/2 in. diam bead of fill material shall be applied on both sides of wall.

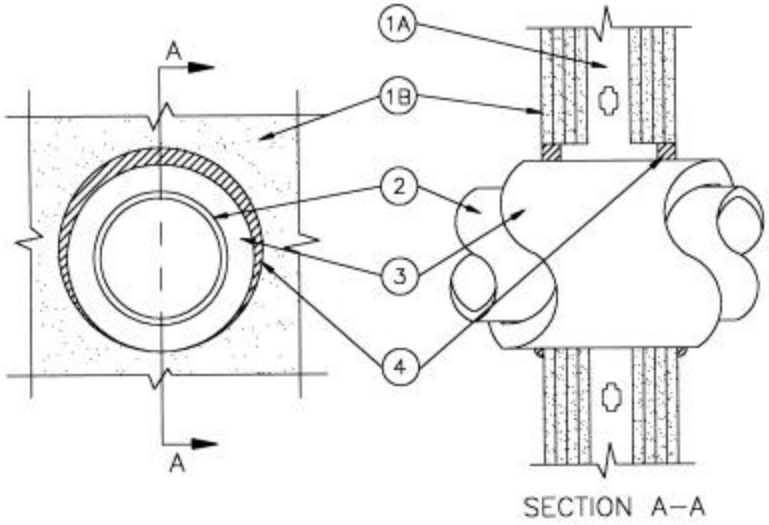
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Mark

System No. W-L-5218

F Rating – 1, 2, 3 & 4 Hr

T Rating – 1, 2 or 3 and 4 Hr



SECTION A–A

1. **Wall Assembly –**The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   B. **Gypsum Board* –** Thickness, type, number of layers and fasteners, as specified in the individual Wall and Partition Design. Max diam of opening is 18 in.

2. **Through Penetrants –** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe –** Nom 12 in. diam (or smaller) Schedule ST 40 (or heavier) steel pipe.
   B. **Iron Pipe –** Nom 12 in. diam (or smaller) cast or ductile iron pipe.
   C. **Conduit** – Nom 4 in. diam (or smaller) steel electrical metallic tubing or steel conduit.
   D. **Copper Tubing –** Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. **Copper Pipe –** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.

3. **Pipe Covering* –** Max 2 in. thick hollow cylindrical heavy density (min 3.5 pcf) 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 tape supplied with the product. The annular space between the insulated pipe and the edge of the through opening shall be min 0 in. (point contact) to max 1-1/4 in.
   See **Pipe and Equipment Covering – Materials** (BRGU) category in the 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.

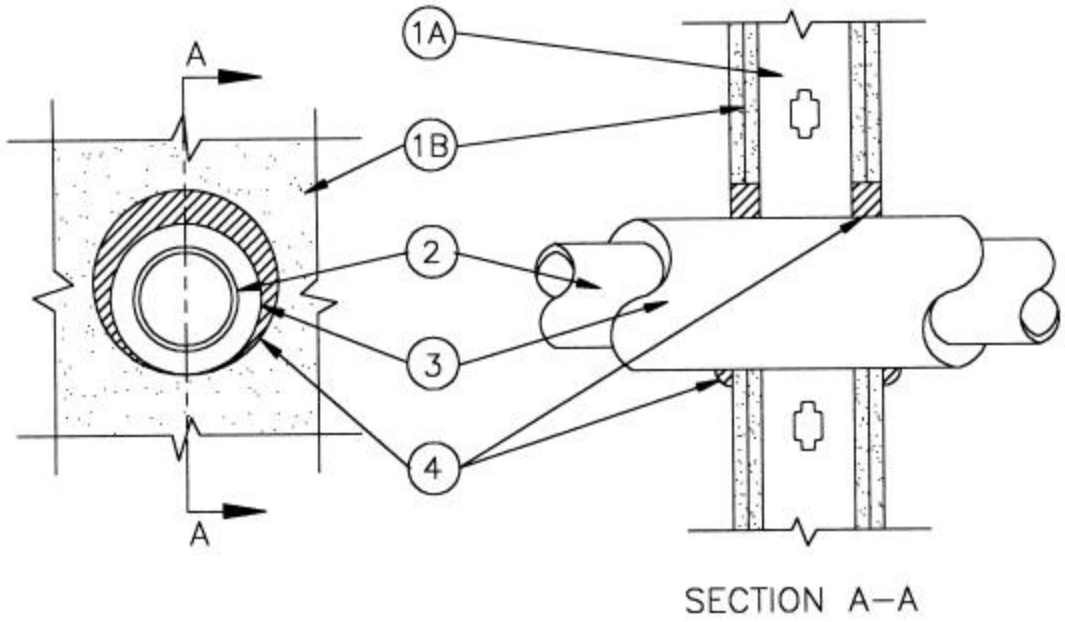
4. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material for 1 hr fire rated wall assemblies and min 1 in. thickness of fill material for 2, 3 and 4 hr fire rated wall assemblies, applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum board, a min 1/2 in. diam bead of fill material shall be applied at the gypsum board/pipe covering interface on both surfaces of wall.
   John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. W-L-5219

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 1/2, 1 & 2 Hr (See Item 3)



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   - A. **Studs –** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
   - B. **Gypsum Board* –** Nom 5/8 in. by 4 ft. wide with square or tapered edges. The gypsum wallboard type, number of layers, and fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 7-1/2 in.

     The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants –** One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes and tubing may be used:
   - A. **Steel Pipe –** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe
   - B. **Iron Pipe –** Nom 4 in. diam (or smaller) cast or ductile iron pipe
   - C. **Copper Tubing –** Nom 2 in. diam (or smaller) Type L (or heavier) copper tube
   - D. **Copper Pipe –** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe

3. **Tube Insulation – Plastic+ –** Nom 1/2 or 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between tube insulation and the periphery of opening shall be min 0 in. (point contact) to max 1 in.

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 94-5VA may be used.

The T Rating is dependant on the hourly F Rating, type of penetrant and thickness of insulation, as shown below.

F Rating	Penetrant	Insulation Thickness, Inches	T Rating
1 Hr	A and B	1/2	1/2 Hr
1 Hr	A and B	3/4	1 Hr
1 Hr	C and D	1/2 and 3/4	1/2 Hr
2 Hr	A and B	1/2	1/2 Hr
2 Hr	A and B	3/4	2 Hr
2 Hr	C and D	1/2 and 3/4	1/2 Hr

4. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. or 1-1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall, for 1 and 2 hr. rated assemblies, respectively. At the point contact location between insulation/wallboard interface, a min. 1/2 in. diam bead of fill material shall be applied on both sides of wall.

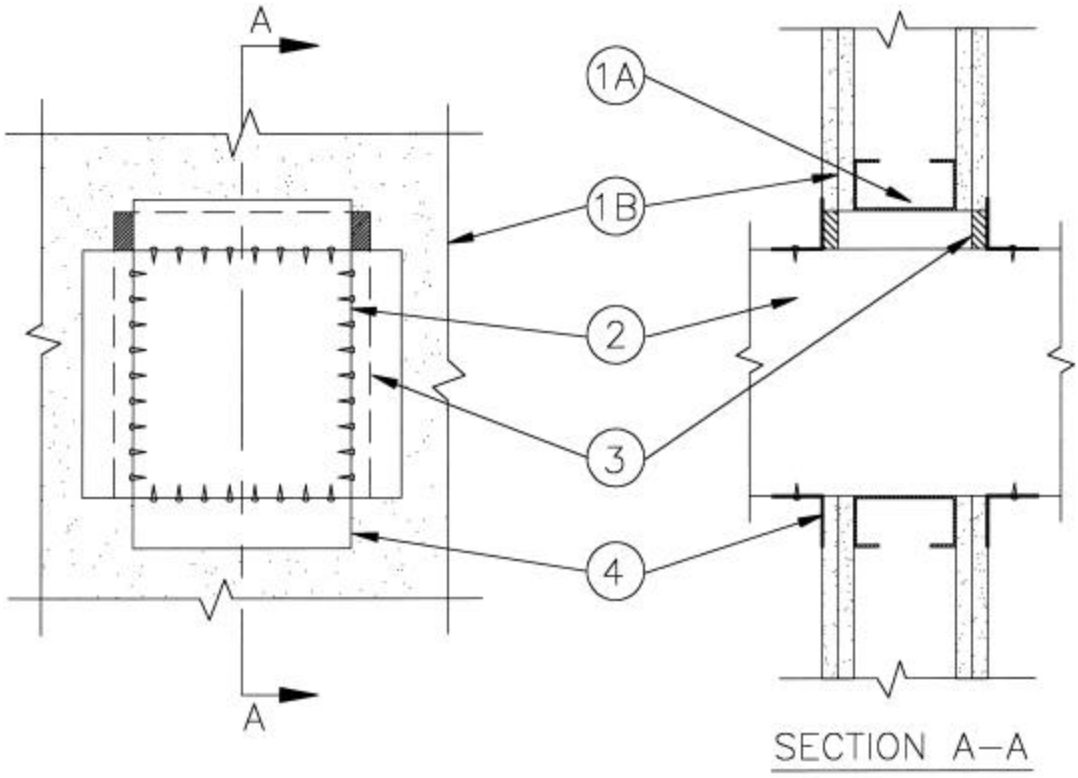
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Mark

System No. W-L-7107

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 0 Hr



1. **Wall Assembly –** The 1 and 2 hr fire rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing shall consist of steel channel studs to be min 3-5/8 in. wide and spaced max 24 in. OC. Additional 3-5/8 in. wide steel studs shall be used to completely frame opening.
   B. **Gypsum Board* –** Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max size of opening to be 957 sq in. with a max dimension of 33 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through-Penetrant –** Nom 26 in. by 30 (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and gypsum board, a min 1/2 in. diam bead of sealant shall be applied at the gypsum board/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard IFC

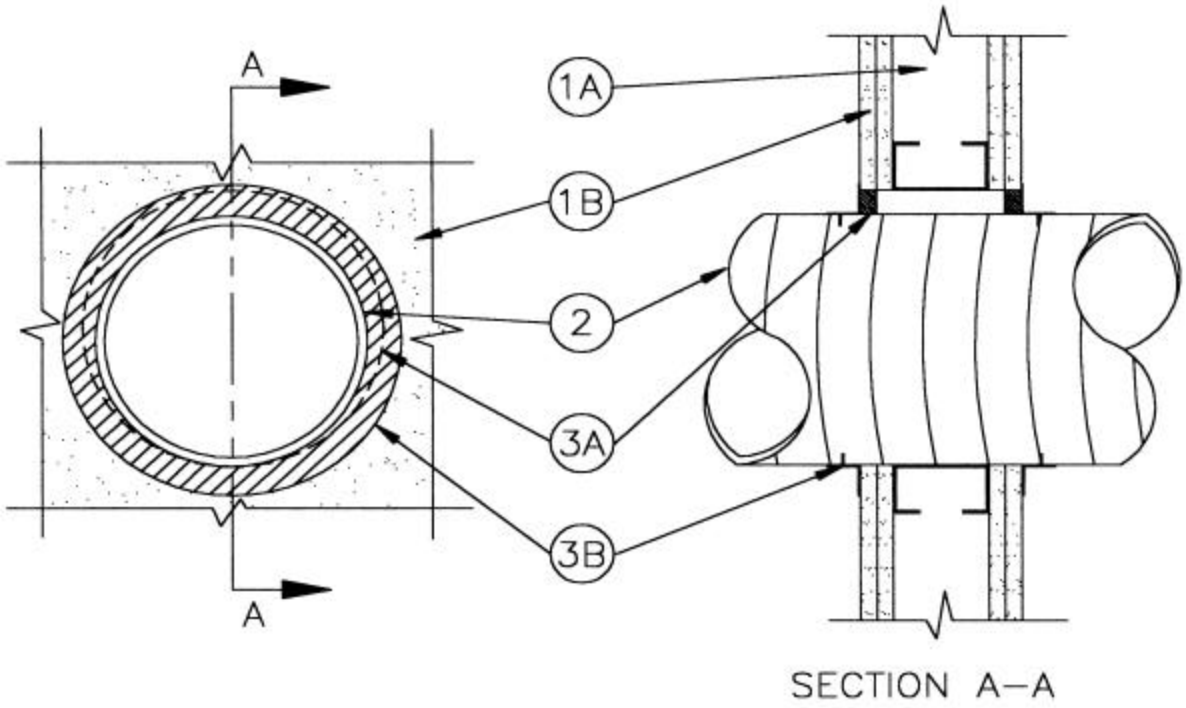
4. **Retaining Angles –** Min 16 gauge galv steel angles sized to lap duct a min of 1 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 1 in. from each end of duct and spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-L-7108

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 0 Hr



1. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC. Additional studs shall be used to completely frame opening.
   B. **Gypsum Board* –** Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max diam of opening is 17 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Steel Duct –** Nom 16 in. (or smaller) No. 26 gauge (or heavier) steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in. (point contact) to max 1 in. Duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and gypsum board, a min 1/2 in. diam bead of sealant shall be applied at the gypsum board/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard IFC

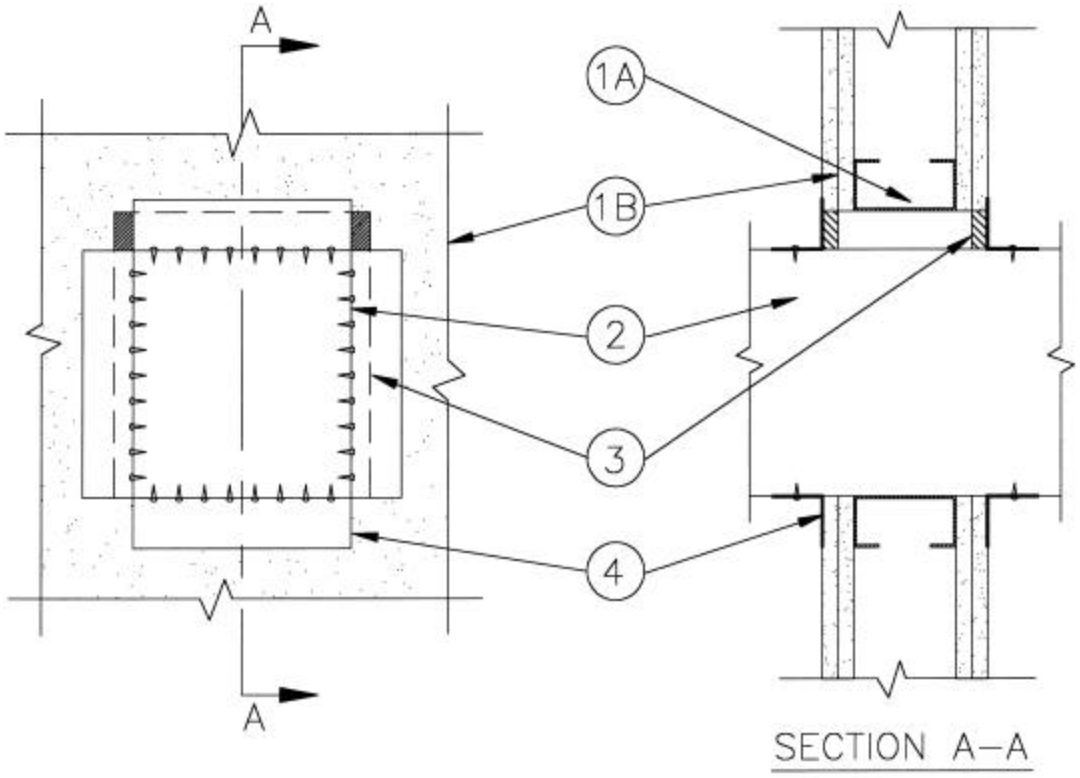
   B. **Retaining Angles –** Min 16 gauge galv steel angles roll-formed and sized to lap duct a min of 1 in. and lap wall surfaces a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-L-7109

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 0 Hr



1. **Wall Assembly –** The 1 and 2 hr fire rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Wall framing shall consist of steel channel studs to be min 3-5/8 in. wide and spaced max 24 in. OC. Additional 3-5/8 in. wide steel studs shall be used to completely frame opening.
   B. **Gypsum Board* –** Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max size of opening to be 957 sq in. with a max dimension of 33 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through-Penetrant –** Nom 26 in. by 30 (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and gypsum board, a min 1/2 in. diam bead of sealant shall be applied at the gypsum board/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard EFC

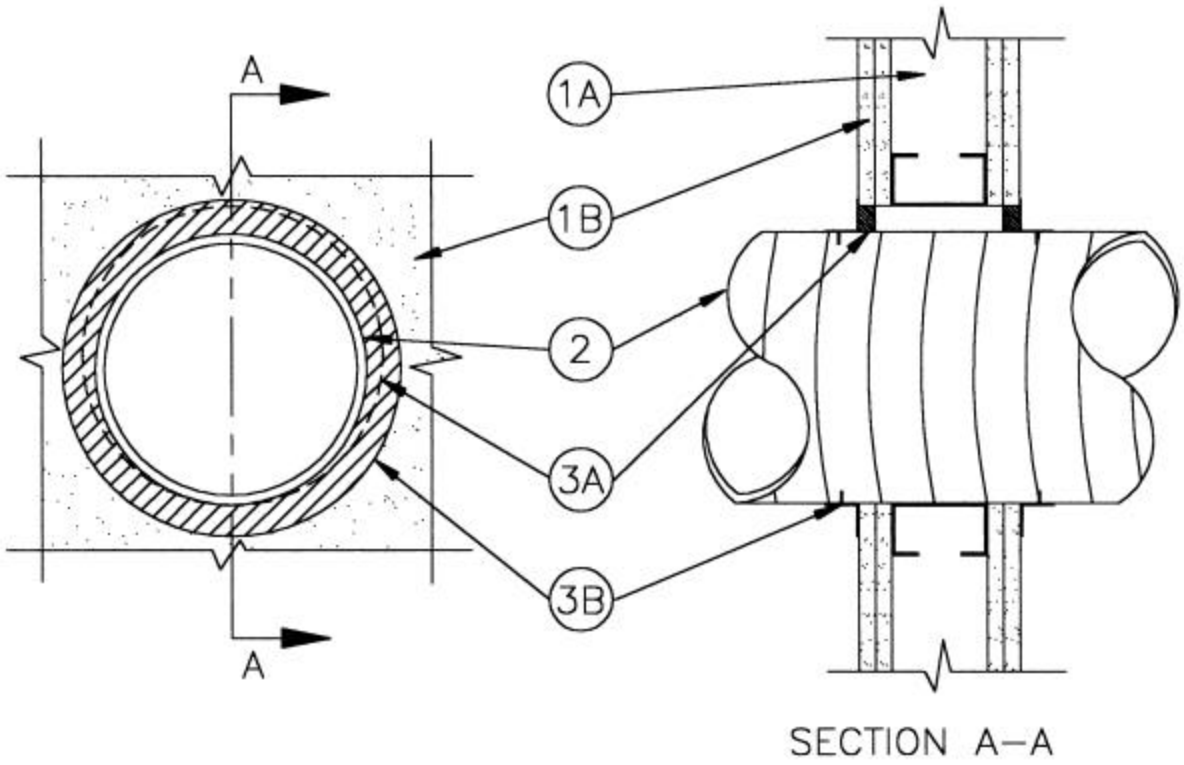
4. **Retaining Angles –** Min 16 gauge galv steel angles sized to lap duct a min of 1 in. and lap wall surfaces of a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 1 in. from each end of duct and spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

System No. W-L-7110

F Rating – 1 & 2 Hr (See Item 1)

T Rating – 0 Hr



SECTION A–A

1. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC. Additional studs shall be used to completely frame opening.
   B. **Gypsum Board* –** Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max diam of opening is 17 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Steel Duct –** Nom 16 in. (or smaller) No. 26 gauge (or heavier) steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in. (point contact) to max 1 in. Duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System –** The firestop system shall consist of the following:
   A. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and gypsum board, a min 1/2 in. diam bead of sealant shall be applied at the gypsum board/duct interface on both surfaces of wall assembly.

   John Wagner & Associates Inc. – GrabberGard EFC

   B. **Retaining Angles –** Min 16 gauge galv steel angles roll-formed and sized to lap duct a min of 1 in. and lap wall surfaces a min of 1 in. Angles attached to duct on both sides of wall with min 1/2 in. long, No. 10 (or larger) sheet metal screws spaced a max of 6 in. OC.

*Bearing the UL Classification Marking

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

UL Listing Index
Construction Joints

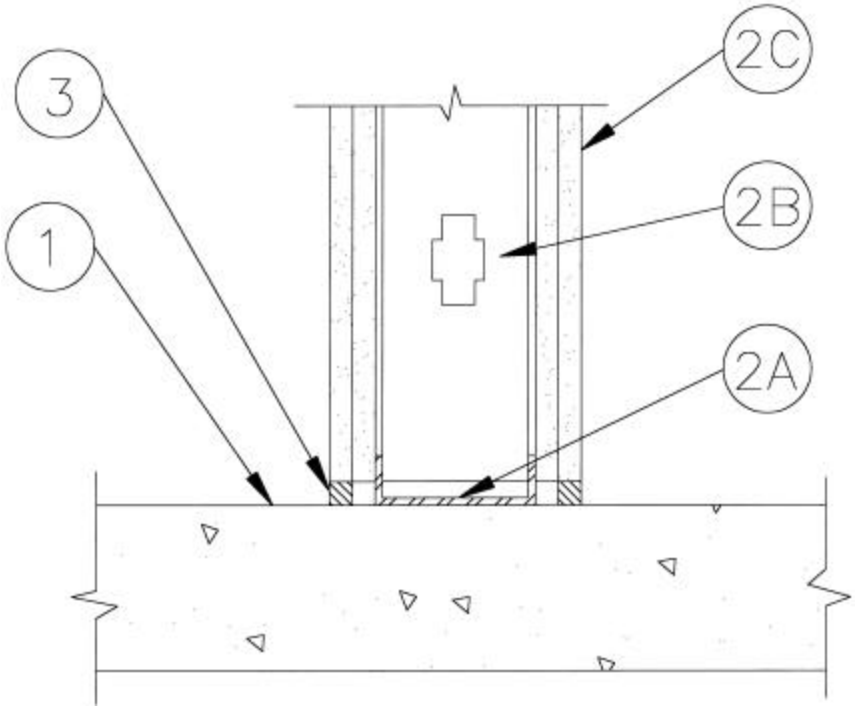
Joint Systems		Joints								GrabberGard Products			
		Bottom of Wall	Floor to Floor	Floor to Wall	Head of Wall	Wall to Wall	Max Joint Width	Class	Movement Capabilities	IFC	EFC	EFS	Hourly Rating
Bottom of Wall	BW-S-0009						3/4			✓			1 & 2
	BW-S-0010						3/4				✓		1 & 2
Floor to Floor	FF-D-0047						1	II	25.0	✓			2
	FF-D-0048						1	II	25.0		✓		2
	FF-D-1059						4	II	12.5			✓	2
Floor to Wall	FW-D-0038						1	II	25.0	✓			2
	FW-D-0039						1	II	25.0		✓		2
	FW-D-1055						4	II	12.5			✓	2
Head of Wall	HW-D-0353						3/4	II	33.0	✓			1 & 2
	HW-D-0354						3/4	II	33.0			✓	2
	HW-D-0355						3/4	II	33.0	✓			1 & 2
	HW-D-0356						3/4	II	33.0	✓			1 & 2
	HW-D-0357						3/4	II	33.0			✓	1, 2, 3 & 4
	HW-D-0358						1	II	25.0			✓	1 & 2
	HW-D-0359						1	II	25.0			✓	2
	HW-D-0368						3/4	II	33.0		✓		1 & 2
	HW-D-0369						3/4	II	33.0		✓		2
	HW-D-0370						3/4	II	33.0		✓		1 & 2
	HW-D-0404						1 1/2	II	25.0			✓	1 & 2
	HW-D-0531						3/4	II & III	33.0			✓	1 & 2
	HW-D-0532						1	II	25.0			✓	2
	HW-D-1050						4	II	12.5			✓	2
Wall to Wall	WW-D-0078						3/4	II	33.0	✓	✓		2
	WW-S-0054						3/4			✓	✓		2

Curtain Wall		Wall Exterior								Framing			
		Steel	Glass	Tilt-Up Panels	Concrete Panels	Aluminum Panels	Brick Veneer	Stone Veneer	EIFS	Steel Stud	Aluminum	N/A	HOURLY
Curtain Wall	CW-D-1006										✓		2
	CW-S1011									✓			2
	CW-S-2054										✓		2

System No. BW-S-0009

Assembly Ratings 1 & 2 Hr (See Item 2)

Nominal Joint Width – 3/4 in.



1. **Floor Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Floor may also be constructed of any 6 in. thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufactures.

2. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL Fire Resistance Directory. The wall shall include the following construction features:

   A. **Steel Floor Runner —** Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Floor runners to be provided with min 1-1/4 in. flanges. Runners secured with steel fasteners spaced 12 in. OC.

   B. **Studs —** Steel studs to be min 2-1/2 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. OC.

   C. **Gypsum Board* —** Gypsum board installed to a min total thickness of 5/8 or 1-1/4 in. on each side of wall for a 1 or 2 hr rated wall, receptively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory, except that a max 3/4 in. gap shall be maintained between the bottom of gypsum board and top of concrete floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Fill, Void or Cavity Material* Sealant — Max separation between top of floor and bottom of gypsum board is 3/4 in.** Min 5/8 in. thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall.

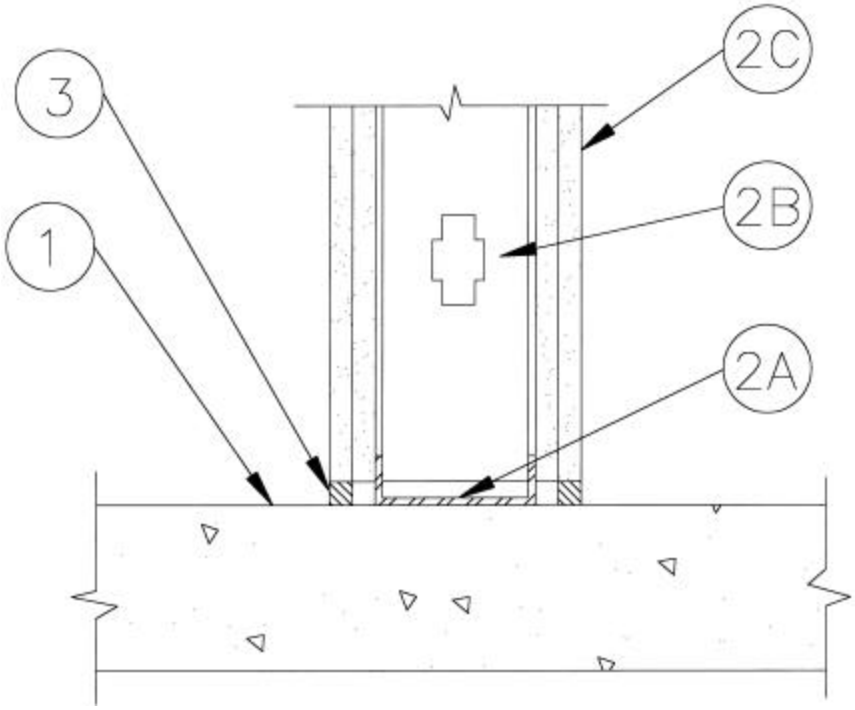
John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Mark

System No. BW-S-0010

Assembly Ratings 1 & 2 Hr (See Item 2)

Nominal Joint Width – 3/4 in.



1. **Floor Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Floor may also be constructed of any 6 in. thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufactures.

2. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL Fire Resistance Directory. The wall shall include the following construction features:

   A. **Steel Floor Runner —** Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Floor runners to be provided with min 1-1/4 in. flanges. Runners secured with steel fasteners spaced 12 in. OC.

   B. **Studs —** Steel studs to be min 2-1/2 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. OC.

   C. **Gypsum Board* —** Gypsum board installed to a min total thickness of 5/8 or 1-1/4 in. on each side of wall for a 1 or 2 hr rated wall, receptively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory, except that a max 3/4 in. gap shall be maintained between the bottom of gypsum board and top of concrete floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

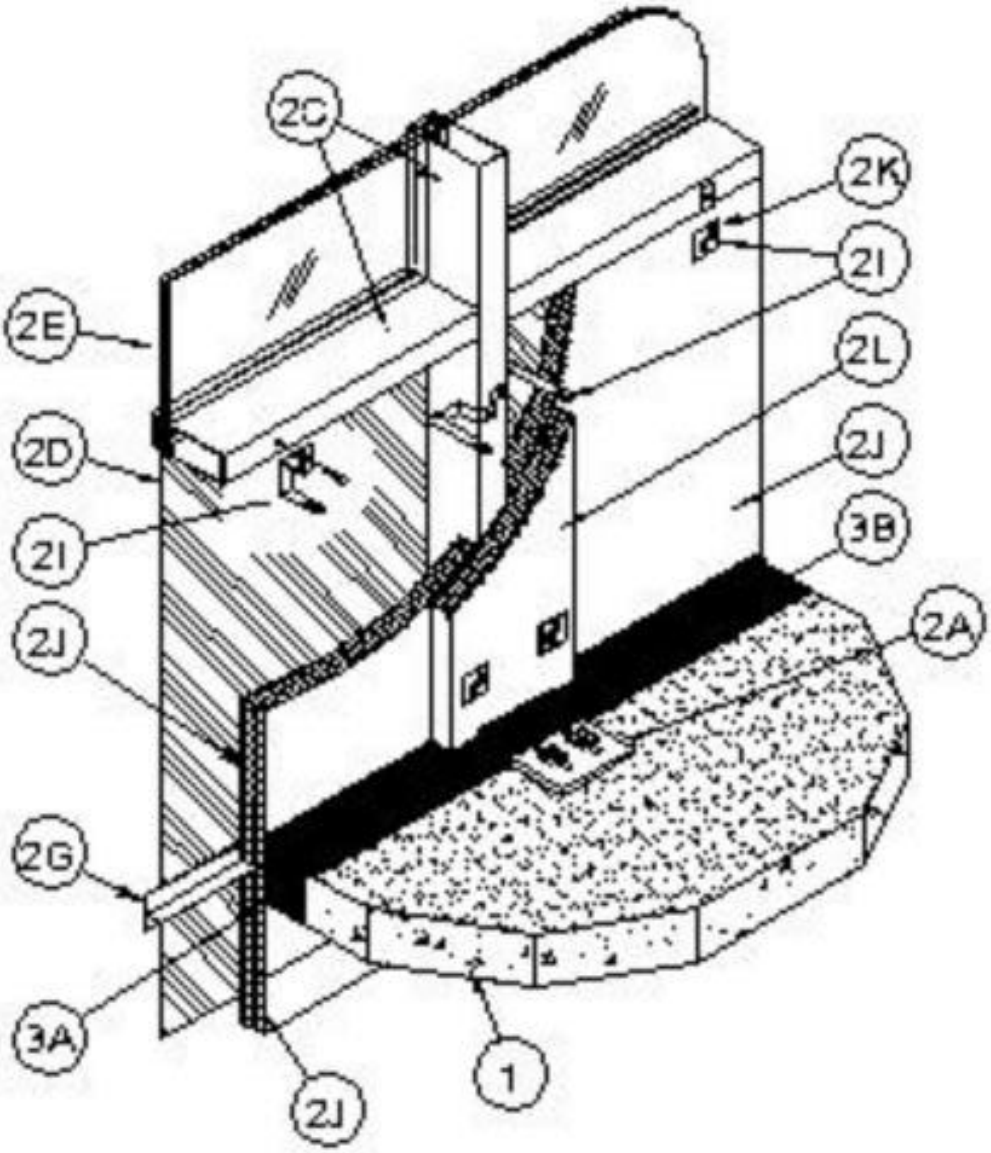
3. **Fill, Void or Cavity Material* Sealant — Max separation between top of floor and bottom of gypsum board is 3/4 in.** Min 5/8 in. thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall.

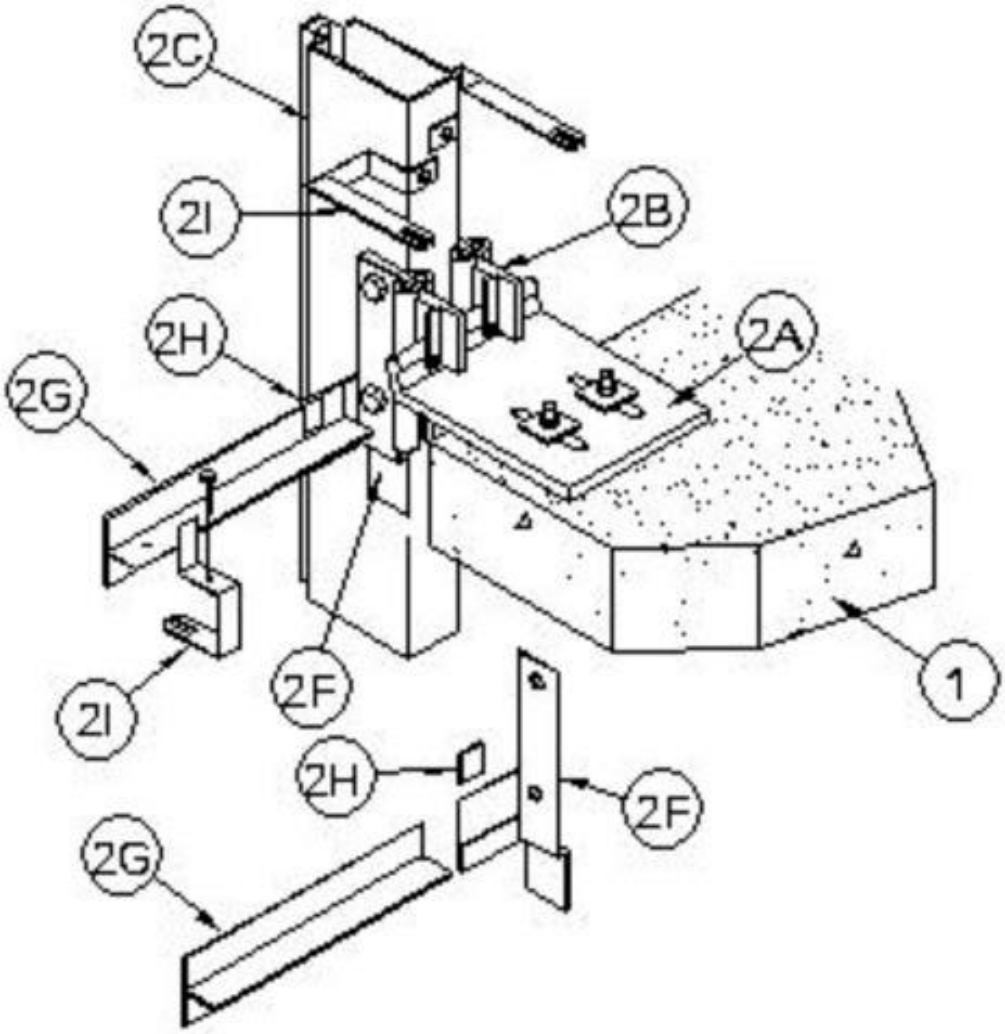
John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Mark

System No. CW-D-1006

F Rating – 2 Hr
T Rating – 1/4 Hr
Integrity Rating – 2 Hr
Insulation Rating – 1/4 Hr
Linear Opening Width – 4 In. Max
Class II Movement Capabilities – 5% Vertical Shear (See Item3)





1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Curtain Wall Assembly –** The curtain wall assembly shall incorporate the following construction features:
   A. **Mullion Anchor Plates –** Nom 7 in. wide by 9-1/4 in. long by 5/8 in. thick extruded aluminum plates with a nominal 1-3/4 in. high raised lip along one end to engage hooked ends of mullion mounting clips (Item 2B). Plates anchored to top surface of floor at each mullion location with steel wedge anchor bolts in conjunction with extruded aluminum washers.
   B. **Mullion Mounting Clips –** Nominal 3 in. wide by 7 in. high extruded aluminum anchor slides with tapped holes and with separate extruded aluminum hooks designed to engage the raised lip of the anchor plate (Item 2A). Anchor slides bolted to each side of mullion at each floor with 1/2 in. diam stainless steel screws with locking washers. Anchor hooks secured to anchor slides with steel jacking screws and secured to raised lip of anchor plate with steel set screw.
   C. **Framing –** The one-piece or split rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be min 2-1/2 in. wide by 6 in. deep and shall be formed from min 0.125 in. thick aluminum. Mullions spaced max 60 in. OC and secured to mullion anchor plates (Item 2A) with mounting clips (Item 2B) at each floor level. Interior face of mullions to be max 4 in. from edge of floor assembly. Transoms to be spaced min 69 in. OC. The minimum height from the top of the floor to the bottom of the vision panel sill is 33 in.
   D. **Spandrel Panels –** The spandrel panels shall consist of one of the following types:
      a. **Glass Panels –** Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.
      b. **Aluminum Panels –** Nom 1/8 in. (3 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

c. **Stone Panels –** Nom 1-3/16 in. (46 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

E. **Vision Panels –** Nom 1 in. thick insulated glass units with two layers of nom 1/4 in. thick transparent heat-strengthened glass separated by a 1/2 in. air space. Each panel installed on silicone rubber setting blocks and secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

F. **Light Gauge Framing* – T-Bar Support Brackets –** Nom 2 in. wide brackets formed from galv steel and designed to bridge extruded aluminum anchor slides of mullion mounting clips (Item 2B). Each T-Bar support bracket provided with nominal 3 in. wide by 5 in. high leg with a nominal 3/4 in. hemmed edge to receive the bottom edge of the T-Bar (Item 2G). T-Bar support bracket secured to each side of mullion using the same bolts used to attach the anchor slides of the mullion mounting clips. The hemmed edge of the T Bar support bracket is to be located 4-1/2 in. below the top surface of the floor slab such that, when installed, the stem of the T-Bar (Item 2G) will be located 2 in. below the top plane of the floor slab. Angle of T Bar support bracket to be recessed from interior face of framing as necessary to accommodate the thickness of the curtain wall insulation (Item 2J).

THERMAFIBER INC

G. **Light Gauge Framing* – T-Bar –** Nom 5 in. wide by 1-1/2 in. high tee section formed from galv steel. T Bar installed between mullions at each floor level to restrain curtain wall insulation (Item 2J) against outward movement when forming material (Item 3A) is installed and to support edge of safing joint cover (Item 3C). The T Bar shall be installed with a clearance of 1/2 to 3/4 in. at each end. The bottom edge of the T Bar shall rest in and be supported by the hemmed edge of the T Bar support bracket (Item 2F) at each end. The top edge of the T Bar shall be locked in place with a T Bar locking clip (Item 2H) at one end and by a min No. 10 by 1/2 in. long self-drilling, self-tapping steel screw at the opposite end. Each T Bar shall be located with its stem at an elevation 2 in. below the top plane of the floor.

THERMAFIBER INC

H. **Light Gauge Framing* – T Bar Locking Clip –** Nom 1 by 2 in. clip formed from galv steel and designed to lock top of T Bar (Item 2G) to T Bar support bracket (Item 2F).

THERMAFIBER INC

I. **Light Gauge Framing* – Vertical and Horizontal Hangers –** Vertical and horizontal hangers formed from 1 in. wide galv steel strips, supplied in two configurations with length as needed to accommodate thickness of curtain wall insulation (Item 2J) and mullion cover (Item 2L). Vertical hangers (with 90 deg twist) screw-attached to interior face of mullions with No. 10 by min 1/2 in. long self-drilling, self-tapping steel screws. Vertical hangers on mullions to be located near each corner of each piece of curtain wall insulation except for the nominal 7 to 9 in. high piece of curtain wall insulation located immediately beneath the stem of the T Bar. The 7 to 9 in. high piece of curtain wall insulation immediately beneath the stem of the T Bar requires only one vertical hanger near its midheight at each end. Horizontal hangers (without twist) screw-attached to T-Bar (Item 2G) and to transom at top of spandrel panel (sill of vision panel) with No. 10 by min 1/2 in. long self-drilling, self-tapping steel screws. Horizontal hangers on T Bar to be located within 6 in. of mullion at each end and spaced max 16 in. OC. Horizontal hanger on transom at top of spandrel panel to be located at center of transom. No hangers are to be used on the transom at the bottom of spandrel panel (lintel of vision panel).

THERMAFIBER INC

J. **Curtain Wall Insulation* –** Min 2 in. thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder, supplied in min 36 in. wide batts. Insulation batts to be installed with no vertical seams. A horizontal seam is to be located 7 to 9 in. below the stem of the T Bar in each spandrel area and is to be sealed with aluminum foil tape. In the spandrel area beneath the stem of the T Bar, insulation panels tightly-fitted between vertical mullions and between the stem of the T Bar (Item 2G) and the transom, flush with the interior surface of framing. Insulation panels impaled on vertical and horizontal hangers (Item 2I) and secured in place with nom 2 by 2 in. steel locking washers (Item 2K). In the spandrel area above the safing joint cover (Item 3C), insulation panels tightly-fitted between vertical mullions and between the safing material and the transom, flush with the interior surface of framing.

THERMAFIBER INC – Firespan 90

K. **Light Gauge Framing* – Locking Washers –** Nom 2 by 2 in. clips formed from galv steel and designed to secure curtain wall insulation and mullion covers on vertical and horizontal hangers (Item 2I).

THERMAFIBER INC

L. **Mullion Covers – Curtain Wall Insulation* –** Nom 2 in. thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder, supplied in min 24 by 48 in. boards. Nom 12 in. wide strips to be centered over mullions and impaled on the same vertical hangers used to secure the spandrel panel insulation and secured in place with nom 2 by 2 in. locking washers (Item 2K). Mullion covers to abut the safing system (Items 3A and 3C) above and below the floor.

THERMAFIBER INC – Firespan 90

M. **Light Gauge Framing* – Spiral Anchor –** (Not Shown) – As an alternate to the vertical hangers (Item 2I), galv steel wire spiral anchors may be used to secure the framing covers (Item 2L) to the curtain wall insulation (Item 2J) on each side of the mullion. Nom length of spiral anchors to be equal to thickness of curtain wall insulation plus thickness of framing cover. Spiral anchors driven through mullion covers and into curtain wall insulation and spaced max 12 in. OC.

THERMAFIBER INC

3. **Safing System –** Max separation between the edge of the floor and the face of the framing members (at time of installation) is 4 in. The safing system is designed to accommodate vertical shear movement up to a max of 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material* –** Nom 4 pcf density mineral wool batt insulation. Batt sections cut to a min 4-1/2 in. width and stacked to a thickness which is min 25 percent greater than the width of linear gap between the curtain wall insulation and the edge of the concrete floor slab to attain a min 20 percent compression in the thickness direction. The forming material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. Forming material to extend completely beneath mullion mounting plate (Item 2A). A max of two tightly-butted seams are permitted in the forming material between mullions.

THERMAFIBER INC – Type SAF

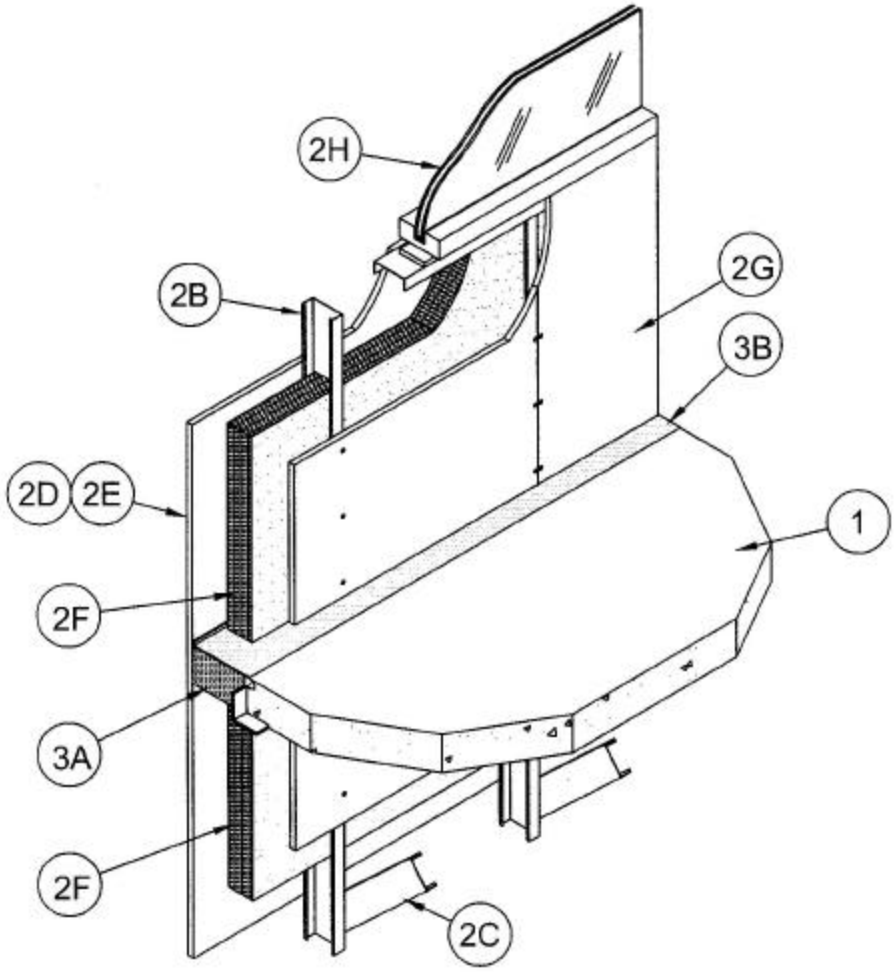
B. **Fill, Void or Cavity Material* –** Min 1/8 in. wet thickness (min 1/16 in. dry thickness) of fill material spray-applied over top of forming material and lapping min 1/2 in. onto the top surface of the floor and onto the curtain wall insulation, mullion anchor plate (Item 2A) and framing covers.

JOHN WAGNER ASSOCIATES INC – GrabberGard EFS

*Bearing the UL Classification Mark

System No. CW-S-1011

Integrity Rating — 2 Hr
Insulation Rating — 1/4 Hr
Linear Opening Width — 2-1/2 In. Max
L Rating At Ambient – Less Than 1 CFM/Lin Ft



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Perimeter of floor assembly to be provided with min 3by 3 by 1/4 in. thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly** – The curtain wall assembly shall incorporate the following construction features:
   A. **Mounting Angles** (Not Shown) - Min 3 in. long angles with one nom 4 in. leg for attachment to edge of floor assembly and with one leg approx 2-1/2 to 3 in. longer than distance to interior face of steel studs. Angles to be formed of min 1/8 in. thick steel. Angles welded to cast-in-place structural steel angle at edge of floor assembly (Item 1) on one side of each steel stud (Item 2B) at each floor level. Top edge of each mounting angle to be recessed 1 to 1-1/2 in. below top surface of floor.
   B. **Steel Studs –** C-shaped studs formed from min 0.034 in. thick (20 ga) galv steel. The steel studs shall be -1/2 in. to 6 in. wide by 1-1/4 in. deep with 5/16 in. wide stiffening flanges and shall be assembled using runner channels formed from min 0.034 in. thick galv steel. Studs spaced max 24 in. OC and welded, bolted or screwed to mounting angles (Item 2A) at each floor level. When cementitious backer units (Item 2E) are used for exterior sheathing, max stud spacing is 16 in. OC. Interior face of studs to be max 2-1/2 in. from edge of floor assembly.

C. **Steel Struts –** Short lengths of steel stud (Item 2B) used to brace each steel stud against lateral movement. One end of strut bolted, screwed or welded to steel stud beneath plane of floor assembly. Opposite end of strut anchored to underside of floor.

D. **Gypsum Board* –** One layer of nom 5/8 in. thick, 48 in. wide gypsum sheathing installed to cover entire exterior surface of wall. Sheathing applied with joints centered over studs and secured to steel studs with min 1 in. long bugle head steel screws spaced max 8 in. OC along the edges and max 12 in. OC in the field of each sheet.

E. **Cementitious Backer Units* –** As an alternate to the gypsum sheathing (Item 2D), nom 1/2 in. or 5/8 in. thick square-edge boards attached to studs with 1-1/4 in. long corrosion resistant self-tapping wafer-head steel screws spaced 6 in OC. Joints covered with glass fiber mesh tape.

UNITED STATES GYPSUM CO — Durock Exterior Cement Board, Durock Cement Board or Durock WMB

F. **Batts and Blankets* –** Any glass fiber insulation bearing the UL Classification Marking as to fire resistance or surface burning characteristics, of a thickness to completely fill stud cavity. Insulation batts friction fit to completely fill all stud cavities of curtain wall above the top of the fill material (Item B) and below the forming material (Item 3A).

See **Batts and Blankets (BZJZ)** category for names of manufacturers.

G. **Gypsum Board* –** One layer of nom 5/8 in. thick, 48 in. wide gypsum board applied with joints centered over studs. Gypsum board secured to steel studs on interior surface of curtain wall with min 1 in. long bugle head steel screws spaced max 8 in. OC along the edges and max 12 in. OC in the field of each sheet. Gypsum board installed to cover interior surface of wall above the top of the fill material (Item 3C) and below the forming material (Item 3B).

H. **Framed Window -** Metal-framed window with nom 1/4 in. thick heat-strengthened glass. Sill of window to be min 34 in. above top of floor slab. Top of window to be min 33 in. below bottom of floor slab.

I. **Siding, Brick or Stucco –** (Not Shown) – Aluminum siding, steel siding, brick veneer or stucco installed over gypsum sheathing or cementitious backer units and meeting the requirements of local code agencies. Brick veneer wall attached to studs with corrugated metal wall ties attached to each stud with steel screws.

3. **Safing System –** The safing system shall incorporate the following construction features:

A. **Forming Material* –** Nom 4 pcf density mineral wool batt insulation. Batt sections to be cut to a min width of 4 in. and stacked to a thickness which is 20 percent greater than the width of linear gap between the gypsum sheathing and the edge of the concrete floor. The forming material is compressed and inserted cut-edge-first into linear gap between edge of floor slab and sheathing material such that its top surface is flush with the top surface of the floor assembly. Length of batt to be equal to on-center spacing of steel studs such that it is friction-fitted between studs and mounting angles without seams. Additional pieces of mineral wool batt to be stuffed inside the channel of each steel stud throughout the thickness of the forming material.

ROXUL INC — SAFE

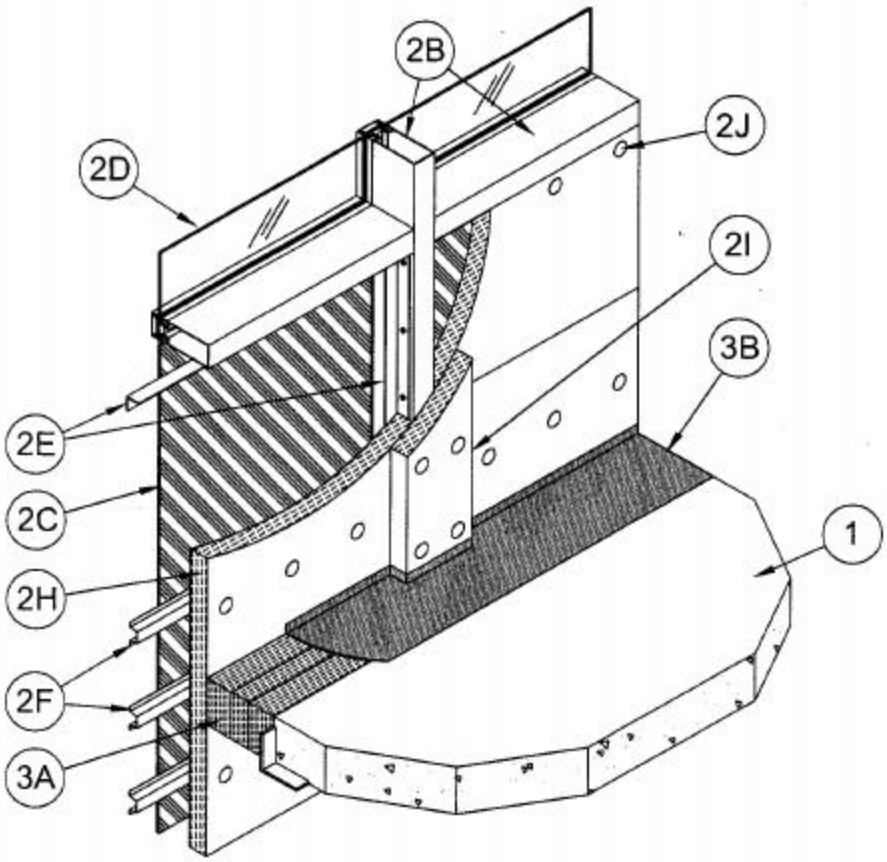
B. **Fill, Void or Cavity Material* –** Min 1/16 in. thickness (dry) of fill material spray-applied over top of forming material and lapping min 1/2 in. onto the top surface of the floor and onto the gypsum sheathing and steel studs.

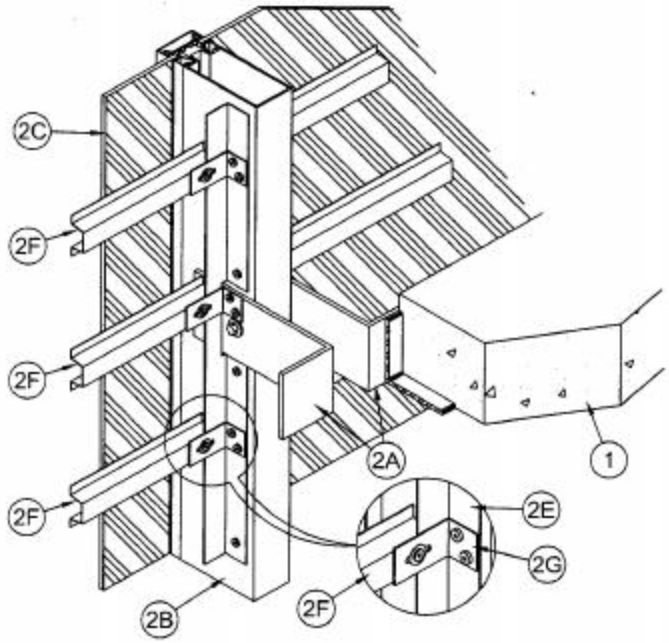
John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Mark

System No. CW-S-2054

Integrity Rating — 2 Hr
Insulation Rating — 1/4 Hr
Linear Opening Width — 8 In. Max





1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Perimeter of floor assembly to be provided with min 4 by 4 by 1/4 in. thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly –** The curtain wall assembly shall incorporate the following construction features:
   A. **Mullion Mounting Clips –** Min 4 in. long angles with one nom 4 in. leg for attachment to edge of floor assembly and with one leg approx 4 in. longer than distance to nearest face of mullion. Clips welded to steel angle at edge of floor assembly (Item 1) on each side of vertical mullion (Item 2B) at each floor level. Top edge of each mounting angle to be recessed min 1/2 in. below top surface of floor.
   B. **Framing –** The rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be minimum 2-1/2in. wide by 5 in. deep and shall be formed from min 0.100 in. thick aluminum. Mullions spaced max 60 in. OC and secured to mullion mounting clips (Item 2A) at each floor level with two 1/2 in. diam by 4 in. long hex head steel bolts in conjunction with steel nuts and washers. Interior face of mullions to be max 8 in. from edge of floor assembly. Transoms framing top and bottom edges of spandrel panels (Item 2C) to be spaced min 72 in. OC. Transom forming sill of vision panel (Item 2D) to be located such that its bottom surface is at height of 33 in. above the top surface of the floor (Item 1).
   C. **Spandrel Panels** – Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws. The following types of spandrel panels may be used:
      1. Nom 1/4 in. thick opaque heat-strengthened or tempered glass.
      2. Nom 1-3/16 in. thick polished granite spandrel panels with 1 in. thick gauged edges.
      3. Nom 1/8 in. thick aluminum panels with 1/4 in. thick edges.
   D. **Vision Panels –** Nom 1/4 in. thick transparent heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.
   E. **Spandrel Panel Perimeter Angles –** Nom 1-1/2 by 1-1/2 in. No. 22 gauge galvanized steel angles installed around entire perimeter of each spandrel panel. Angles recessed from interior face of framing as necessary to accommodate thickness of curtain wall insulation (Item 2H). Angles notched as necessary to be continuous over mullion mounting clips (Item 2A). Angles screw-attached to mullions and transom along sides and top of each spandrel panel with No. 10 by 1/2 in. long self-drilling, self-tapping steel screws spaced max 12 in. OC. Angle along bottom of each spandrel panel to be screw-attached to leg of angle on mullion at each end without any direct attachment to transom.
   F. **Stiff Back Channel –** Nom 2-1/2 in. wide by 7/8 in. deep hat-shaped channel formed of 22 gauge galv steel to be installed to stiffen curtain wall insulation between mullions above and below and at elevation of safing joint. One stiff back channel to be located with its centerline approx 6 in. below floor and one stiff back channel to be located with its centerline approx 6 in. above floor. A third stiff back channel is to be located near the midheight of the safing joint. A clearance of 1/4 to 1/2 in. shall be maintained between the ends of the stiff back channels and the mullions. Stiff back channel secured to mullion at each end with channel attachment clip (Item 2G) in conjunction with a No. 8 by 1/2 in. long self-drilling, self-tapping wafer head steel screw or a 3/16 in. diam steel bolt with nut and washer.
   G. **Channel Attachment Clip –** Nom 1-1/2 by 2-1/2 by 1-1/2 in. long angle formed of 16 gauge galv steel. The 2-1/2 in. leg is provided with a 1/4 in. wide by 1-1/2 in. long slot along its centerline for attachment of the stiff back channel. Clips secured to mullions mounting clips (Item 2A) and mullions, through perimeter angles, with two No. 10 by 1/2 in. long self-drilling, self-tapping steel screws. Channel clips installed with 2-1/2 in. leg recessed from interior face of mullion to accommodate thickness of curtain wall insulation (Item 2H).

H. **Curtain Wall Insulation* –** Min 2 in. thick mineral wool board insulation, unfaced or faced on one side with aluminum foil/scrim vapor retarder, supplied in min 36 in. wide boards. Insulation boards to be installed with no vertical seams and with horizontal seams spaced min 24 in. OC. A full-width board shall be centered at the midheight of floor and tightly-fitted between vertical mullions, flush with interior surface of framing. The centered board shall be secured to the stiff back channels (Item 2F) located approx 6 in. above and below the floor with cup head weld pins (Item 2J) spaced max 10 in. OC along each channel. The remainder of the spandrel panel framing above and below the centered full-width board shall be filled in with additional lengths of board cut to fit tightly between mullions and with the horizontal seams between board sections tightly butted. The boards shall be secured to the spandrel panel perimeter angles with cup head weld pins at each corner of each board and spaced max 10 in. OC. When faced boards are used, butted seams to be covered with min 4 in. wide aluminum foil tape.

ROXUL INC — RHT-80

I. **Framing Covers – Curtain Wall Insulation* –** Min 8 in. wide strips cut from the same min 2 in. thick mineral wool batt insulation used for the curtain wall insulation (Item 2H). Framing covers to be centered over mullions and secured to the spandrel panel perimeter angles (Item 2E) with cup head weld pins (Item 2J) spaced max 12 in. OC. Where more than one spandrel panel occurs between vertically separated vision panels, the horizontal transom between spandrel panels shall also be covered with an 8 in. wide framing cover in the same manner as on the vertical mullions. Framing covers on mullions to abut the mineral wool batt safing material (Item 3A) above and below floor.

ROXUL INC — RHT-80

J. **Weld Pin** - No. 12 gauge galv steel weld pin with nom 1-3/16 in. diam galv steel cup head. Cup head weld pins provided in two lengths. One length to be equal to thickness of curtain wall insulation (Item 2H) and second length to be equal to thickness of curtain wall insulation plus thickness of framing cover (Item 2I). Cup head weld pins inserted through curtain wall insulation and mullion covers and welded to spandrel panel perimeter angles at max OC spacings referenced in Items 2H and 2I.

3. **Perimeter Fire Containment System –** The perimeter fire containment system shall incorporate the following construction features:

A. **Forming Material* –** Nom 4 in. thick, mineral wool batt safing material to be installed in continuous pieces between mullion clips. Safing material to be cut to a 4-1/2 in. width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap and recessed from top surface of floor to accommodate the required thickness of fill material. Additional pieces of safing material to be friction-fit into space between mullion mounting clips at each mullion location with top edges of mullion clips covered with a min 1/2 in. thickness of compressed safing material.

ROXUL INC — SAFE

B. **Fill, Void or Cavity Material* – Sealant –** Min 1/16 in. thickness (dry) of fill material applied within the joint, flush with top surface of floor.

John Wagner & Associates Inc. – GrabberGard EFS

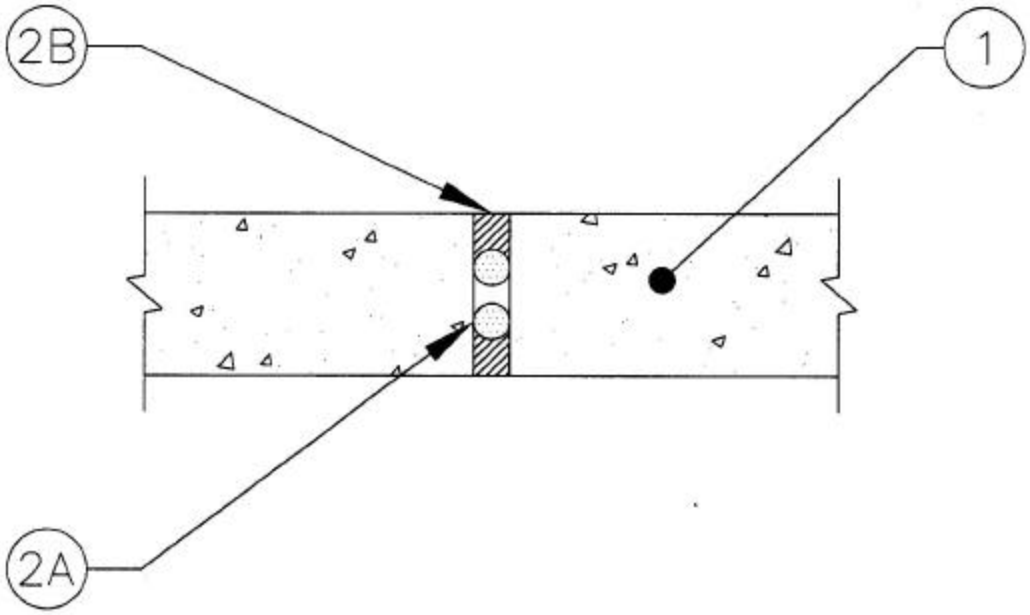
*Bearing the UL Classification Mark

System No. FF-D-0047

Assembly Rating – 2 hr

Nominal Joint Width – 1 in.

Class II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Joint Systems – Max width of joint (at time of installation of joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system shall consist of the following:
   A. **Packing Material – Backer Rod –** Nom 1-1/4 in. diam polyethylene backer rod compressed and firmly packed into joint opening and recessed from both sides of floor to accommodate required thickness of fill material.
   B. **Fill, Void or Cavity Material – Sealant –** Min 1 in. thickness of fill material applied within the joint, flush with both surfaces of floor.

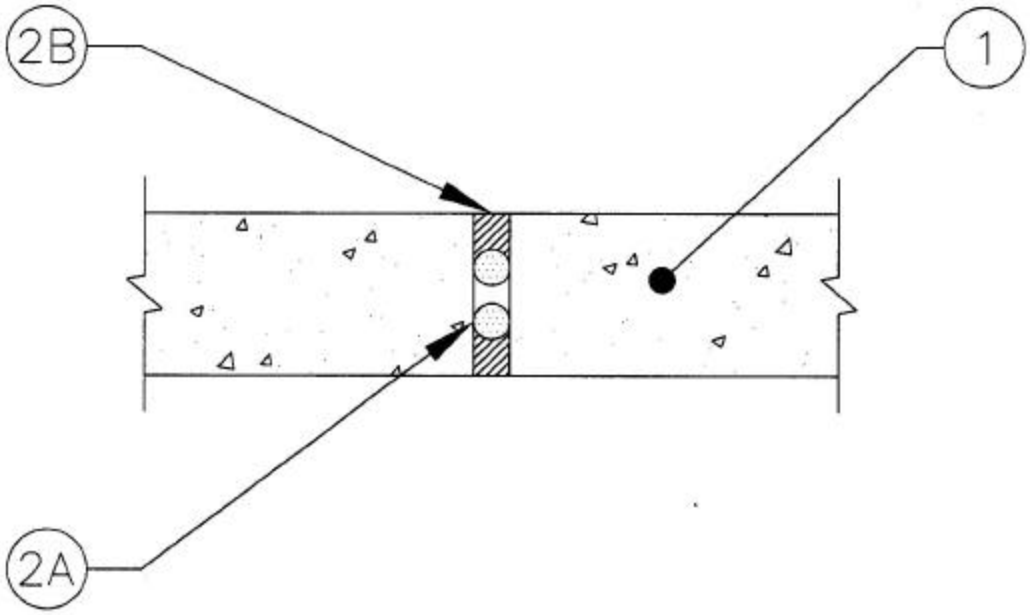
John Wagner & Associates Inc. – GrabberGard IFC

System No. FF-D-0048

Assembly Rating – 2 hr

Nominal Joint Width – 1 in.

Class II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Joint Systems – Max width of joint (at time of installation of joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system shall consist of the following:
   A. **Packing Material – Backer Rod –** Nom 1-1/4 in. diam polyethylene backer rod compressed and firmly packed into joint opening and recessed from both sides of floor to accommodate required thickness of fill material.
   B. **Fill, Void or Cavity Material – Sealant –** Min 1 in. thickness of fill material applied within the joint, flush with both surfaces of floor.

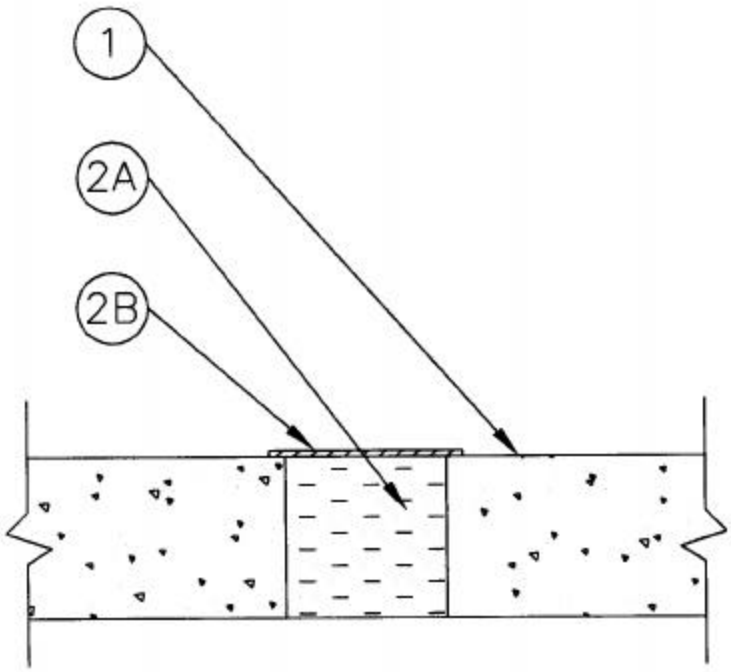
John Wagner & Associates Inc. – GrabberGard EFC

System No. FF-D-1059

Assembly Rating – 2 Hr

Joint Width – 4 in. Max

Class II Movement Capabilities – 12.5% Compression or Extension



1. **Floor Assembly –** Min 4 1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Joint System –** Max width of joint (at time of installation of joint system) is 4 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width. The joint system shall consist of the following:

   A. **Forming Material* –** Min 4 pcf mineral wool batt insulation installed into joint opening as a permanent form. Batt cut to min width of 4 1/2 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and such that the compressed batt sections are flush with the top surface of floor.

   Owens Corning – Paroc Safing Insulation
   Thermafiber LLC – Type SAF
   Rock wool Manufacturing Company – Delta Safing Board

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/16 in. dry thickness of fill material sprayed or brushed on top surface of floor to completely cover mineral wool and overlap a min of 1/2 in. onto concrete floor.

   Grabber® – GrabberGard EFS

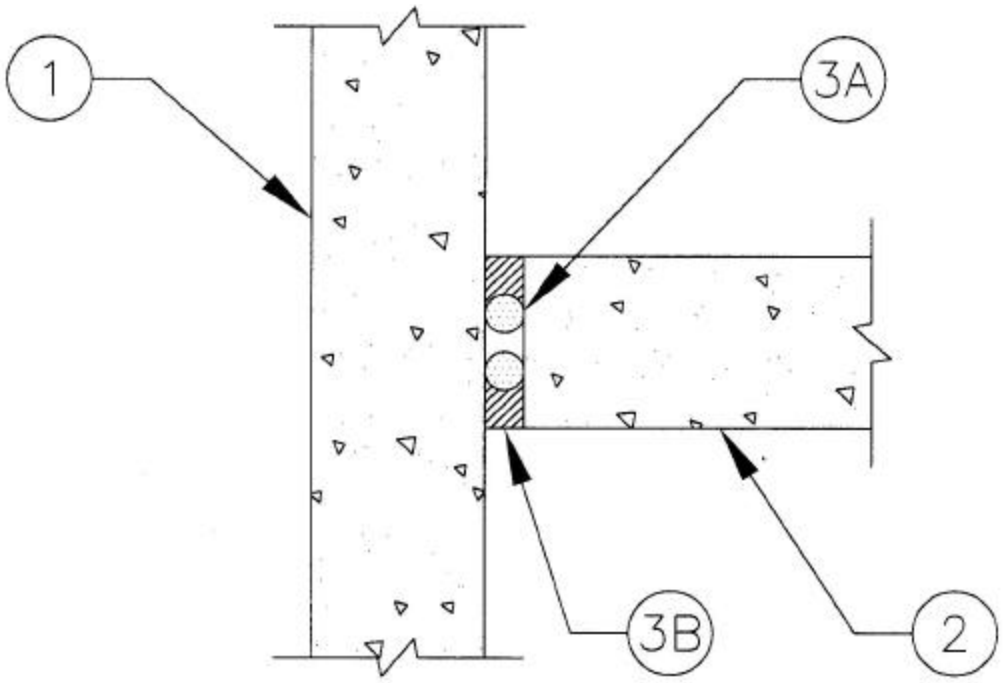
*Bearing the UL Classification Marking

System No. FW-D-0038

Assembly Rating – 2 hr

Nominal Joint Width – 1 in.

Class II Movement Capabilities – 25% Compression or Extension



1. **Wall Assembly** – Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

   See Classified **Concrete Blocks** (CATZ) category in the Fire resistance Directory for names of manufactures.

2. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

3. **Joint Systems – Max width of joint (at time of installation of joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system shall consist of the following:

   A. **Packing Material – Backer Rod –** Nom 1-1/4 in. diam polyethylene backer rod compressed and firmly packed into joint opening and recessed from both sides of wall to accommodate required thickness of fill material.

   B. **Fill, Void or Cavity Material – Sealant –** Min 1 in. thickness of fill material applied within the joint, flush with both surfaces of wall.

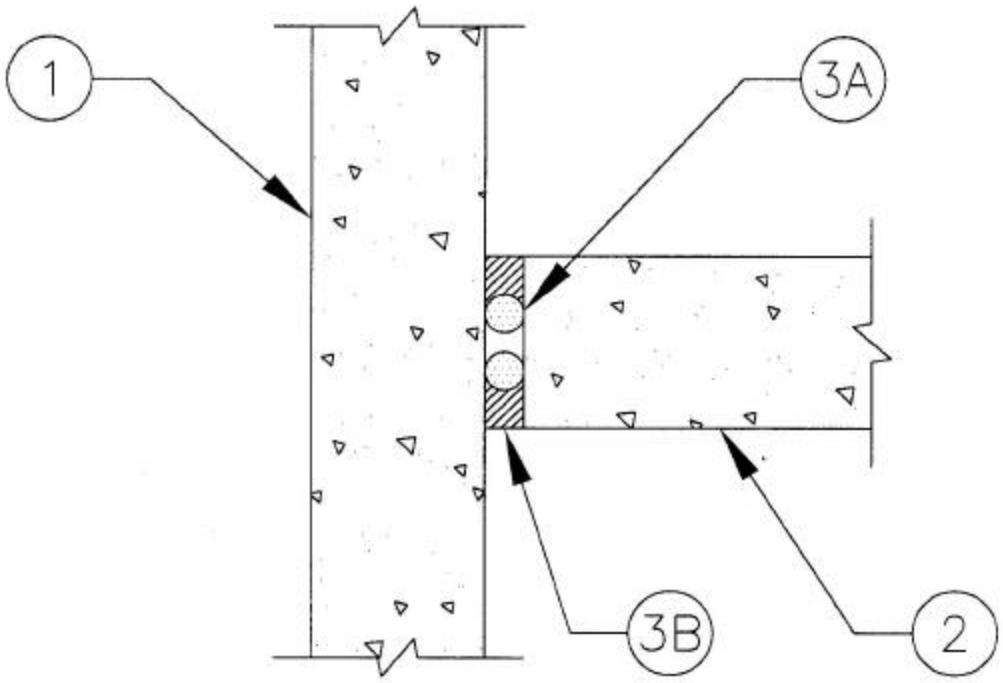
John Wagner & Associates Inc. – GrabberGard IFC

System No. FW-D-0039

Assembly Rating – 2 hr

Nominal Joint Width – 1 in.

Class II Movement Capabilities – 25% Compression or Extension



1. **Wall Assembly** – Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

   See Classified **Concrete Blocks** (CATZ) category in the Fire resistance Directory for names of manufactures.

2. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

3. **Joint Systems – Max width of joint (at time of installation of joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system shall consist of the following:

   A. **Packing Material – Backer Rod –** Nom 1-1/4 in. diam polyethylene backer rod compressed and firmly packed into joint opening and recessed from both sides of wall to accommodate required thickness of fill material.

   B. **Fill, Void or Cavity Material – Sealant –** Min 1 in. thickness of fill material applied within the joint, flush with both surfaces of wall.

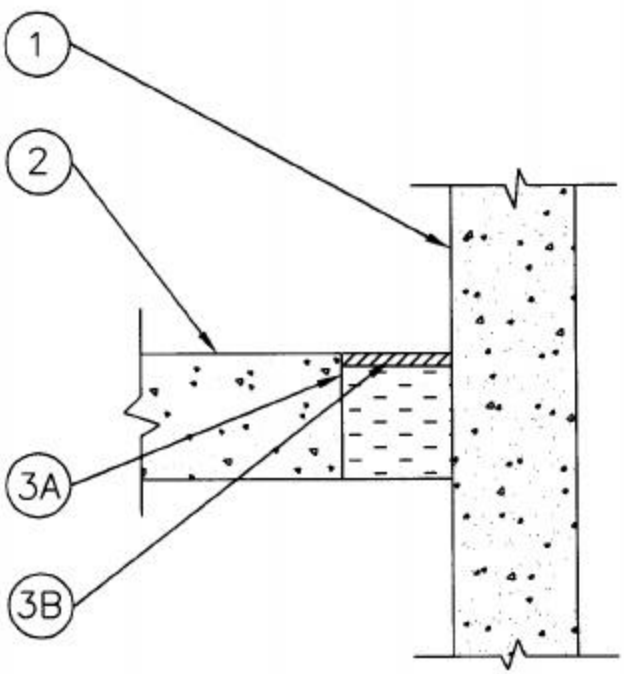
John Wagner & Associates Inc. – GrabberGard EFC

System No. FW-D-1055

Assembly Rating – 2 Hr

Joint Width – 4 in. Max

Class II Movement Capabilities – 12.5% Compression or Extension



1. **Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.**

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

2. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

3. **Joint System –** Max width of joint (at time of installation of joint system) is 4 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width. The joint system shall consist of the following:

   A. **Forming Material* –** Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Batt cut to min width of 4-1/2 in. and installed edge first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and such that the compressed batt sections are flush with the top surface of floor. Adjoining lengths of batt to be tightly butted with seams spaced min 36 in. apart along the length of the joint.

      Owens Corning – Paroc Safing Insulation

      Thermafiber LLC – Type SAF

      Rock Wool Manufacturing Company – Delta Safing Board

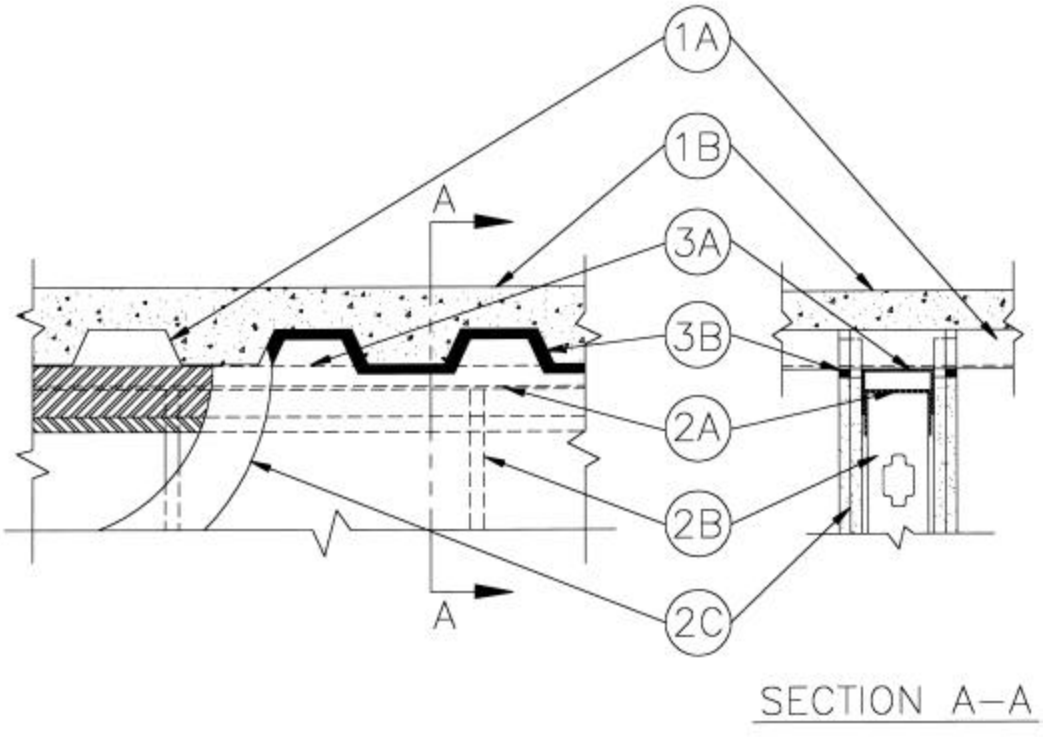
   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/16 in. dry thickness of fill material sprayed or brushed on top surface of floor to completely cover mineral wool and overlap a min of 1/2 in. onto concrete floor.

      John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0353

Assembly Ratings 1 & 2 Hr (See Item 2)
Nominal Joint Width –3/4 in.
Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. deep galv fluted units.
   B. **Concrete –** Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly** (Not Shown) – As an alternative to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of roof assembly shall be equal or greater than the hourly rating of the wall assembly and shall include the following construction features:
   A. **Steel Roof Deck** – Max 3 in. deep galv steel fluted roof deck.
   B. **Roof Insulation** – Min 2-1/4 in. thick poured insulation concrete, as measured from the top plane of the floor units.
   C. **Roof Covering* –** Hot-mopped or cold-application materials compatible with insulating concrete.

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor And Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. gap maintained between the top of ceiling runner and top of deflection plate. When deflection channel is not used, ceiling runner is secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC.
   A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item

2B). Slotted ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys of steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

METAL-LITE INC – The System
SLIPTRACK SYSTEMS INC. – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped ceiling runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. below bottom of deflection channel, when deflection channel is used. When deflection channel is not used, studs shall not be secured to ceiling runner. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at mid-height of slot on each side of wall. Stud spacing not to exceed 24 in. OC.

C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 in or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated wall, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that the gypsum board is cut to fit the contour of the steel floor units with a nom 3/4 in. gap. The screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the deflection channel, when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the ceiling runner. **The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.**

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a deflection channel and a fill material, as follows:

A. **Deflection Channel –** (Optional) – A nom 3-5/8 in. wide by min 2 in. deep min 24 ga. steel U-shaped channel. Deflection channel secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Fill Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and all surfaces of the steel floor units, flush with each surface of gypsum board.

John Wagner & Associates Inc. – GrabberGard IFC

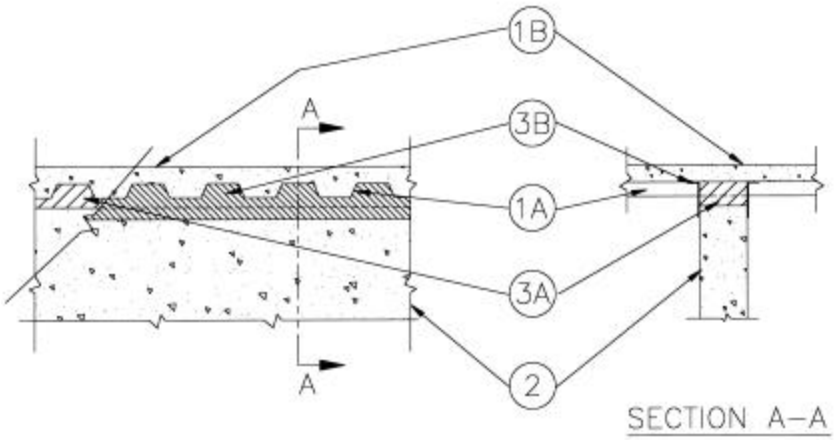
*Bearing the UL Classification Marking

System No. HW-D-0354

Assembly Rating – 2 Hr (See Item 2)

Nominal Joint Width – 3/4 in.

Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. deep galv fluted units.
   B. **Concrete –** Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly** (Not Shown) – As an alternative to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of roof assembly shall be equal or greater than the hourly rating of the wall assembly and shall include the following construction features:
   A. **Steel Roof Deck** – Max 3 in. deep galv steel fluted roof deck.
   B. **Roof Insulation** – Min 2-1/4 in. thick poured insulation concrete, as measured from the top plane of the floor units.
   C. **Roof Covering* –** Hot-mopped or cold-application materials compatible with insulating concrete.

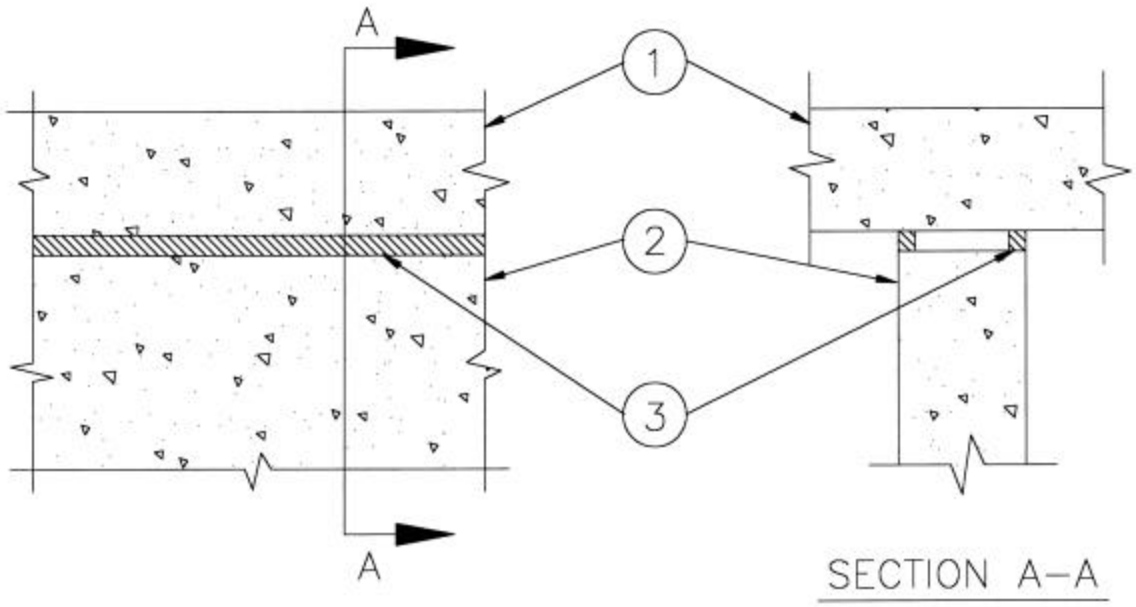
2. **Wall Assembly –** Min 4-7/8 in. thick reinforced lightweight or normal weight (100-150pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a forming material and a fill material, as follows:
   A. **Forming Material* –** Min 4-7/8 in. thickness of min 4 pcf density mineral wool batt insulation cut to the shape of the fluted deck, approximately 25 percent larger than the area of the flutes with additional min 4-7/8 in. thick by 1 in. high sections at the bottom of the shapes to completely fill the 3/4 in. gap between the top of the wall and bottom of the steel floor units. Mineral wool to be compressed and firmly packed into the flutes and the gap between the top of the wall and bottom of the steel floor units, flush with both sides of wall.
      IIG Minwool LLC – Paroc Safing Insulation
      Thermafiber LLC – Type SAF
   B. **Fill, Void or Cavity Material* –** Min 1/16 in. thickness of fill material sprayed or brushed on each side of the wall in the flutes of the steel floor units and between the top of the wallboard and the bottom of the steel floor units to completely cover mineral wool and overlap a min of 1 in. onto wall and steel deck on both sides of wall.
      John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0355

Assembly Ratings – 2 Hr
Nominal Joint Width – 3/4 in.
Class II Movement Capabilities –33% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.

2. **Wall Assembly –** Min 4-7/8 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.**
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

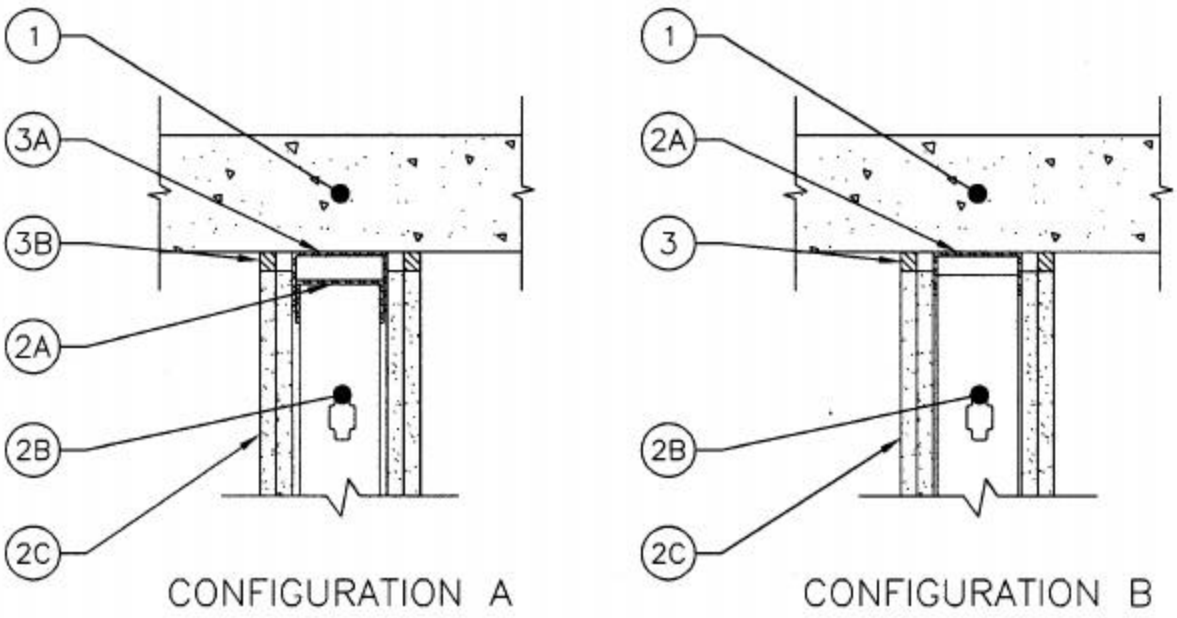
3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the wall and the bottom of the floor, flush with each surface of wall.

John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. HW-D-0356

Assembly Ratings 1 & 2 Hr (See Item 2)
Nominal Joint Width – 3/4 in.
Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.

CONFIGURATION A

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Ceiling Runners –** Floor and Ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be installed within the deflection channel such that a 1 in. gap is maintained between the top of ceiling runner and top of deflection channel. Deflection channel is secured to floor with steel masonry anchors spaced a max of 24 in. OC.
   B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. below bottom of deflection channel. Stud spacing not to exceed 24 in. OC.
   C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the wallboard to studs at the top of the wall shall be located 1in. below the bottom of the U-shaped deflection channel (Item 3A).

   The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a deflection channel and a fill material, as follows:
   A. **Deflection Channel –** A nom 3-5/8 in. wide by min 2 in. deep min 24 gauge (or heavier) steel U-shaped channel. Deflection channel secured to floor assembly with steel fasteners, spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and the bottom of floor, flush with each surface of wallboard.

John Wagner & Associates Inc. – GrabberGard IFC

CONFIGURATION B

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners –** Floor and Ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner is secured to floor with steel masonry anchors spaced a max of 24 in. OC.

A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner is secured to floor with steel masonry anchors spaced max 24 in. OC.

METAL-LITE – The System

SLIPTRACK SYSTEMS, INC – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Steel studs shall not be secured to ceiling runner when slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at mid-height of each slot Stud spacing not to exceed 24 in. OC.

C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the gypsum board to studs at the top of the wall shall be located 1in. below the bottom of the ceiling runner (Item 2A).

The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.

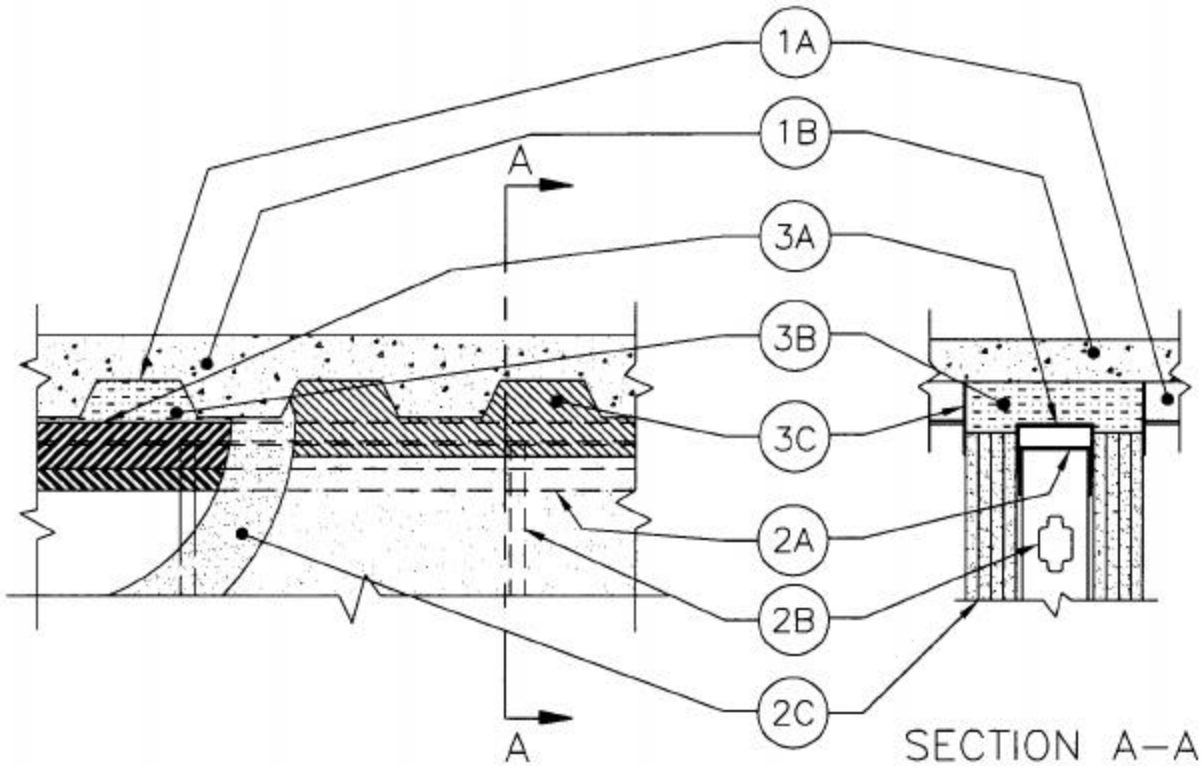
3. **Fill, Void or Cavity Material* – Sealant – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and the bottom of floor, flush with each surface of wallboard.

John Wagner & Associates Inc. – GrabberGard IFC

*Bearing the UL Classification Marking

System No. HW-D-0357

Assembly Ratings 1, 2, 3 and 4 Hr (See Item 2)
L Rating at Ambient – Less than 1 CFM/Lin Ft.
L Rating at 400 F – Less than 1 CFM/Lin Ft.
Nominal Joint Width – 3/4 in.
Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. deep galv fluted units.
   B. **Concrete –** Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly** (Not Shown) – As an alternative to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of roof assembly shall be equal or greater than the hourly rating of the wall assembly and shall include the following construction features:
   A. **Steel Roof Deck** – Max 3 in. deep galv steel fluted roof deck.
   B. **Roof Insulation** – Min 2-1/4 in. thick poured insulation concrete, as measured from the top plane of the floor units.
   C. **Roof Covering* –** Hot-mopped or cold-application materials compatible with insulating concrete.

2. **Wall Assembly –** The 1, 2, 3, or 4 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400-Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. gap maintained between the top of ceiling runner and top of deflection plate. When deflection channel is not used, ceiling runner is secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC.

A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner is secured to floor with steel masonry anchors spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

METAL-LITE – The System
SLIPTRACK SYSTEMS, INC – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. below bottom of deflection channel, when deflection channel is used. When deflection channel is not used, studs shall not be secured to ceiling runner. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at mid-height of each slot Stud spacing not to exceed 24 in. OC

C. **Gypsum Board* –** Gypsum board sheets installed to a min total thickness of 5/8,1-1/4,1-7/8 or 2-1/2 in. on each side of wall for 1,2,3 and 4 hr rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the deflection channel, when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the ceiling runner. **The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.**

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a deflection channel, forming material and a fill material, as follows:

   A. **Deflection Channel** (Optional) – A nom 3-5/8 in. wide by min 2 in. deep, min 24 ga. steel U-shaped channel. Deflection channel secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

   B. **Forming Material* –** Min 4-7/8 in. thickness of min 4 pcf density mineral wool batt insulation for 1 and 2 hr rated assemblies, min 7-3/8 in. and 8-5/8 in. thickness of min 4 pcf density mineral wool batt insulation for 3 and 4 hr rated assemblies, respectively, cut to the shape of the fluted deck, approximately 25 percent larger than the area of the flutes and compressed into flutes of the steel floor units between the top of the deflection channel and the steel deck, flush with both sides of wall. Additional pieces of min 5/8 in. thickness of min 4 pcf mineral wool batt insulation for 1 and 2 hr rated assemblies, min 1-7/8 in. and min 2-1/2 in. thickness of min 4 pcf density mineral wool batt insulation for 3 and 4 hr rated assemblies, respectively, cut into strips and compressed approximately 25 percent to fill the 3/4 in. gap between the top of the gypsum board and bottom of the steel floor units, flush with both sides of wall.

      IIG Minwool LLC - Paroc Safing Insulation
      Thermafiber L L C - Type SAF
      Rock Wool Manufacturing Company – Delta Safing Board

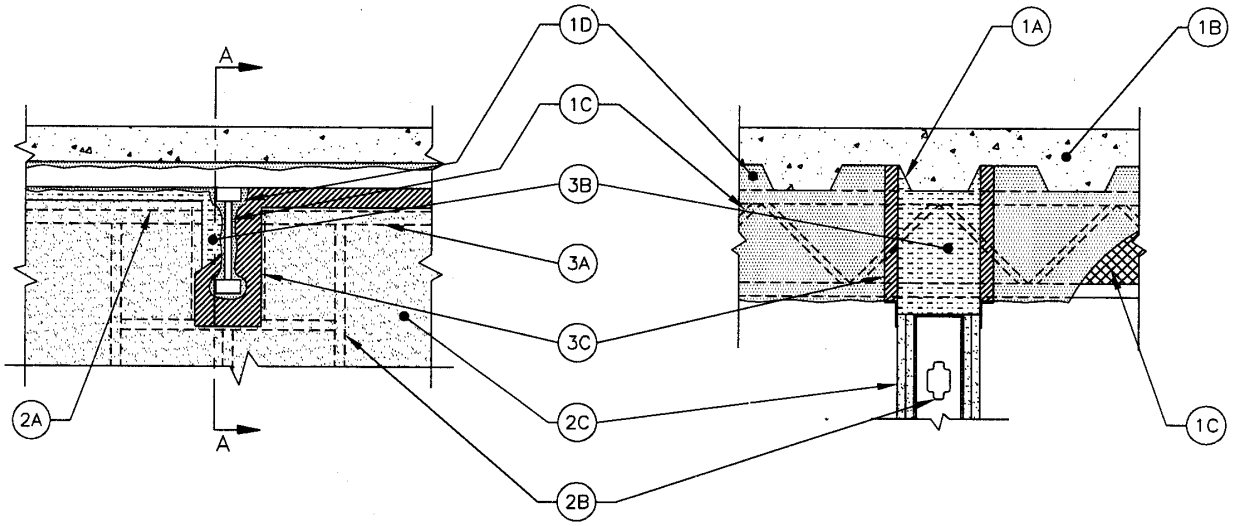
   C. **Fill, Void or Cavity Material* –** Min 1/16 in. (dry) thickness of fill material sprayed or brushed on each side of the wall in the flutes of the steel floor units and between the top of the gypsum board and the bottom of the steel floor units to completely cover mineral wool and overlap a min of 1 in. onto gypsum board and steel deck, on both sides of wall.

      John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0358

Assembly Ratings – 1 & 2 Hr
Nominal Joint Width – 1 in.
CLASS II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 Series Floor -Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. deep galv steel fluted floor units.
   B. **Concrete –** Min 2-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete, as measured from the top plane of the floor units.
   C. **Structural Steel Support** (Optional) – Steel beam or open-web steel joist, as specified in the individual D700 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented perpendicular to wall assembly. Where open-web steel joists pass through the fire rated wall, 3/8 in. diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd shall be secured to one side of each joist with galvanized steel tie wire and the lath shall be fully covered with spray-applied fire resistive material with no min thickness requirement.
   D. **Spray-Applied Fire Resistive Materials* –** After installation of the ceiling runner (Item 2A) or deflection channel (Item 3A, if used), steel floor units and structural steel supports to be sprayed in accordance with the specifications in the individual D700 Series Design.

      WR Grace & Co. Conn Construction Products Div. – Type MK-6/HY.

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Ceiling Runners** – Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with min 1-1/4 in. to max 3 in. flanges. When deflection channel (Item 3A) is used, ceiling runner is to nest within the deflection channel with 1/2 in. to 1 in. gap maintained between the top of ceiling runner and top of the deflection channel. When deflection channel is not used, ceiling runner to be provided with 3 in. flanges and secured to steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC. Ceiling runner to be centered beneath and parallel with valley of steel floor units. A clearance of 1 to 1-1/4 in. shall be maintained between the end of the ceiling runner or deflection channel and the spray applied fire resistive material on the structural steel support members.

A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

METAL-LITE – The System

SLIPTRACK SYSTEMS, INC – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than with bottom nesting in and secured to floor runner. When deflection channel (Item 3A) is used, steel studs attached to ceiling runner (Item 2A) with sheet metal screws located 1/2 in. below bottom of deflection channel. When deflection channel is not used, studs to nest in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at mid-height of each slot. A framed opening shall be constructed around each structural steel support member. A min clearance of 1 in. to a max clearance of 3 in. shall be maintained between the framing and spray applied fire resistive material on the two sides of the structural support member. The clearance between the framing and the spray applied fire resistive material on the bottom of the structural steel support member shall be min 1/2 in. to max 1 in. Stud spacing not to exceed 24 in. OC

C. **Gypsum Board* –** Gypsum Wallboard sheets installed to a min total thickness of 5/8 in. and 1-1/4 in. on each side of wall for 1 and 2 hr rated assemblies, respectively. Wall to be constructed as specified in the individual U400 Series Design in the UL Fire Resistance Directory, except that a max nom 1 in. gap shall be maintained between the top of the gypsum board and the spray applied fire resistive material on the steel floor units and min 1/2 in. to max 1 in. gap shall be maintained between the top edge of the gypsum board and the spray applied fire resistive material on the structural steel support member. The screws attaching the gypsum board to the studs along the top of the wall shall be located 1 in. below the bottom of the deflection channel, when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board at the top of the wall shall be located 1 in. below the bottom of the ceiling runner. **The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.**

3. **Joint System – Max separation between bottom of the spray applied fire resistive material on the steel floor units and top of gypsum board (at time of installation of joint system) is 1 in. Max separation between spray applied fire resistive material on bottom of structural support member and framed opening in top of wall is 1 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width as measured between the spray applied fire resistive material on the steel floor units and the top of the gypsum board.** The joint system consists of a forming material and fill materials, with or without deflection channel (Item 3A), as follows:

   A. **Deflection Channel** (Optional) – Min 24 gauge galv steel channel, 3 in. deep, sized to accommodate ceiling runner (Item 2A). Deflection channel to be centered beneath and parallel with valley of steel floor unit and secured to steel floor unit with steel fasteners or by welds spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1/2 in. to 1 in. gap between the top of the ceiling runner and the top of the deflection channel. A clearance of 1 to 1-1/4 in. shall be maintained between the end of the deflection channel and the spray applied fire resistive material on the structural steel support members. The ceiling runner nest inside the deflection channel without attachment.

   B. **Forming Material –** Min 4 pcf density mineral wool batt insulation cut to a length approximately the same as the overall thickness of wall and inserted cut edge first into the spaces between the spray-applied fire resistive material on the structural steel member and the framed notch at the top of the wall, flush with the gypsum board surface on both sides of the wall. The thickness of forming material shall be sufficient to attain a min compression of 33 percent between the sides of the framed notch and the protected structural steel member and between the bottom of the framed notch and bottom of the protected structural steel member. Additional sections of mineral wool batt insulation are compressed 33 percent in thickness and are installed cut edge first to completely fill the gap above the top of the gypsum board, flush with both surfaces of wall.

      Fibrex Insulations Inc. – FBX Safing Insulation
      IIG Minwool LLC – Paroc Safing Insulation
      Rock Wool Manufacturing Co. – Delta Board
      Roxul – Type Safe
      Thermafiber, LLC – Type SAF

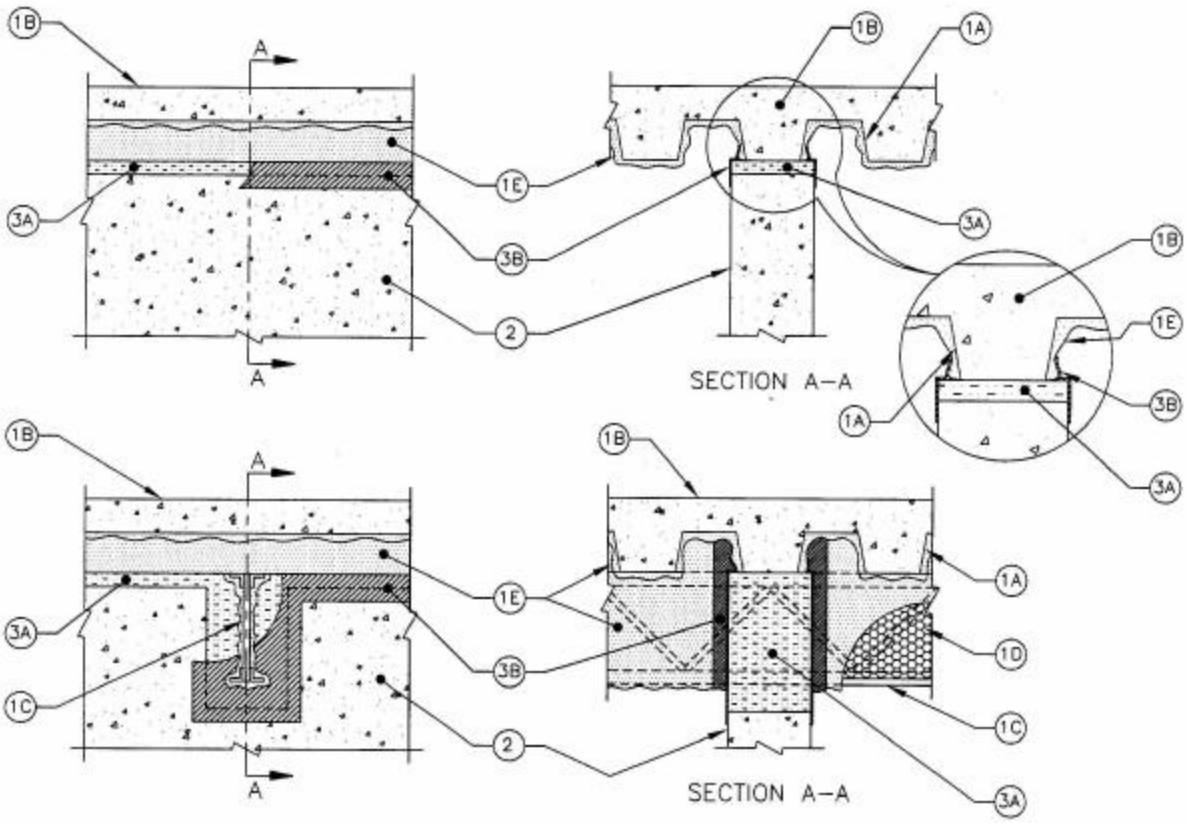
   C. **Fill, Void or Cavity Material* –** Min 1/16 in. wet thickness of fill material sprayed or brushed over the forming material on each side of the wall. Fill material to overlap a min of 1 in. onto gypsum board and a min 2 in. onto the spray applied fire resistive material (Item 1D) on the steel floor unit and on the structural steel support member on both sides of wall.

      John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0359

Assembly Rating 2 Hr
L Rating at Ambient – Less than 1 CFM/Lin. Ft.
L Rating at 400° F – Less that 1 CFM/Lin. Ft.
Nominal Joint Width - 1”
Class II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 Series Floor -Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   - A. **Steel Floor and Form Units* –** Max 3 in. deep galv steel fluted floor units.
   - B. **Concrete** - Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.
   - C. **Structural Steel Support** (Optional) – Steel beam or open-web steel joist, as specified in the individual D700 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented perpendicular to wall assembly.
   - D. **Steel Lath –** Where open-web steel joists pass through the fire rated wall, 3/8 in. diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd shall be secured to one side of each joist with steel tie wire and the lath shall be fully covered with spray-applied fire resistive material with no min thickness requirement.
   - E. **Spray-Applied Fire Resistive Materials* –** Prior to installation of the forming material (Item 3A) and sealant (Item 3B), steel floor units and structural steel supports to be sprayed with the thickness of material specified in the individual D700 Series Design. Material is to be excluded from the steel deck in the area immediately above the wall. The spray applied fire resistive material is mixed with water in accordance with the mixing instructions on the bag. The min average density of the spray applied fire resistive material shall be 15 pcf with a min individual density of 14 pcf. Dee Design Information Section in Volume 1 of the Fire Resistance Directory for method of density determination.

WR Grace & Co. Conn Construction Products Div. – Type MK-6/HY.

2. **Wall Assembly** – Min 6-1/8 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block*. Wall assembly to be centered beneath and parallel with valley of steel floor unit.

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

3. **Joint System – Max separation between bottom plane of steel floor unit and top of concrete wall (at time of installation of joint system) is 1 in. Max separation between spray applied fire resistive material on bottom of structural support member and notched opening in top of wall is 1 in. Max clearance between spray applied fire resistive material on sides of structural steel member and notched opening in top of wall in 3 in. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width as measured between bottom plane of steel floor units and top of concrete wall.** The joint system shall consists of forming and fill materials, as follows:

A. **Forming Material* –** Nom 4 pcf density mineral wool batt insulation cut to a length approximately 1 in. longer than overall thickness of wall and inserted cut edge first into the spaces between the spray-applied fire resistive material on the structural steel member and the notched opening at the top of the wall. The thickness of forming material shall be sufficient to attain a min compression of 20 percent between the sides of the notched opening and the protected structural steel member and a min compression of 33 percent between the bottom of the notched opening and the bottom of the protected structural steel member. The mineral wool batt insulation is to be additionally compressed in the length direction such that it is flush with both surfaces of the wall. Additional min 8 in. wide sections of mineral wool batt insulation are compressed 50 percent in thickness and are installed cut edge first to completely fill the gap above the top of the wall. The forming material shall be flush with both surfaces of wall.

Fibrex Insulations Inc. – FBX Safing Insulation
IIG Minwool LLC – Paroc Safing Insulation
Rock Wool Manufacturing Co. – Delta Board or Delta-8
Roxul – Type Safe
Thermafiber, LLC – Type SAF

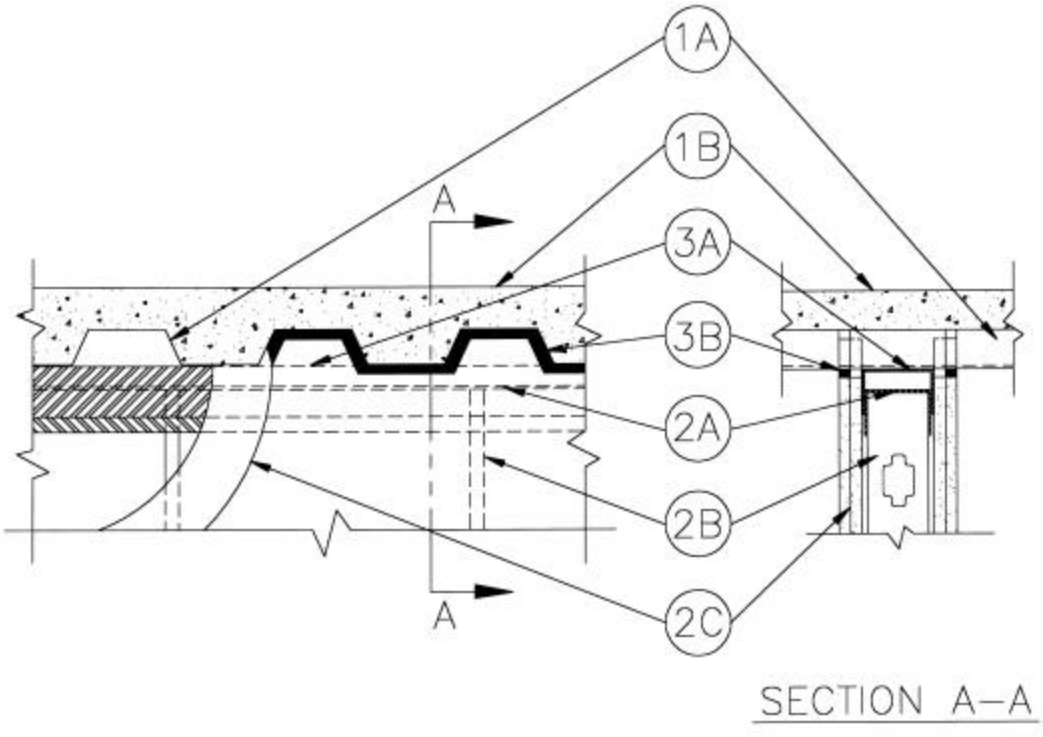
B. **Fill, Void or Cavity Material* –** Min 1/8 in. (dry) thickness of fill material sprayed or brushed over the forming material on each side of the wall. Fill material to overlap a min of 1/2 in. onto the concrete wall and a min 2 in. onto the spray applied fire resistive material (Item 1E) on the steel floor unit and on the structural steel support member on both sides of wall.

John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0368

Assembly Ratings 1 & 2 Hr (See Item 2)
Nominal Joint Width –3/4 in.
Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. deep galv fluted units.
   B. **Concrete –** Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly** (Not Shown) – As an alternative to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of roof assembly shall be equal or greater than the hourly rating of the wall assembly and shall include the following construction features:
   A. **Steel Roof Deck** – Max 3 in. deep galv steel fluted roof deck.
   B. **Roof Insulation** – Min 2-1/4 in. thick poured insulation concrete, as measured from the top plane of the floor units.
   C. **Roof Covering* –** Hot-mopped or cold-application materials compatible with insulating concrete.

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor And Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. gap maintained between the top of ceiling runner and top of deflection plate. When deflection channel is not used, ceiling runner is secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC.
   A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed perpendicular to direction of fluted steel floor units and secured to

valleys of steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

METAL-LITE INC – The System
SLIPTRACK SYSTEMS INC. – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped ceiling runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. below bottom of deflection channel, when deflection channel is used. When deflection channel is not used, studs shall not be secured to ceiling runner. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at mid-height of slot on each side of wall. Stud spacing not to exceed 24 in. OC.

C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 in or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated wall, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that the gypsum board is cut to fit the contour of the steel floor units with a nom 3/4 in. gap. The screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the deflection channel, when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. below the bottom of the ceiling runner. **The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.**

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a deflection channel and a fill material, as follows:

A. **Deflection Channel –** (Optional) – A nom 3-5/8 in. wide by min 2 in. deep min 24 ga. steel U-shaped channel. Deflection channel secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

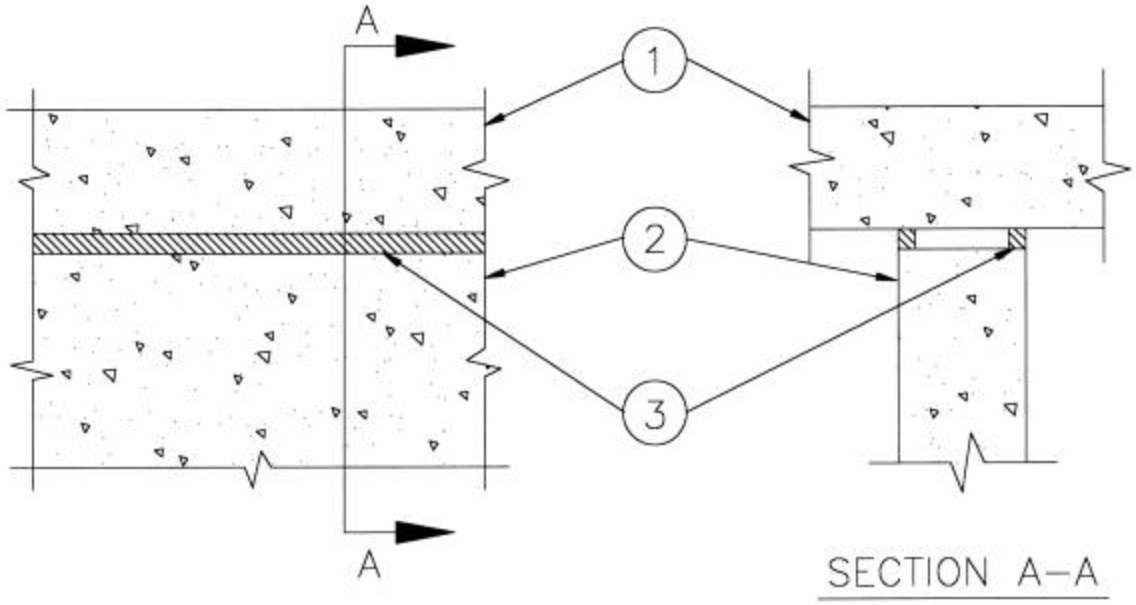
B. **Fill Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and all surfaces of the steel floor units, flush with each surface of gypsum board.

John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. HW-D-0369

Assembly Ratings – 2 Hr
Nominal Joint Width – 3/4 in.
Class II Movement Capabilities –33% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.

2. **Wall Assembly –** Min 4-7/8 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.**
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

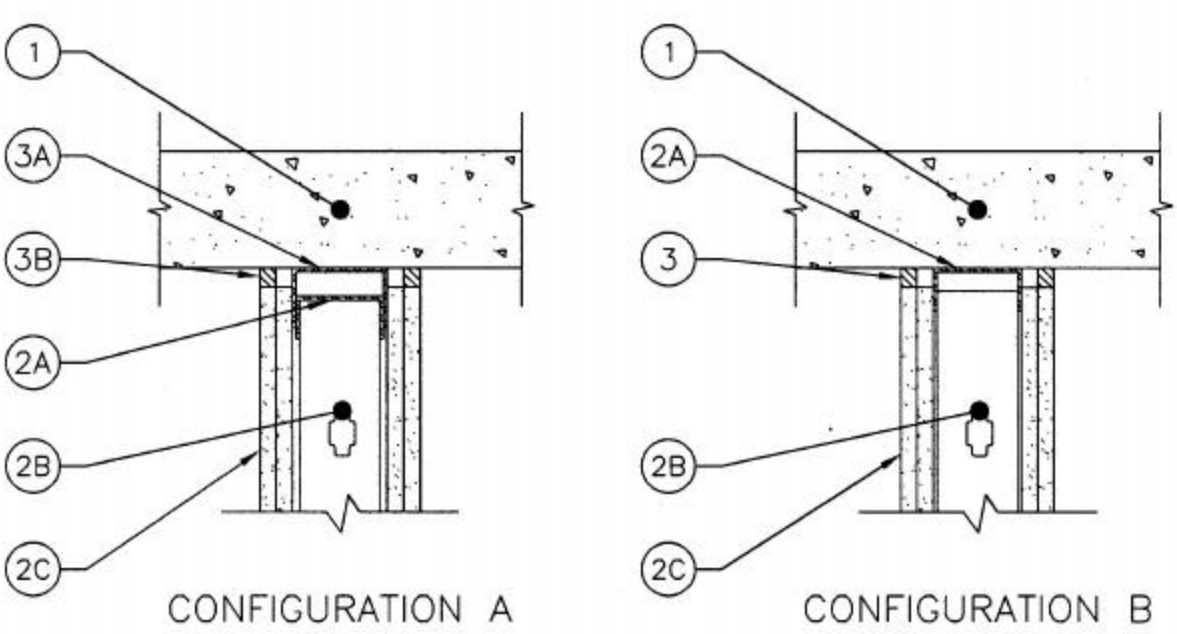
3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the wall and the bottom of the floor, flush with each surface of wall.

John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. HW-D-0370

Assembly Ratings 1 & 2 Hr (See Item 2)
Nominal Joint Width – 3/4 in.
Class II Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete.

CONFIGURATION A

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Ceiling Runners –** Floor and Ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be installed within the deflection channel such that a 1 in. gap is maintained between the top of ceiling runner and top of deflection channel. Deflection channel is secured to floor with steel masonry anchors spaced a max of 24 in. OC.
   B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. below bottom of deflection channel. Stud spacing not to exceed 24 in. OC.
   C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the wallboard to studs at the top of the wall shall be located 1in. below the bottom of the U-shaped deflection channel (Item 3A).

   The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.

3. **Joint System – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of a deflection channel and a fill material, as follows:
   A. **Deflection Channel –** A nom 3-5/8 in. wide by min 2 in. deep min 24 gauge (or heavier) steel U-shaped channel. Deflection channel secured to floor assembly with steel fasteners, spaced max 24 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Fill, Void or Cavity Material* – Sealant –** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and the bottom of floor, flush with each surface of wallboard.

John Wagner & Associates Inc. – GrabberGard EFC

CONFIGURATION B

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners –** Floor and Ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner is secured to floor with steel masonry anchors spaced a max of 24 in. OC.

A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner is secured to floor with steel masonry anchors spaced max 24 in. OC.

METAL-LITE – The System

SLIPTRACK SYSTEMS, INC – SLP-TRK

A2. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. Clipped ceiling runner installed perpendicular to direction of fluted steel floor units and secured to valleys with steel fasteners spaced 24 in. OC.

TOTAL STEEL SOLUTIONS LLC – Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed perpendicular to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. OC.

THE STEEL NETWORK INC – VertiTrack VTD358, VTD400, VTD600 and VTD800

B. **Studs –** Steel studs to be min 3-5/8 in. wide. Studs cut 1/2 to 3/4 in. less in length than assembly height. Steel studs shall not be secured to ceiling runner when slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at mid-height of each slot Stud spacing not to exceed 24 in. OC.

C. **Gypsum Board* –** Gypsum board sheets to be installed to a min total thickness of 5/8 or 1-1/4 in. on each side of the wall for a 1 or 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the gypsum board to studs at the top of the wall shall be located 1in. below the bottom of the ceiling runner (Item 2A).

The hourly fire rating of the joint system is dependent on the hourly fire rating of the wall.

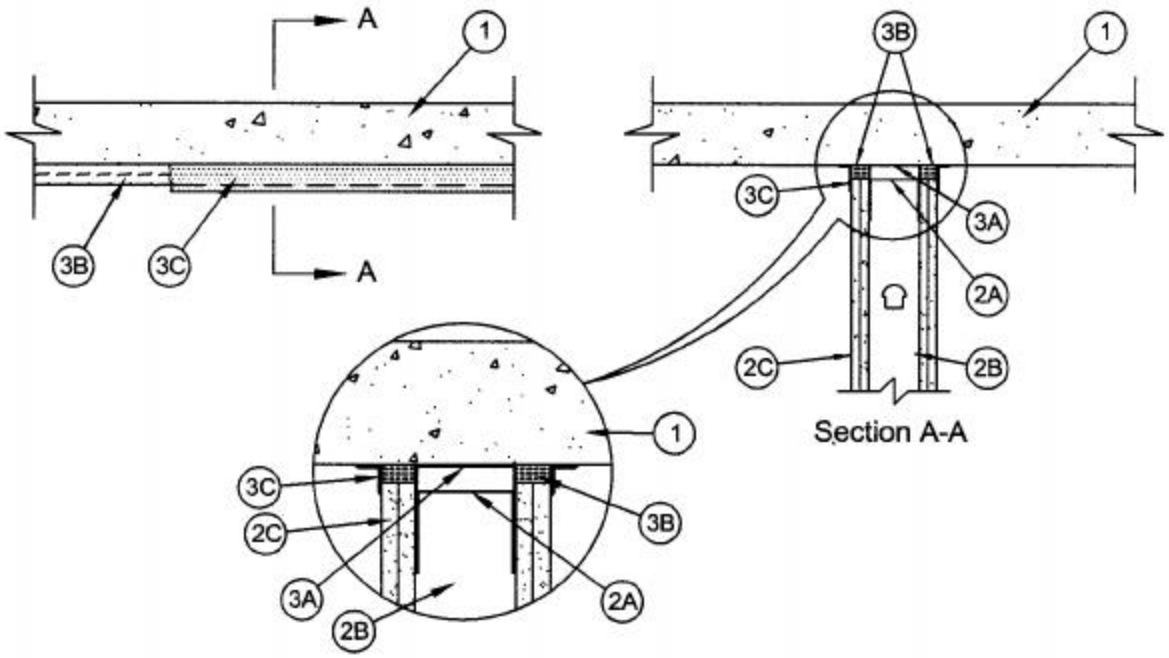
3. **Fill, Void or Cavity Material* – Sealant – Max separation between bottom of floor and top of wall is 3/4 in. The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** Min 5/8 in. thickness of fill material installed on each side of the wall between the top of the gypsum board and the bottom of floor, flush with each surface of wallboard.

John Wagner & Associates Inc. – GrabberGard EFC

*Bearing the UL Classification Marking

System No. HW-D-0404

Assembly Rating 1 & 2 Hr (See Item 2)
L Rating at Ambient – Less than 1 CFM/Lin Ft.
L Rating at 400°F – Less than 1 CFM/Lin Ft.
Nominal Joint Width – 1-1/2 in.
Class II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

   A. **Steel Floor And Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with 3 in. (76 mm) flanges. When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel. When deflection channel is not used, ceiling runner is secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC.

   A1. **Light Gauge Framing* – Slotted Ceiling Runner –** As an alternative to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv. steel channels with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

   METAL-LITE INC – The System
   SLIPTRACK SYSTEMS, INC. – SLP-TRK

   A3. **Light Gauge Framing* – Clipped Ceiling Runner –** As an alternate to the ceiling runner in Items 2A and 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm). Clipped ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

   TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. **Light Gauge Framing* – Vertical Deflection Ceiling Runner –** As an alternate to the ceiling runner in Items 2A, 2A1 and 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips provided with step bushings for permanent fastening of steel studs. Vertical deflection ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When vertical deflection ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK, INC. – VertiTrack VTD358, VTD400, VTD600 AND VTD800

A4. **Light Gauge Framing* – Notched Ceiling Runner –** As an alternate to the ceiling runner in Items 2A through 2A3, notched ceiling runner to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

DENMAR STEEL INC – Type SCR

B. **Studs Steel** - Studs to be min 3-5/8 in. (92 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection, through bushings, with steel screws at midheight of each slot. Stud spacing not to exceed 24 in OC (610 mm).

C. **Gypsum Board*** – Gypsum board sheets installed to min total thickness of 5/8 in. and 1-1/4 in. (16 mm and 32 mm) on each side of wall for 1 and 2 hr rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a max 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the lower surface of the floor. The screws attaching the wallboard to studs (Item 2B) at the top of the wall shall be located 1 in. (25 mm) below the bottom of the deflection channel (Item 3A), when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. (25 mm) below the bottom of the ceiling runner.

The hourly fire rating of the joint system is dependant of the hourly fire rating of the wall.

3. **Joint System – Max separation between bottom of floor and top of wall is 1-1/2 in. (38 mm). The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system consists of a deflection channel, forming material and a fill material, as follows:

A. **Deflection Channel –** (Optional) - A nom 3-5/8 in. (92 mm) wide by 3 in. (76 mm) deep min 24 ga steel U-shaped channel. Deflection channel secured to concrete floor slab with steel masonry anchors spaced max 24 in. OC (610 mm). The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Forming Material*** – Min 4 pcf (64 kg/m^3) mineral wool batt insulation cut into 5/8 in. and 1-1/4 in. (16 and 32 mm) wide strips for 1 and 2 Hr rated assemblies, respectively. Mineral wool to be compressed 50 percent in thickness and installed edge first into gap between top of gypsum board and bottom of floor, flush with both sides of wall.

FIBREX INSULATIONS INC — FBX Safing Insulation
IIG MINWOOL LLC – MinWool-1200 Safing
ROCK WOOL MANUFACTURING CO — Delta Board or Delta -8
ROXUL INC — Type Safe
THERMAFIBER L L C — Type SAF

C. **Fill, Void or Cavity Material* –** Min 1/16 in. (1.6 mm) thickness (dry) of fill material sprayed or brushed on each side of the wall between the top of the gypsum board and the bottom of the floor to completely cover mineral wool and overlap a min of 1/2 in.(13 mm) onto gypsum board and floor on both sides of wall.

JOHN WAGNER & ASSOCIATES INC. – GrabberGard EFS

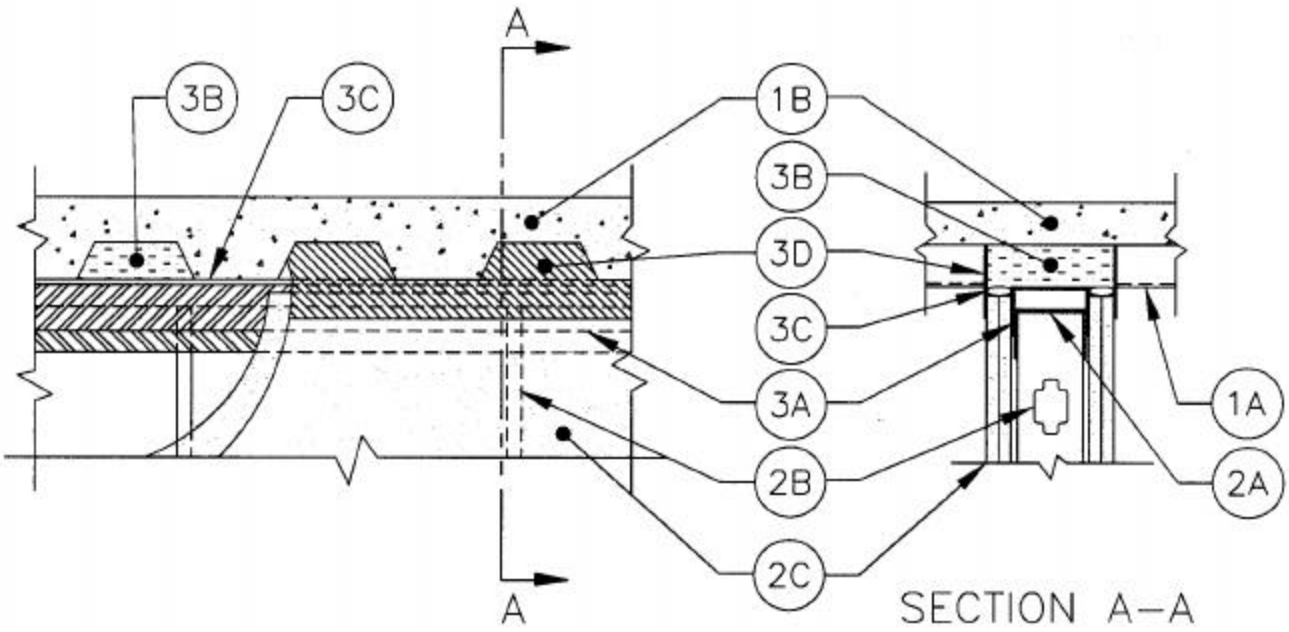
*Bearing the UL Classification Marking

System No. HW-D-0531

Assembly Ratings 1 & 2 Hr (See Item 2)

Nominal Joint Width – 3/4 in.

Class II and III Movement Capabilities – 33% Compression or Extension



1. **Floor Assembly –** The fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Form Units* –** Max 3 in. (76 mm) deep galv fluted units.
   B. **Concrete –** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400kg/m^3) concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly –** (not shown) – As an alternate to the floor assembly a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly and shall include the following construction features:
   A. **Steel Roof Deck –** Max 3 in. (76 mm) deep galv. steel fluted roof deck.
   B. **Roof Insulation –** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the floor units.
   C. **Roof Covering –** Hot-mopped or cold application materials compatible with insulating concrete.
   D. **Studs –** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 5/8 in. (16 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. Stud spacing not to exceed 24 in. (610 mm) OC.

2. **Wall Assembly –** The 1 or 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Steel Floor and Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection plate. When deflection channel is not used, ceiling runner is secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. (610 mm) OC.
   B. **Gypsum Board* –** Gypsum board sheets installed to a min total thickness of 5/8 in. (16 mm) on each side of wall. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 3/4 in. (19 mm) gap shall be maintained between top of the wallboard and the bottom of the steel floor units and the top row of screws shall be installed into the studs 1 in. (25 mm) below the bottom of the ceiling runner or deflection channel, when used. **The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.**

3. **Joint System – Max width of joint (at time of installation of joint system) is 3/4 in. (19 mm). The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system consists of the following:
   A. **Deflection Channel** (Optional) – A nom 3-5/8 in. (92 mm) wide by min 2 in. (51 mm) deep, min 24 gauge steel U-shaped channel. Deflection channel secured to valleys of steel floor units (Item 1A) with steel fasteners or by welds spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.
   B. **Forming Material* –** Min 4-7/8 in. (124 mm) and 6-1/8 in. (156 mm) thickness of min 4 pcf (64 kg/m^3) density mineral wool batt insulation for 1 and 2 hr rated assemblies, respectively, cut to the shape of the fluted deck, approximately 20 percent larger than the area of the flutes and compressed into flutes of the steel floor units between the top of the ceiling runner and the steel deck, flush with the surface of the wall on both sides.

      Fibrex Insulation, Inc. – FBX Safing Insulation
      IIG Minwool LLC – MinWool-1200 Safing
      Rock Wool Manufacturing Co – Delta Safing Board
      Thermafiber LLC – Type SAF

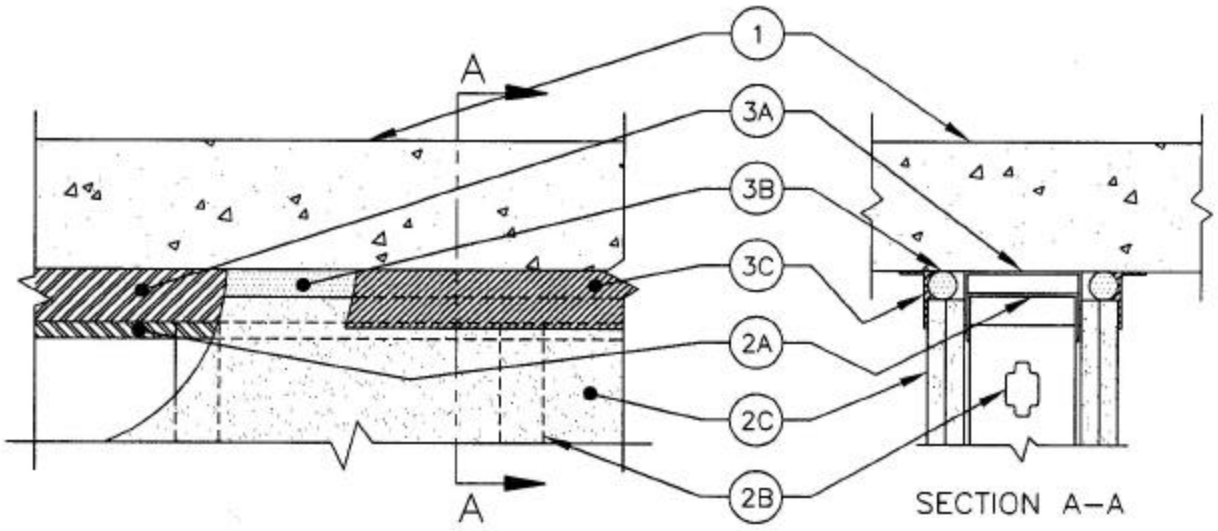
   C. **Backer Rod –** Nom 1 in. (25 mm) diam polyethylene backer rod compressed and firmly packed into the nom 3/4 in. (19 mm) gap between the top of the gypsum board and the bottom of the steel deck and the bottom of the forming material in area of flutes. Backer rod compressed flush with both surfaces of the wall.
   D. **Fill, Void or Cavity Material* –** Min 1/16 in. (1.6 mm) dry thickness of fill material sprayed or brushed on each side of the wall in the flutes of the steel floor units and between the top of the gypsum board and the bottom of the steel floor units to completely cover mineral wool and backer rod and overlap a min of 1 in. (25 mm) onto gypsum board and steel deck on both sides of wall.

      John Wagner & Associates Inc. – GrabberGard EFS

*Bearing the UL Classification Marking

System No. HW-D-0532

Assembly Rating – 2 Hr
L Rating at Ambient – Less than 1 CFM/Lin Ft.
L Rating at 400°F – Less than 1 CFM/Lin Ft.
Nominal Joint Width – 1 in.
Class II Movement Capabilities – 25% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete.

2. **Wall Assembly** – The 2 hr fire rated gypsum wallboard/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 - Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

   A. **Steel Floor and Ceiling Runners –** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). When U-shaped deflection channel (Item 3A) is used, ceiling runner installed within the deflection channel with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel. When deflection channel is not used, ceiling runner is secured to floor assembly (Item 1) with steel masonry anchors spaced max 24 in. (610 mm) OC.

   A1. **Light Gauge Framing* – Slotted Ceiling Runner** – As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed with steel fasteners spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

   Metal-Lite, Inc. – The System
   SCAFCO Steel Stud Manufacturing CO
   Brady Construction Innovations Inc.,
   DBA Sliptrack Systems, Inc. – SLP-TRK

   A2. **Light Gauge Framing* – Vertical Deflection Ceiling Runner** – As an alternate to the ceiling runners in Item 2A and 2A1, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened with runner. Slotted clips provided with step bushing for permanent fastening of steel studs. Flanges sized to accommodate steel studs (Item 2B). Vertical deflection ceiling runner installed with steel fastened spaced max 24 in. (610 mm) OC. When vertical deflection ceiling runner is used, deflection channel (Item 3A) shall not be used.

   The Steel Network, Inc. – VertiTrack VTD358, VTD400, VTD600 and VTD800

A3. **Light Gauge Framing* – Clipped Ceiling Runner** – As an alternate to the ceiling runner in Items 2A, 2A1 and 2A2, clipped runner to consist of galv steel channel with clips performed in track flanges which positively engaged the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 3-1/4 in. (83 mm). Clipped ceiling runner installed with steel fasteners spaced max 24 in. (610 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

Total Steel Solutions, LLC – Snap Trak

B. **Studs –** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height. Studs attached to ceiling runner with sheet metal screws a min of 1/2 in. (13 mm) below bottom of deflection channel, when deflection channel is used. When deflection channel is not used, studs shall not be secured to ceiling runner. When slotted ceiling runner is used (Item 2A1), steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at midheight of each slot. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Wallboard, Gypsum* –** Wallboard sheets to be installed to a min total thickness of 1-1/4 in. (32 mm) on each side of the wall. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 1 in. (25 mm) gap shall be maintained between the top of the wallboard and lower surface of the floor. The screws attaching the wallboard to studs at the top of the wall shall be located 1 in. (25 mm) below the bottom of the ceiling runner or deflection channel (Item 3A).

3. **Joint System – Max separation between bottom of floor and top of wall is 1 in. (25 mm) The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system consists of a deflection channel and a fill material, as follows:

A. **Deflection Channel –** (Optional) – A nom 3-5/8 in. (92 mm) wide by min 2 in. (51 mm) deep min 24 ga. steel U-shaped channel. Deflection channel secured to Floor with steel masonry anchors spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Backer Rod –** Nom 1-1/4 in. (32 mm) diam polyethylene backer rod compressed and firmly packed into the 1 in. (25 mm) gap between the top of the wallboard and lower surface of the floor assembly. Backer rod to be flush with both surfaces of wall.

C. **Fill Void or Cavity Material* – Sealant** – Min 1/16 in. (1.6 mm) dry thickness (min 1/8 in. or 3.2 mm wet thickness) of fill material sprayed or brushed over joint, completely covering backer rod and overlapping min 1 in. (25 mm) onto wallboard and concrete floor.

John Wagner & Associates Inc. – GrabberGard EFS

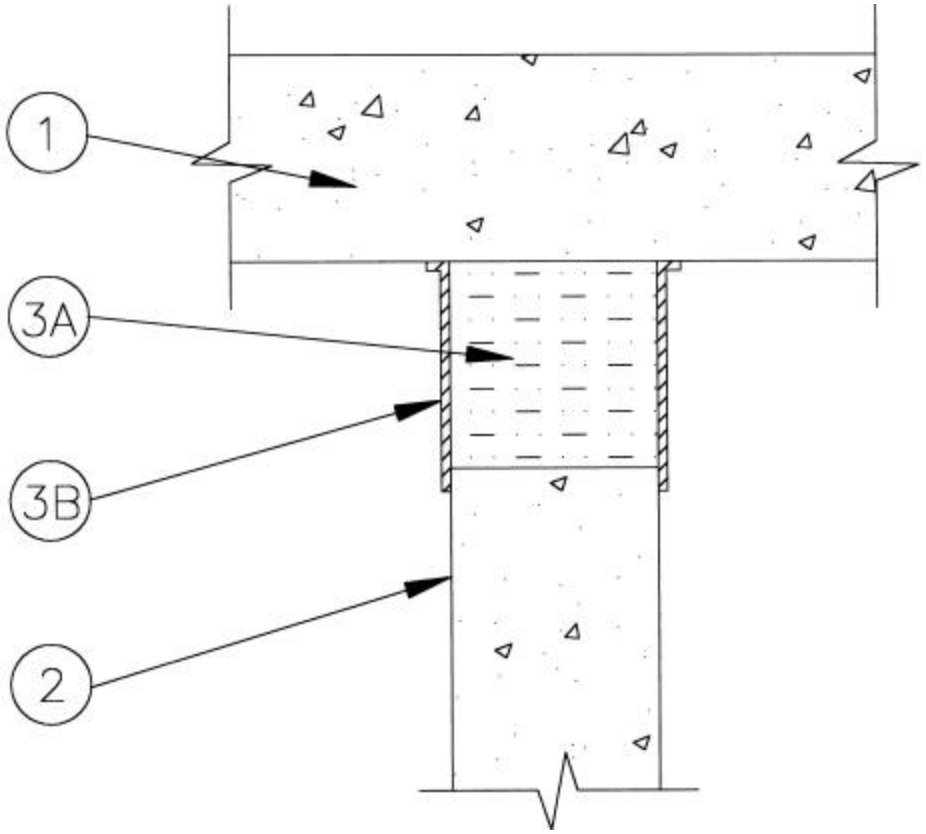
* Bearing UL Classification Marking

System No. HW-D-1050

Assembly Rating – 3 Hr

Joint Width – 4 in. Max

Class II Movement Capabilities – 12.5% Compression or Extension



1. **Floor Assembly –** Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Wall Assembly –** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.**

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

3. **Joint System – Max width of joint (at time of installation of joint system) is 4 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width.** The joint system shall consist of the following:

   A. **Forming Material* –** Min 4 pcf mineral wool batt insulation installed into joint opening as a permanent form. Batt cut to min width of 4-1/2 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and such that the compressed batt sections are flush with the top surface of floor.

   IIG Minwool LLC – Paroc Safing Insulation

   Thermafiber LLC – Type SAF

   Rock wool Manufacturing Company – Delta Safing Board

   B. **Fill, Void or Cavity Material* – Sealant –** Min 1/16 in. dry thickness of fill material sprayed or brushed on joint completely covering mineral wool and overlapping a min of 1/2 in. onto concrete floor and wall assembly.

   John Wagner & Associates Inc. – GrabberGard EFS

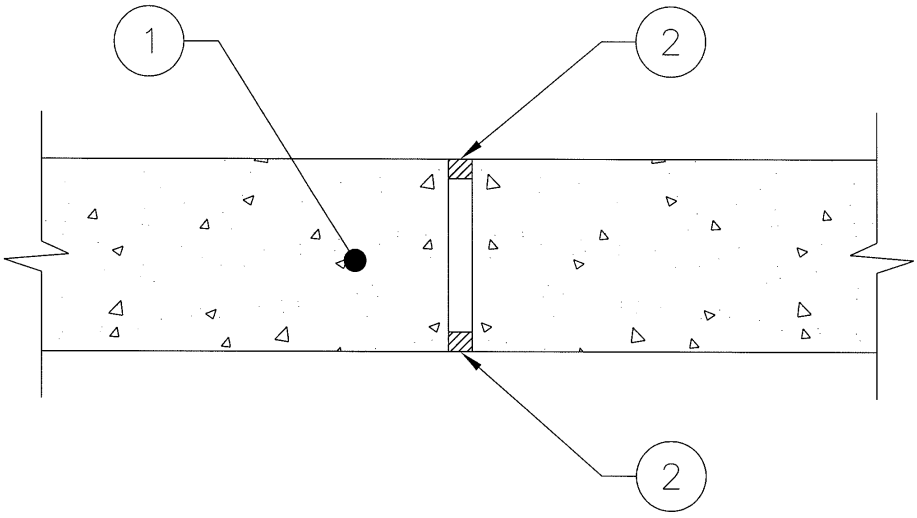
*Bearing the UL Classification Marking

System No. WW-D-0078

Assembly Rating – 2 Hr

Nominal Joint Width – 3/4 in. (19 mm)

Class II Movement Capabilities – 33% Compression and Extension



1. **Wall Assembly –** Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks.*** See **Concrete Blocks** (CATZ) category in the Fire Resistance Directory for names of manufacturers.

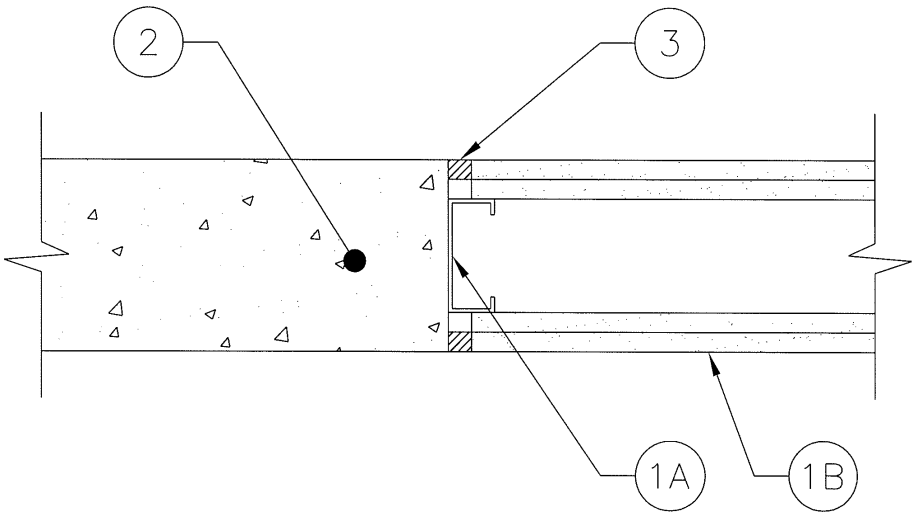
2. **Joint System – Fill, Void or Cavity Materials* – Max width of joint (at time of installation of joint system) is 3/4 in. (19 mm). The joint system is designed to accommodate a max 33 percent compression or extension from its installed width.** The joint system shall consist of a min 5/8 in. (16 mm) thickness of fill material applied within the joint, flush with each surface of wall.

John Wagner & Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking

System No. WW-S-0054

Assembly Rating – 1 and 2 Hr (See Item 1)
Nominal Joint Width – 3/4 in. (19 mm)



1. **Wall Assembly –** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs –** Steel studs to be min 3-1/2 in. (89 mm) wide by 1-1/4 in. (32 mm) deep corrosion proteced min 25 MSG steel channels. Studs not to exceed 24 in. (610 mm) OC. Stud installed nominally centered at joint location.
   B. **Gypsum Board* –** Gyspum board sheets installed to a min total thickness of 5/8 in. (16 mm) or 1-1/4 in. (32 mm) on each side of wall for 1 and 2 hr fire rated assemblies, respectively.

   The hourly rating of the joint system is dependent on the hourly rating of the wall assembly in which it is installed.

2. **Wall Assembly –** Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks.***
   See **Concrete Blocks** (CATZ) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System – Fill, Void or Cavity Materials* – Max width of joint (at time of installation of joint system) is 3/4 in. (19 mm).** The joint system shall consist of a min 5/8 in. (16 mm) thickness of fill material applied within the joint, flush with each surface of wall.

   John Wagner & Associates Inc. – GrabberGard IFC or GrabberGard EFC

*Bearing the UL Classification Marking

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

WHi Listing Index
Penetrations

Concrete		Penetrants								GrabberGard Products			
		No Penetrants	Metallic Pipe/Conduit	Non-Metallic Pipe	Electrical Cables	Cable Trays	Insulated Pipe	Mechanical Ducts	Multiple Items	IFC	EFC	EFS	Hourly Rating
Floors & Walls	JWA/PHV 120-01			■						✓			2
	JWA/PHV 120-02			■						✓			2
	JWA/PHV 120-05	■								✓	✓	✓	2
	JWA/PHV 120-06		■		■	■				✓	✓	✓	2
	JWA/PHV 120-08		■							✓	✓		2
	JWA/PHV 120-09		■		■					✓	✓	✓	2
	JWA/PHV 120-10		■							✓	✓		2
	JWA/PHV 120-11						■					✓	2
	JWA/PHV 120-15			■						✓	✓		2
	JWA/PHV 120-16			■						✓	✓		2
	JWA/PHV 120-18			■						✓	✓		2
Floors	JWA/PH 120-01		■							✓			2
	JWA/PH 120-02						■			✓	✓		2
	JWA/PH 120-04		■							✓	✓		2
	JWA/PH 120-06			■						✓	✓		2
	JWA/PH 180-01			■						✓			3

GRABBER CONSTRUCTION PRODUCTS
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WHi Listing Index
Penetrations

Framed Construction		Penetrants								GrabberGard Products			
		No Penetrants	Metallic Pipe/Conduit	Non-Metallic Pipe	Electrical Cables	Cable Trays	Insulated Pipe	Mechanical Ducts	Multiple Items	IFC	EFC	EFS	Hourly Rating
Floors	JWA/PH 60-01									✓	✓		1
	JWA/PH 60-02									✓	✓		1
	JWA/PH 60-03									✓	✓		1
	JWA/PH 60-04									✓	✓		1
	JWA/PH 60-05									✓	✓		1
	JWA/PH 60-06									✓	✓		1
	JWA/PH 120-05									✓	✓		2
Walls	JWA/PV 60-01									✓			1
	JWA/PV 60-03									✓	✓		1
	JWA/PV 60-04									✓	✓		1
	JWA/PV 120-01									✓			1 & 2
	JWA/PV 120-02									✓	✓		1 & 2
	JWA/PV 120-03									✓			1 & 2
	JWA/PV 120-06									✓	✓		1 & 2
	JWA/PV 120-07									✓	✓		1 & 2

GRABBER CONSTRUCTION PRODUCTS
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WHi Listing Index
Construction Joints

Joint Systems		Joints								GrabberGard Products			
		Bottom of Wall	Floor to Floor	Floor to Wall	Head of Wall	Wall to Wall	Max Joint Width	Class	Movement Capabilities	IFC	EFC	EFS	Hourly Rating
	JWA/PHV 60-01						3/4	II	25.0			✓	1
	JWA/PHV 120-03						3/4	II	33.0			✓	1 & 2
	JWA/PHV 120-04									✓	✓	✓	2
	JWA/PHV 120-07									✓	✓		2
	JWA/PV 60-02						3/4	II	33.0	✓	✓		1
	JWA/PV 120-04						3/4	II	33.0			✓	1 & 2
	JWA/PV 120-05						1	II	25.0	✓	✓	✓	1 & 2
	JWA/PV 240-01						2	II	12.5			✓	4

GRABBER CONSTRUCTION PRODUCTS
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WHi Listing Index
Construction Joints

Curtain Wall		Wall Exterior								Framing			
		Steel	Glass	Tilt-Up Panels	Concrete Panels	Aluminum Panels	Brick Veneer	Stone Veneer	EIFS	Steel Stud	Aluminum	N/A	Hourly Rating
	JWA/PH 120-03									✓			2
	JWA/JS 120-01									✓			2
	JWA/JS 120-02									✓			2
	JWA/JS 120-03									✓			2
	JWA/JS 120-04									✓			2
	JWA/JS 120-05										✓		2
	JWA/JS 120-06												2
	JWA/JS 120-07									✓			2
	JWA/JS 120-08										✓		2
	JWA/JS 120-09										✓		2
	JWA/JS 120-10										✓		2
	JWA/JS 120-11									✓			2
	JWA/JS 120-12									✓			2
	JWA/JS 120-13									✓			2
	JWA/JS 120-14									✓			2
	JWA/JS 120-15												2
	JWA/JS 120-16												2
	JWA/JS 120-17									✓			2
	JWA/JS 120-18									✓			2
	JWA/JS 120-19									✓			2
	JWA/JS 120-20									✓			2
	JWA/JS 120-21									✓			2

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

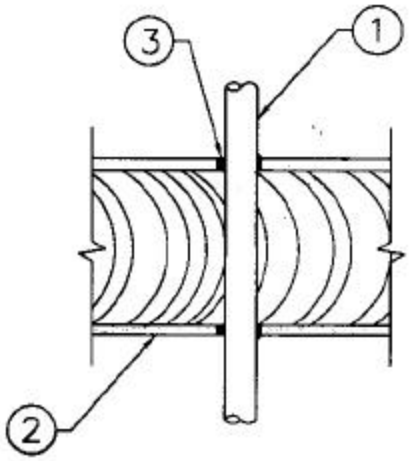
Design No.: JWA/PH 60-01

Single Penetrations

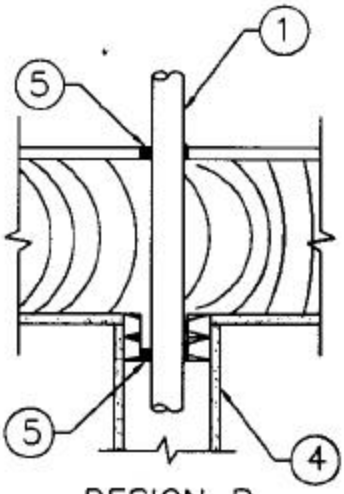
Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479: Non-metallic Open and Closed Systems
ULC S115-M95: Non-metallic Closed Pipe
Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Design Number	Max Hole Size	Annular Space	ASTM E-814		ULC S115-M95		
				"F"	"T"	"F"	"FH"	"FT"
PVC up to 1-1/2 in.	A	2-1/2"	0" – 1/2"	1 hour	50 min	1 hour	1 hour	50 min
PVC up to 2 in.	A	3"	0" – 1/2"	N/A	N/A	1 hour	N/A	15 min
Nonmetallic Rigid Conduit up to 1-1/2 in.	A	2-1/2"	0" – 1/2"	1 hour	50 min	1 hour	1 hour	50 min
Nonmetallic Rigid Conduit up to 2 in.	A	3"	0" – 1/2"	N/A	N/A	1 hour	N/A	15 min
PEX up to 1 in	A	2"	0" – 1/2"	1 hour	10 min	1 hour	1 hour	10 min
CPVC up to 2 in.	A	3"	0" – 1/2"	N/A	N/A	1 hour	N/A	15 min
PEX up to 1 in	B	2"	0" – 1/2"	1 hour	40 min	1 hour	1 hour	40 min
PE/Al/PE up to ¾ in.	B	1-3/4"	0" – 3/4"	1 hour	1 hour	1 hour	1 hour	1 hour
PEX/Al/PEX up to ¾ in.	B	1-3/4"	0" – 3/4"	1 hour	1 hour	1 hour	1 hour	1 hour



DESIGN A



DESIGN B

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

JWA/PH 60-01

System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.

2. **Floor/Ceiling Assembly:** 1 hour fire rated ASTM E-119 or CAN/ULC S101 wood framed gypsum wallboard (GWB) floor/ceiling assemblies with or without concrete topping, having a minimum depth of 10¾" (275mm).

Design A

3. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0" t o 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of sealant must be placed around penetrating item.

Design B

4. **Wall Assembly:** Rated or non-rated metal or wood framed gypsum wallboard (GWB) wall assemblies.

5. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. Fill header and sill plate contained in wall assembly min 5/8 in. (16 mm) depth. On 0" t o 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of sealant must be placed around penetrating item.

***WH Labeled Component**

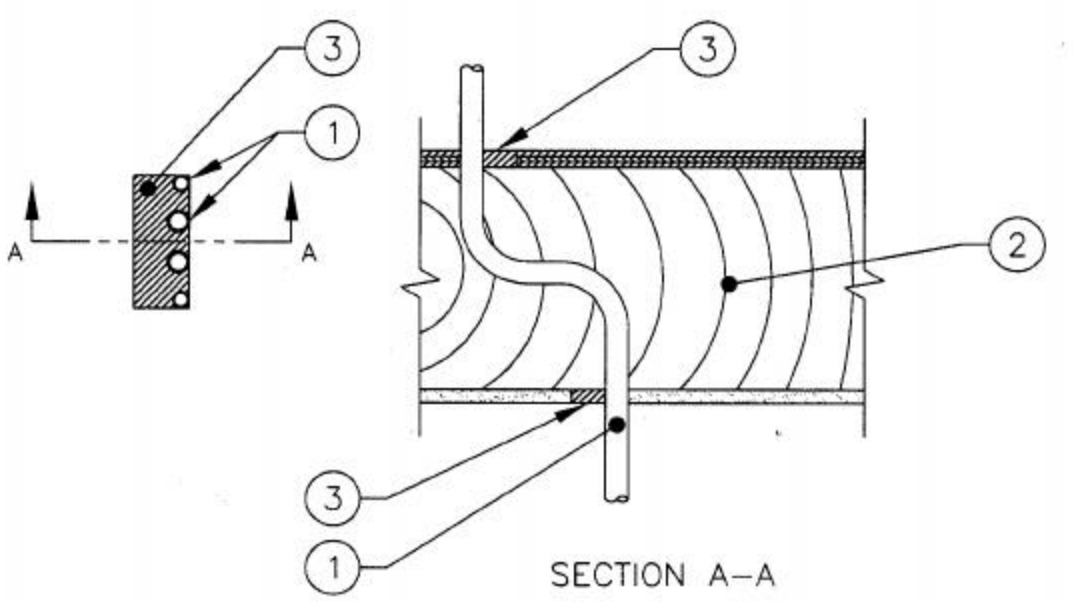
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PH 60-02

Single or Multiple Penetrations Only
Horizontal (floor/ceiling)
Test Standards: ASTM E-814, UL 1479: Non-metallic Open and Closed Systems
ULC S115-M95: Non-metallic Closed Pipe
Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	"F" Rating	"T" Rating
IPEX PE/Al/PE up to 1" ID	See Item 1	0 - 1-1/4"	1 hour	41 min
IPEX PEX/Al/PEX up to 1" ID	See Item 1	0 - 1-1/4"	1 hour	41 min



SECTION A–A

System Design Instructions

1. Penetrating Item: Centered or offset in hole, see table above. Up to 4 penetrations of polyethylene tubing, 1 in. (25mm) ID or less in diameter. Maximum opening size to be 15 sq in. ((9375 sq mm) with max dimension of 6 in. (150 mm). All penetrating items to be reliably supported.

2. Floor/Ceiling Assembly: 1 hour rated ASTM E-119 wood framed floor/ceiling assembly.
a) Subfloor with or without concrete topping mixture.
b) Wood or composite wood joists.
c) Gypsum wallboard.

3. Firestop System, Component: John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* - Min. 3/4 in thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Min. 1/2 in. diam. bead of fill material applied at the penetrant/floor and penetrant/ceiling interfaces at point contact locations on both sides of assembly.

***WH Labeled Component**

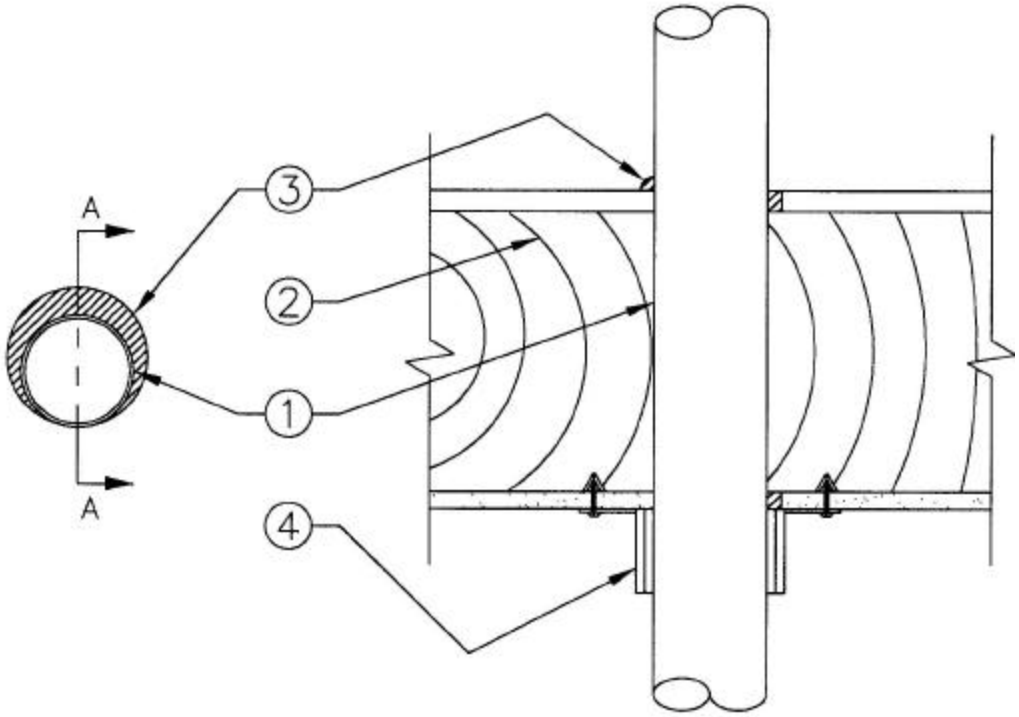
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PH 60-03

Single Penetrations
Horizontal (floor/ceiling)
Test Standards: ASTM E-814, UL 1479
CAN/ULC S115-M95: open and closed systems
Test Furnace Internal Positive Pressure Differential – 50 Pa (0.20 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic Pipe 1-1/2" – 4"	5"	0" – 1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr
ccPVC Plastic Pipe 1-1/2" – 4"	5'	0" – 1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr
ABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr
ccABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor Assembly:** 1 hour rated CAN/ULC S101 or equivalent wood framed gypsum wallboard (GWB) floor/ceiling assemblies with or without concrete topping, minimum nominal 10" depth wood or composite wood floor joists.
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 3/4" (19mm) within the annulus on top surface of floor assembly and a min of 5/8" (15mm) within the annulus of the gypsum wallboard ceiling membrane. On 0 – 1/4" (6mm) annular spaces of the floor surface, a 1/2" (13mm) diameter fillet bead must be placed around the penetrating item.
4. **Firestop System, Component 2:** PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to floor/ceiling assembly using 1-1/2" toggle bolts over fender washers, at joist locations use 1-1/2" drywall screws to fasten collar directly to joists.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

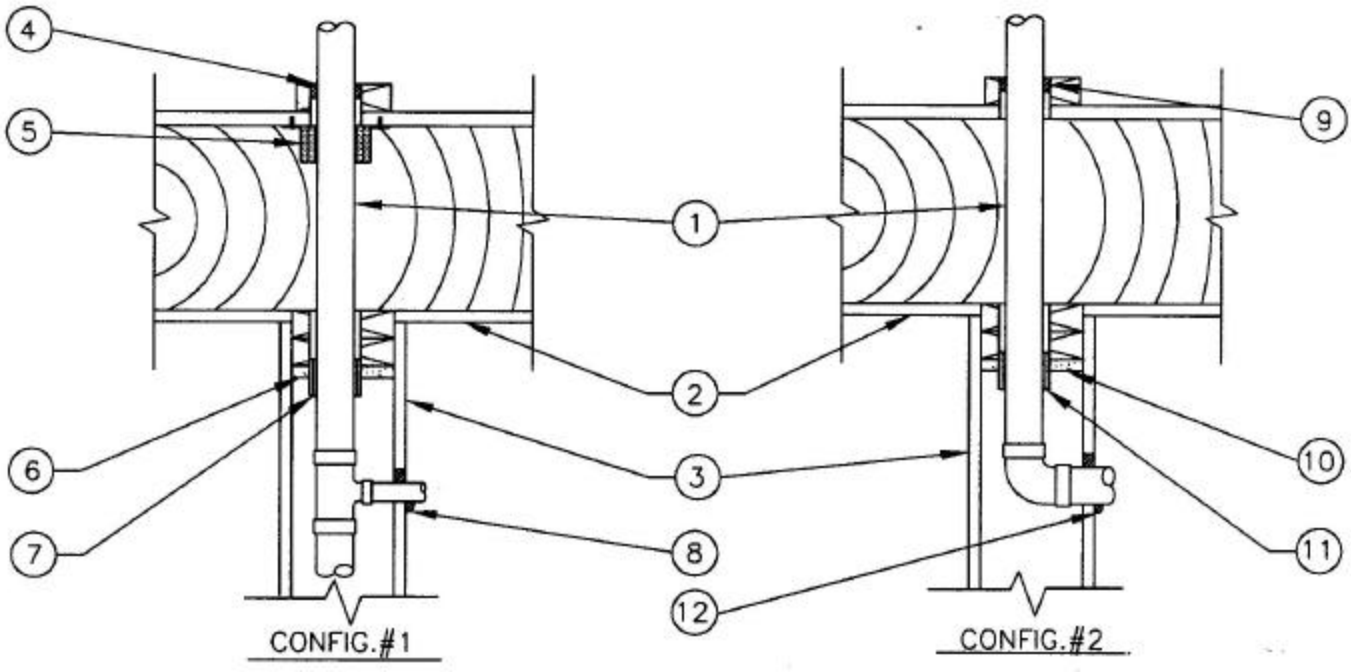
Design No.: JWA/PH 60-04

Single Penetrations

Horizontal (floor/ceiling)
Test Standards: ASTM E-814, UL 1479
ULC S115-M95: non-metallic open and closed systems
Test Furnace Internal Positive Pressure Differential – 50 Pa (0.20 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E814/UL 1479 "F" & "T" Rating	ULC S115-M95 "FTH" Rating
ccABS Plastic Pipe to 3"	4"	1/2"	Up to 1 hour	Up to 1 hour
w/ branch line to 1-1/2"**	2"	0" – 1/2"		
ABS Plastic Pipe to 3"	4"	1/2"	Up to 1 hour	Up to 1 hour
w/ branch line to 1-1/2"**	2"	0" – 1/2"		
PVC Plastic Pipe to 3"	4"	1/2"	Up to 1 hour	Up to 1 hour
w/ branch line to 1-1/2"**	2"	0" – 1/2"		
ccPVC Plastic Pipe to 3"	4"	1/2"	Up to 1 hour	Up to 1 hour
w/ branch line to 1-1/2"**	2"	0" – 1/2"		
CPVC Plastic Pipe to 2"	3"	1/2"	Up to 1 hour	Up to 1 hour
w/ branch line to 2"***	2-1/2"	0" – 1/2"		

**** For use with configuration #1 only**
***** For use with both configuration #1 or #2**



System Design Instructions

1. **Penetrating Item:** Main line to be centered in hole and branch line to be centered or offset in hole, see table above. Elbows, Tee's and couplings can penetrate the firestop system. (cc abv. for Cellular Core)
2. **Floor/Ceiling Assembly:** 1 hour rated ASTM E-119 or CAN/ULC S101 floor/ceiling/wall assemblies with or without concrete topping, having a minimum depth of 10¾" (275mm).
3. **Wall Assembly:** Fire rated or non-fire rated gypsum wall assembly with min. nom. 6-in. wide wood studs.

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

JWA/PH 60-04

Configuration #1

4. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space in the sill plates contained within the wall assembly to a 3/4" (19mm) depth.
5. **Firestop System, Component 2:** PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to the underside of the sub-floor using min. 8 x 9/16" wafer screws.
6. **Firestop System, Component 3:** One layer of 5/8" Type "X" gypsum wallboard insert installed within stud cavity in which the penetration occurs and securely fastened with drywall screws on the underside of header plate.
7. **Firestop System, Component 4:** PFP Partners – Wrap Strip WS1* two layers installed in the annular space between pipe and header plates. Aluminum foil tape to be installed around the circumference of the outer wrap strip and pipe assembly for securing wrap strips in place.
8. **Firestop System, Component 5:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* to be installed in fire-rated chase walls only. Min 5/8 in. thickness in the annular space in the membrane of the chase wall. On 0" to ¼" (6mm) annular spaces a 3/8" (10mm) diameter fillet bead must be placed around the penetrating item on the surface of the GWB assembly.

Configuration #2

9. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space in the sill plates contained within the wall assembly to a 3/4" (19mm) depth.
10. **Firestop System, Component 3:** One layer of 5/8" Type "X" gypsum wallboard insert installed within stud cavity in which the penetration occurs and securely fastened with drywall screws on the underside of header plate.
11. **Firestop System, Component 4:** PFP Partners – Wrap Strip WS1* two layers installed in the annular space between pipe and header plates.
12. **Firestop System, Component 5:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* to be installed in fire-rated chase walls only. Min 5/8 in. thickness in the annular space in the membrane of the chase wall. On 0" to ¼" (6mm) annular spaces a 3/8" (10mm) diameter fillet bead must be placed around the penetrating item on the surface of the GWB assembly.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PH 60-05

Single Penetrations

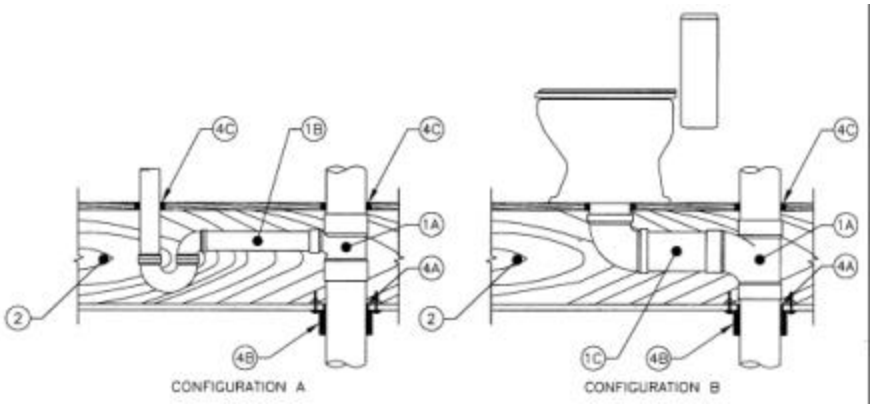
Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479

CAN/ULC S115-M95: non-metallic open and closed systems

Positive Pressure Differential – 50 Pa (0.2 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E-814 Fire "F" Rating	ULC S115-M95 Fire/Hose "FH" Rating	ULC S115-M95 Temp Rating "FTH" Rating
ccABS Plastic Pipe to 2"	3"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
ABS Plastic Pipe to 2"	3"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
PVC Plastic Pipe to 2"	3"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
ccABS Plastic Pipe to 4"	5"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
ABS Plastic Pipe to 4"	5"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
PVC Plastic Pipe to 4"	5"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
ccPVC Plastic Pipe to 4"	5"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour
CPVC Plastic Pipe to 4"	5"	0" – 1/2"	Up to 1 Hour	Up to 1 Hour	Up to 1 Hour



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Elbows, Tee's and couplings can penetrate the firestop system.
   a) **Max riser pipe size 4" –** Configuration A & B
   b) **Max branch pipe size 2" –** Configuration A
   c) **Max branch pipe size 4" –** Configuration B
2. **Floor/Ceiling Separations:** 1 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed gypsum wallboard (GWB) floor/ceiling assemblies with or without concrete topping, having a minimum depth of 10¾" (275mm).
3. **Wall Fire Separations (Optional – Not Shown):** Rated or non-rated metal or wood framed gypsum wall board (GWB) wall assemblies, when used, install the firestop system as detailed in (Item 4) to the underside of single or double top plates.
4. **Firestop System Component –**
   a) John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness 5/8" (15mm) within the annulus of the gypsum wallboard ceiling membrane, as a smoke seal.
   b) PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to assembly using 1-1/2" toggle bolts over fender washers, at joist locations use 1-1/4" drywall screws and fender washers to fasten collar directly to joists. Use 1-1/4" drywall screws and fender washers to fasten collar to single or double top plates, when wall is used.
   c) John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 3/4" (19mm) within the annulus on top or bottom surface of floor assembly. On 0 – 1/4" (6mm) annular spaces of the floor surface, a 1/2" (13mm) diameter fillet bead must be placed around the penetrating item.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

Design No.: JWA/PH 60-06

Single Penetrations

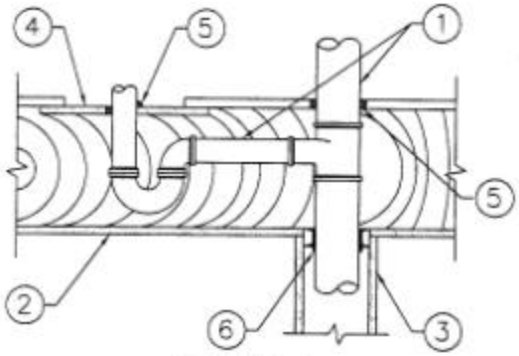
Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479

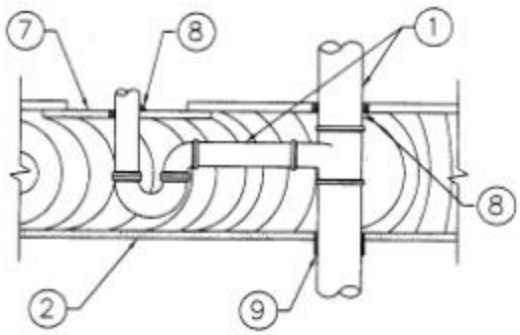
ULC S115-M95: non-metallic open and closed systems

Test Furnace Internal Positive Pressure Differential – 50 Pa (0.20 in. of water) Minimum

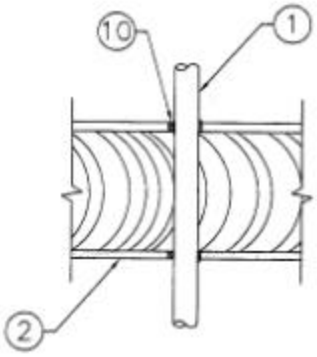
Penetrating Material & Size	Design Number	Max Hole Size	Annular Space	ASTM E-814 "F"	ASTM E-814 "T"	ULC S115-M95 "F"	ULC S115-M95 "FH"	ULC S115-M95 "FT"
ccABS or ABS pipe up to 3" w/ branch line up to 1-1/2"	A	4-1/8" 2-1/2"	1/2" 0" – 1/2"	N/A	N/A	1 hour	N/A	55 min
ccPVC or PVC pipe up to 3" w/ branch line up to 1-1/2"	A	4-1/8" 2-1/2"	1/2" 0" – 1/2"	1 hour	55 min	1 hour	1 hour	55 min
ccPVC Plastic pipe up to 3" w/ branch line up to 1-1/2"	B	4-1/8" 2-1/2"	1/2" 0" – 1/2"	N/A	N/A	1 hour	N/A	25 min
ccPVC or PVC pipe up to 1-1/2"	C	3"	¼" – ½"	N/A	N/A	1 hour	N/A	1 hour
ccABS or ABS pipe up to 1-1/2"	C	3"	¼" – ½"	1 hour	1 hour	1 hour	1 hour	1 hour
Nonmetallic Rigid Conduit up to 1-1/2"	C	3"	¼" – ½"	N/A	N/A	1 hour	N/A	1 hour
ccPVC or PVC pipe up to 1-1/2"	D	3"	¼" – ½"	1 hour	50 min	1 hour	1 hour	50 min
ccABS or ABS pipe up to 1-1/2"	D	3"	¼" – ½"	1 hour	1 hour	1 hour	1 hour	1 hour
Nonmetallic Rigid Conduit up to 1-1/2"	D	3"	¼" – ½"	1 hour	1 hour	1 hour	1 hour	50 min



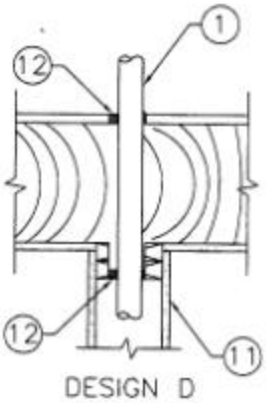
DESIGN A



DESIGN B



DESIGN C



DESIGN D

System Design Instructions

1. **Penetrating Item:** Main line to be centered in hole and branch line to be centered or offset in hole, see table above.

2. **Floor/Ceiling Assembly:** 1 hour fire rated ASTM E-119 or CAN/ULC S101 wood framed gypsum wallboard (GWB) floor/ceiling assemblies with or without concrete topping, having a minimum depth of 10¾" (275mm).

Design A

3. **Wall Assembly:** Rated or non-rated metal or wood framed gypsum wallboard (GWB) wall assemblies.
4. **Firestop System Component 1:** One layer of nom 5/8" (16 mm) Type X gypsum wallboard insert securely fastened with drywall screws on 4" (100 mm) centers to reduce tub drain hole sizes up to 12" x 16" (300 x 400 mm).
5. **Firestop System Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0" to 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of must be placed around penetrating item.
6. **Firestop System Component 3:** PFP Partners – Wrap Strip WS1* to be installed around penetrants. Min two layers installed in the annular space between the pipe and header plate. Aluminum foil tape to be installed around circumference of the outer wrap strip and pipe assembly for securing wrap strips in place.

Design B

7. **Firestop System Component 1:** One layer of nom 5/8" (16 mm) Type X gypsum wallboard insert securely fastened with drywall screws on 4" (100 mm) centers to reduce tub drain hole sizes up to 12" x 16" (300 x 400 mm).
8. **Firestop System Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0" to 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of must be placed around penetrating item.
9. **Firestop System Component 3:** PFP Partners – Wrap Strip WS1* to be installed around penetrants. Min two layers installed in the annular space between the pipe and ceiling membrane. Aluminum foil tape to be installed around circumference of the outer wrap strip and pipe assembly for securing wrap strips in place.

Design C

10. **Firestop System Component 1: For PVC or ccPVC pipe only** – John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0" to 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of must be placed around penetrating item.

10a. **Firestop System Component 1: For ABS or ccABS pipe only** – John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0" to 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of must be placed around penetrating item

Design D

11. **Wall Assembly:** Rated or non-rated metal or wood framed gypsum wallboard (GWB) wall assemblies.
12. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the membrane. Fill header and sill plate contained in wall assembly min 5/8 in. (16 mm) depth. On 0" to 1/4" (6 mm) annular space a min 1/2" (12 mm) diam bead of must be placed around penetrating item.

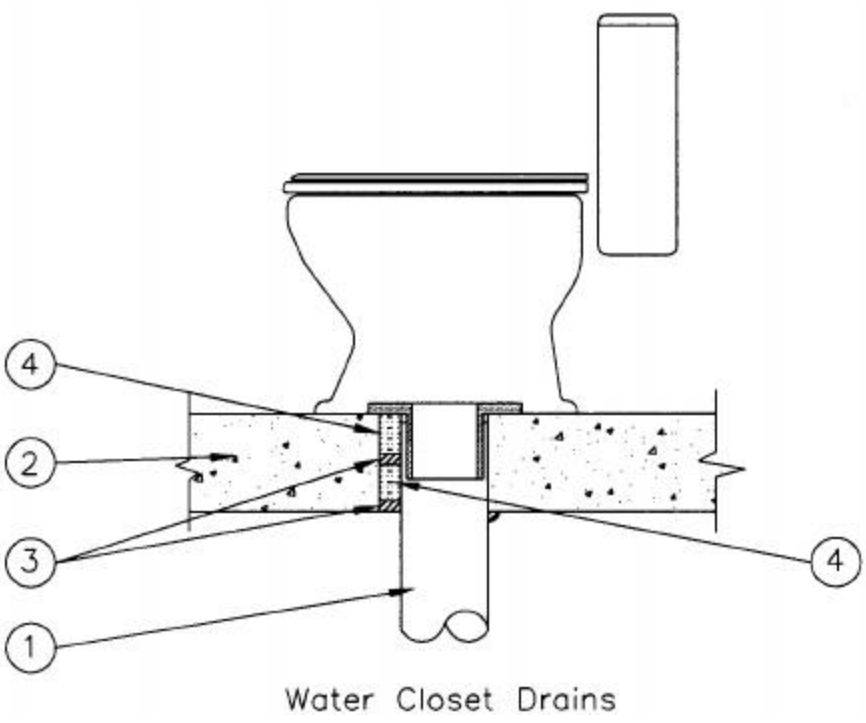
***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

Design No. JWA/PH 120-01

Single Penetrations Only
Horizontal (floor/ceiling)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
Steel and Cast Iron Pipe to 4" Sch 10 & up	6"	0" – 1-1/2"	2 Hour	2 Hour	2 Hour



Water Closet Drains

System Design Instructions

1. **Penetrating Item:** See table above. Single penetrations only.
2. **Floor/Ceiling Fire Separations:** Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 4-1/2" (115mm).
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS– GrabberGard IFC* installed at a minimum thickness of 1/2" (13mm) within the annulus to completely cover the underside of both mineral wool inserts. On 0" to 1/4" (6mm) annular spaces a 3/8" (10mm) diameter fillet bead must be placed around the penetrating item on the bottom surface of the concrete.
4. **Firestop System, Component 2:** Filler material, mineral wool insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space in two pieces at a minimum total thickness of 3-1/2" (90mm). Top insert of mineral wool to be min 2 in. (51mm) thick and bottom insert of mineral wool to be min 1-1/2 in. (39mm) thick. Recess filler material 1/2" (13mm) from the bottom surface of the concrete for sealant placement.

***WH Labeled Component**

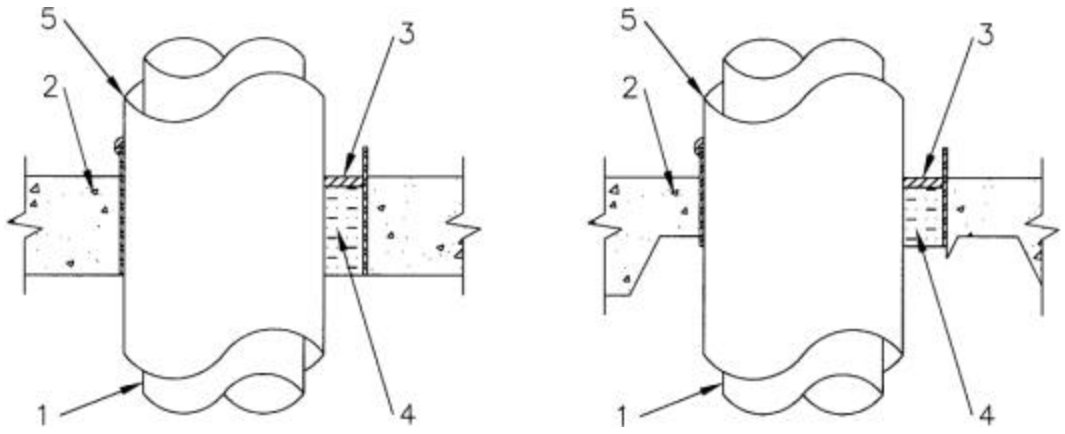
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PH 120-02

Pipe Insulation Through Penetrations
Single Penetrations Only
Horizontal (floor/ceiling)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
Steel and Cast Iron Pipe to 8" Sch 10 & up	10"	0" – 1/2"	2 Hour	2 Hour	69 min



System Design Instructions

1. **Penetrating Item:** See table above. Single penetrations only.
   a) Metal Sleeve: Min 24 gauge or heavier metal sleeve fit tightly into the opening flush with or max 1-1/2" (38mm) above the top surface of the floor assembly.
2. **Floor/Ceiling Fire Separations:**
   a) Min 20 gauge or heavier galvanized steel decking with min 1-1/2" (38mm) flute height firmly supported, with min 3" (77mm) concrete cover.
   b) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 4-1/2" (115mm).
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/2" (13mm) within the annulus on the top surface of the floor assembly. On 0" to 1/4" (6mm) annular spaces a 3/8" (10mm) diameter fillet bead must be placed around the penetrating item on the surface of the concrete.
4. **Firestop System, Component 2:** Filler material, mineral wool insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 3-1/2" (90mm). Recess filler material 1/2" (13mm) for sealant placement.
5. **Through Insulating Material:** Koolphen K rigid phenolic foam insulation having a 1" (25mm) wall thickness.

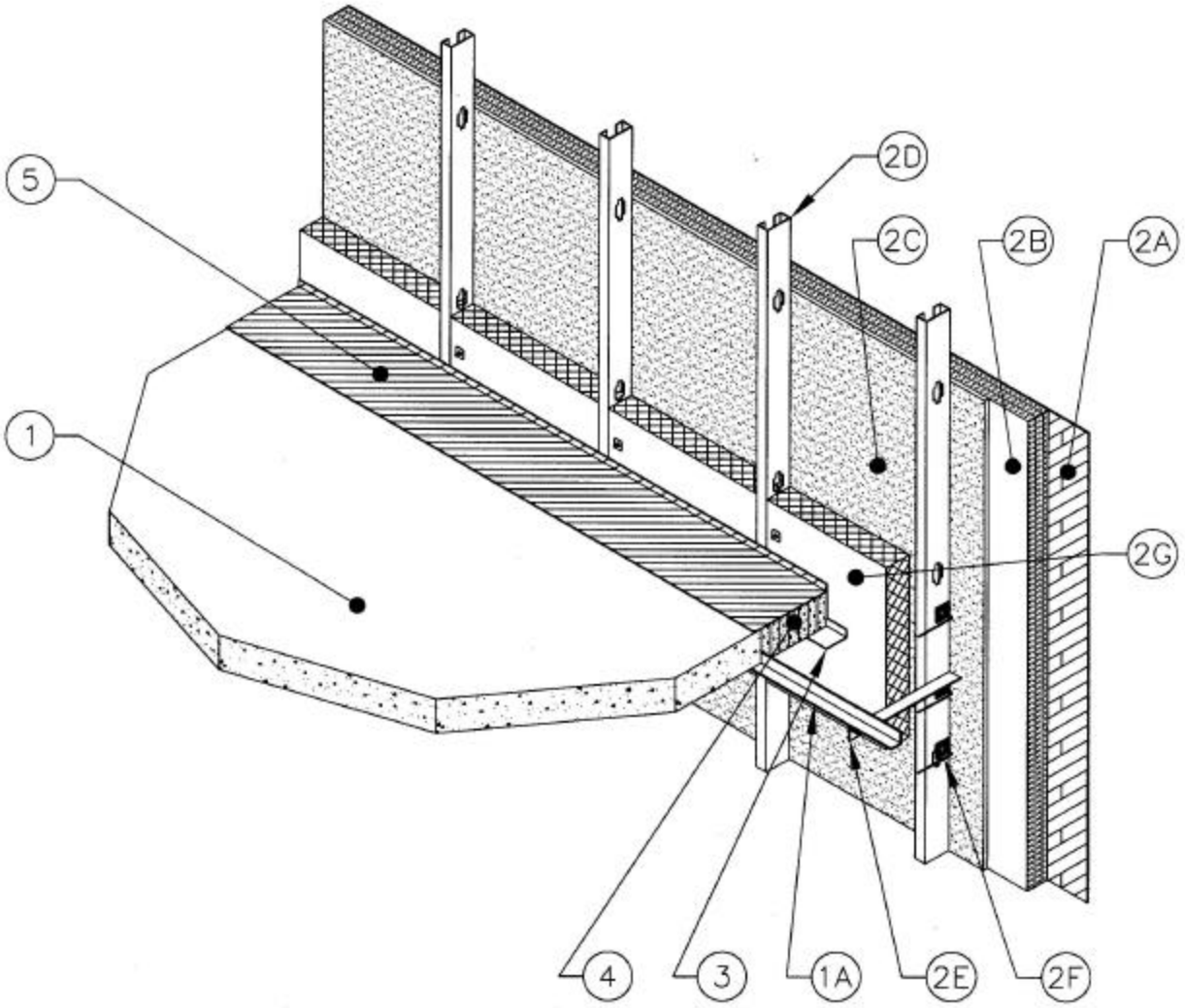
***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

Design No. JWA/PH 120-03

Horizontal or Vertical Expansion/Control Joints
Test Standards: ASTM E-119, ULC S115-M95
L-Rating At Ambient < 1 CFM/Lin Ft
L-Rating At 400° F < 1 CFM/Lin Ft
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Width	Fire "F" Rating	Temp. "FT" Rating
Horizontal Joints	10"	up to 2hrs	30 min



System Design Instructions

1. **Floor/Ceiling Assemblies:** ASTM E-119 and CAN/ULC S101 up to 2 hour rated floor/ceiling assemblies; Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 4-1/2in. (114mm) and including the following:
   A. **Steel Angle** – Perimeter of floor assembly to be provide with min 1-1/2 by 1-1/2 by 3/16 in. thick cast-in-place structural steel angle for weld-attachment of EIFS mounting attachment (Item 2E).

2. **Exterior Insulation Finish System:** This Exterior Insulation Finish System (EIFS) to be constructed of the materials and in the manner described by the EIFS wall manufacturer's installation instructions and shall include the following features:
   A. **Cementitious Finish Coating** – Min 1/16 in. thick cementitious finish coating applied as per EIFS wall manufacturer's instructions.
   B. **Expanded Polystyrene (EPS) Foam Boards** – Max 3 in. thickness of expanded polystyrene foam boards applied to exterior gypsum board as per EIFS wall manufacturer's instructions.
   C. **Exterior Gypsum Board** – Min 1/2 in. thick exterior gypsum boards applied to steel studs with min 1 in. long pan head screws at 10 OC. Gypsum boards installed as per EIFS wall manufacturer's instructions.
   D. **Steel Stud Framing** – Vertical framing members shall be min 3-5/8 in. by 1-1/4 in., 16 ga steel "C" studs. Attachment shall be according to EIFS wall manufacturer's guidelines. Vertical framing shall not exceed a spacing of 24 in. OC.
   E. **Mounting Attachment** – Min 1-1/2 in. by 1-1/2 in. by 3/16 in. thick structural steel angle weld-attached to steel stud framing and cast-in-place structural angle located max 48 in. OC.
   F. **Impaling Pins** – Min 6-1/2 in. long 12 ga steel pins, welded or mechanically fastened to flat side of steel studs and bent 90 degrees perpendicular to the face of the curtain wall insulation. Pins to be installed at max 8 in. OC vertically and at max 24 in. OC horizontally.
   G. **Curtain Wall Insulation** – Min 4 in. 4 pcf mineral wool board, unfaced or faced on one side with aluminum foil/scrim vapor retarder, supplied in min 24 in. wide boards. Mineral wool board to be impaled on pins, flush with interior surface of steel studs, and secured in position with min 1-1/4 in. square steel clinch shields. Fill the cavity of all "C" shaped studs with insulation. A single piece of 24 in. wide mineral wool to extend a min 12 in. below and min 8 in. above the of the bottom and top surfaces of the concrete floor assembly.

3. **Firestop System Component 1:** Steel angle manufactured from min 16 ga steel to be welded or mechanically fastened to vertical steel studs. Angle to be installed such that the horizontal leg of angle is min 4 in. below the top surface of the concrete floor assembly to support the mineral wool insulation (Item 4). Size and installation of steel angle is as follows:
   A. **Joints ranging from 0 to max 2 in.** – No angle is required.
   B. **Joints ranging from min 2 to max 6 in.** – Min 1 by 1 in. angle to be installed.
   C. **Joints ranging from min 6 to max 10 in.** – Min 1 by 3 in. angle to be installed such that the 3 in. leg is installed horizontally with the 1 in. leg installed vertically.

4. **Firestop System Component 2:** Filler material mineral rock wool or ceramic fiber insulation with a minimum density of 4-6 PCF (68 kg/m^3) with mineral wool fibers running perpendicular to curtain wall and compressed a minimum of 20% into the joint space at a minimum depth of 4 in. (102 mm). As an alternative, the min 4 pcf mineral wool maybe installed such that the mineral wool fibers run parallel to curtain wall and are compressed a minimum of 40% into the joint space at a minimum depth of 4in. (102 mm).

5. **Firestop System Component 3:** John Wagner & Assoc. Inc. dba GRABBER CONSRTUCTION PRODUCTS – GrabberGard EFS* (mastic) for horizontal applications sprayed into place with a minimum wet film thickness of 3/32 in. (2.5 mm). Always overlap GrabberGard EFS* onto the surface of the substrate a minimum of 1in. (25 mm). Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PH 120-04

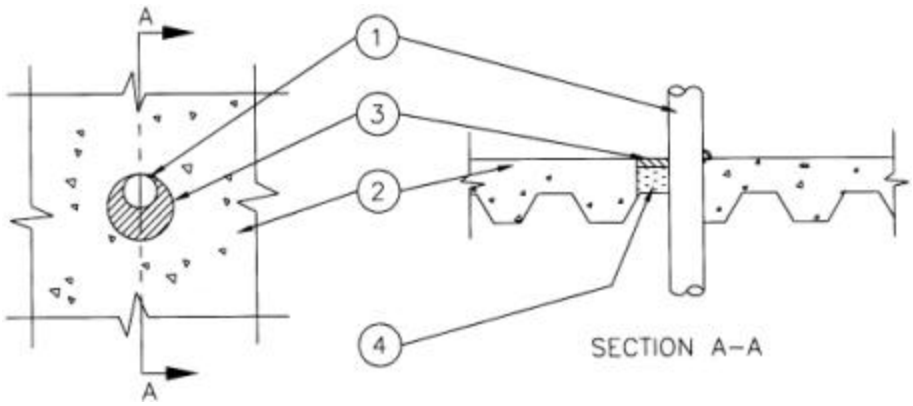
Single Penetrations

Horizontal (floor)

Test Standards: ASTM E-814, UL 1479, ULC S115-M95

Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E 814/UL1479 "F"	ASTM E 814/UL1479 "T"	ULC S115-M95 "FH"	ULC S115-M95 "FTH"
Steel & Cast Iron Pipe (1" to 24") Sch 40 & up	29"	0" – 4"	2 Hour	30 min.	2 Hour	30 min.



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling Fire Separations:** Min 20 gauge or heavier galvanized steel decking with up to 3½" (88mm) flute height firmly supported with min 2½" concrete cover.
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. – dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GabberGard IFC* product must be installed at a minimum thickness of ½" (13mm) within the annulus on top surface of floor assembly. On 0 - ¼" (6mm) annular spaces, a ½" (13mm) diameter fillet bead must be placed around the penetrating item.
4. **Firestop System, Component 2:** Filler material, mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 2½" (61mm). Recess filler material ½" (13mm) for sealant placement.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

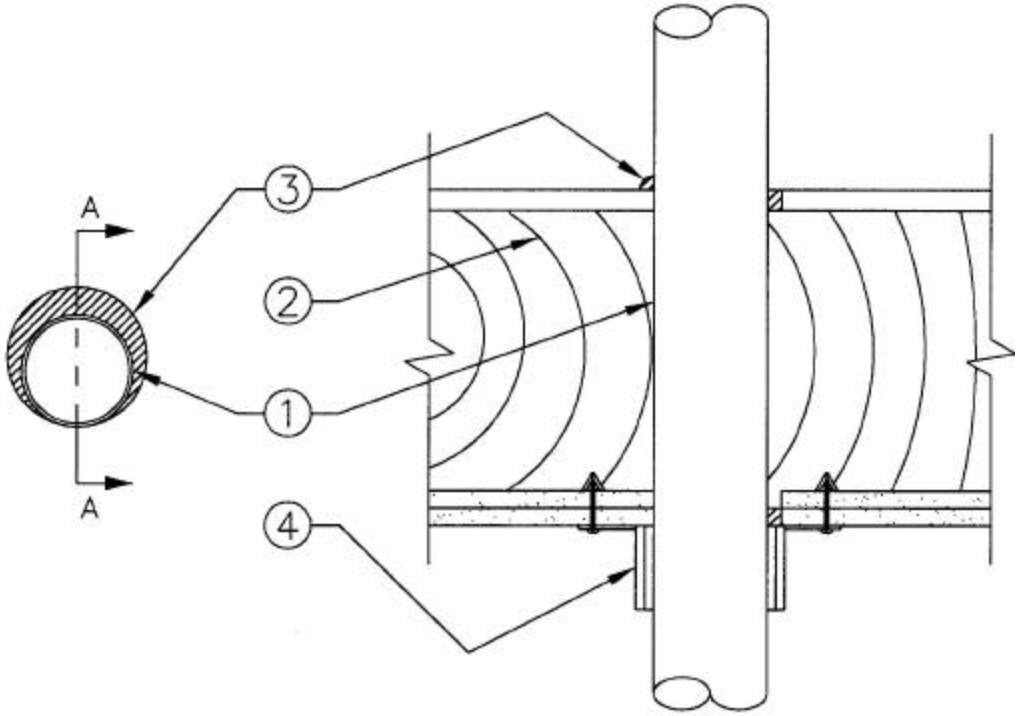
Design No.: JWA/PH 120-05

Single Penetrations

Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479: Non-metallic open and closed systems
ULC S115-M95**: Non-metallic closed systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Temp Rating "T" Rating
PVC Plastic Pipe 1-1/2" – 4"	5"	0" – 1/2"	Up to 2 Hr	Up to 2 Hr
ccPVC Plastic Pipe 1-1/2" – 4"	5'	0" – 1/2"	Up to 2 Hr	Up to 2 Hr
CPVC Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 2 Hr	Up to 2 Hr
ccABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 2 Hr	Up to 2 Hr
ABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 2 Hr	Up to 2 Hr
FRPP Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	Up to 2 Hr	Up to 2 Hr



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling Assembly:** 1 or 2 hour rated ASTM E-119 wood framed gypsum wallboard (GWB) floor/ceiling assemblies with or without concrete topping, minimum nominal 10" depth wood or composite wood floor joists.
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 3/4" (19mm) within the annulus on top surface of floor assembly and a min of 5/8" (18mm) within the annulus of the gypsum wallboard ceiling membrane. On 0 – 1/4" (6mm) annular spaces of the floor surface, a 1/2" (13mm) diameter fillet bead must be placed around the penetrating item.
4. **Firestop System, Component 2:** PFP Partner – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to floor/ceiling assembly using 1-1/2" toggle bolts over fender washers, at joist locations use 1-1/2" drywall screws to fasten collar directly to joists.

***WH Labeled Component**
****Not tested to 50 Pa pressure differential as required by Canadian code for combustible DWV (Drain, Waste or Vent) piping systems.**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

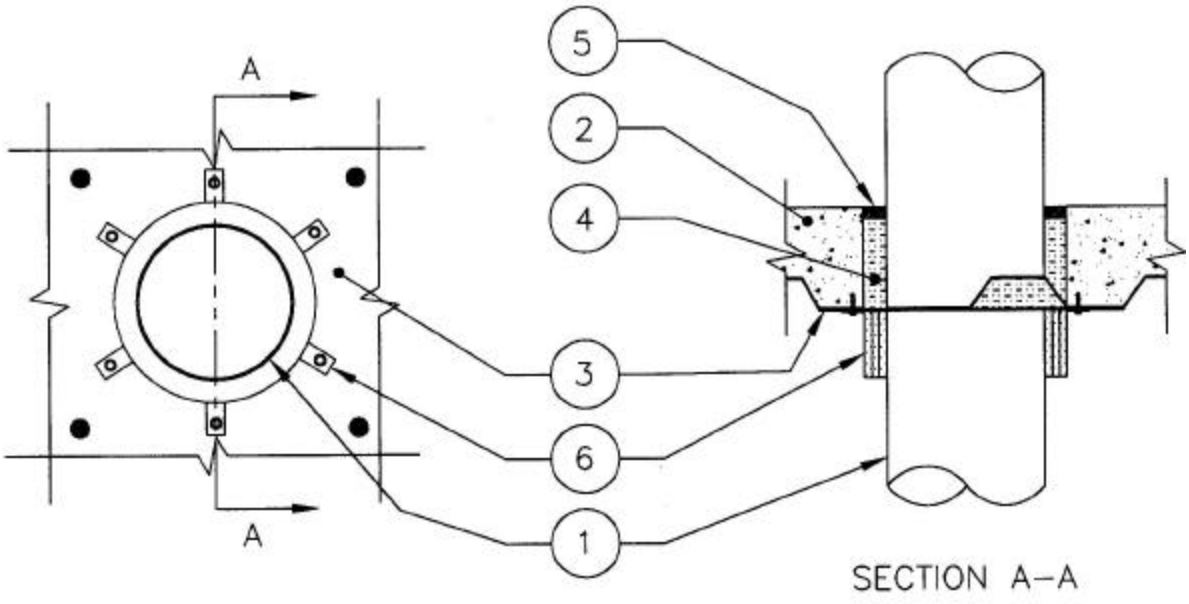
Design No.: JWA/PH 120-06

Single Penetrations

Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479: Non-metallic open and closed systems
CAN/ULC S115-M95**: Non-metallic closed systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Temp Rating "T" Rating
PVC Plastic Pipe 1-1/2" - 6"	7"	1/4"	Up to 2 Hr	Up to 2 Hr
ccPVC Plastic Pipe 1-1/2" - 6"	7"	1/4"	Up to 2 Hr	Up to 2 Hr
CPVC Plastic Pipe 1-1/2" - 6"	7"	1/4"	Up to 2 Hr	Up to 2 Hr
ccABS Plastic Pipe 1-1/2" - 4"	5"	1/4"	Up to 2 Hr	Up to 2 Hr
ABS Plastic Pipe 1-1/2" - 4"	5"	1/4"	Up to 2 Hr	Up to 2 Hr
FRPP Plastic Pipe 1-1/2" - 4"	5"	1/4"	Up to 2 Hr	Up to 2 Hr



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling Assembly:** Min 20 gauge or heavier galvanized steel decking with min 2" (50mm) flute depth with min 2-1/2" concrete cover.
3. **Firestop System, Component 1:** Min 18 gauge or heavier 12"x12" steel plate. Steel plate securely fastened to underside of floor separation with concrete anchors.
4. **Firestop System, Component 2:** Filler material, mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 4" (102mm). Recess filler material 1/2" (13mm) for sealant placement.
5. **Firestop System, Component 3:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/2" (13mm) within the annulus on top surface of floor assembly.
6. **Firestop System, Component 4:** PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to floor/ceiling assembly using 1/4" diameter by 1-1/4" long steel masonry anchors over fender washers.

***WH Labeled Component**
****Not tested to 50pa pressure differential as required by Canadian code for combustible DWV (Drain, Waste or Vent) piping systems.**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

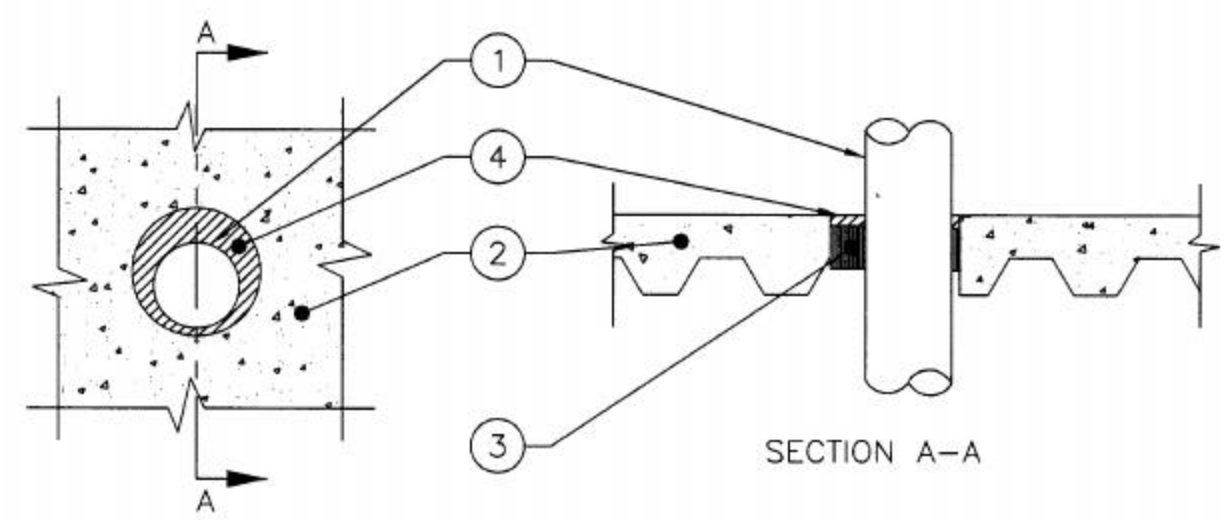
Design No.: JWA/PH 180-01

Single Penetrations

Horizontal (floor)

Test Standards: ASTM E-814, UL 1479: Non-metallic Open and Closed Systems
ULC S115-M95** Non-metallic Closed Systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E 814/ UL 1479 "F"	ASTM E 814/ UL 1479 "T"	ULC S115 – M95 "FH"	ULC S115 – M95 "FTH"
PVC Pipe (1" to 4")	6"	3/8" – 1-1/8"	3 Hour	121 Min.	3 Hour	121 Min.
ccPVC Pipe (1" to 4")	6"	3/8" – 1-1/8"	3 Hour	121 Min.	3 Hour	121 Min.
PVC Pipe (1" to 4")	6"	3/8" – 1-1/8"	3 Hour	121 Min.	3 Hour	121 Min.



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling Fire Separations:** Min 20 gauge or heavier galvanized steel decking with up to 3-1/2" (88mm) flute height firmly supported with min 2-1/2" (63 mm) concrete cover.
3. **Firestop System, Component 1:** PFP Partners – Wrap Strip WS1* – Nominal 1/8 in. thick intumescent material supplied in 2 in. (50 mm) wide strips. Min 3 layers of wrap strip to be wrapped entirely around pipe with additional wraps strips to be friction fitted to completely fill the annular space. Wrap strips to be recessed a min 1/2 in. (13 mm) below the top surface of the floor assembly to accommodate Firestop System, Component2.
4. **Firestop System, Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* - Product must be installed at a minimum thickness of 1/2" (13mm) within the annulus on top surface of floor assembly.

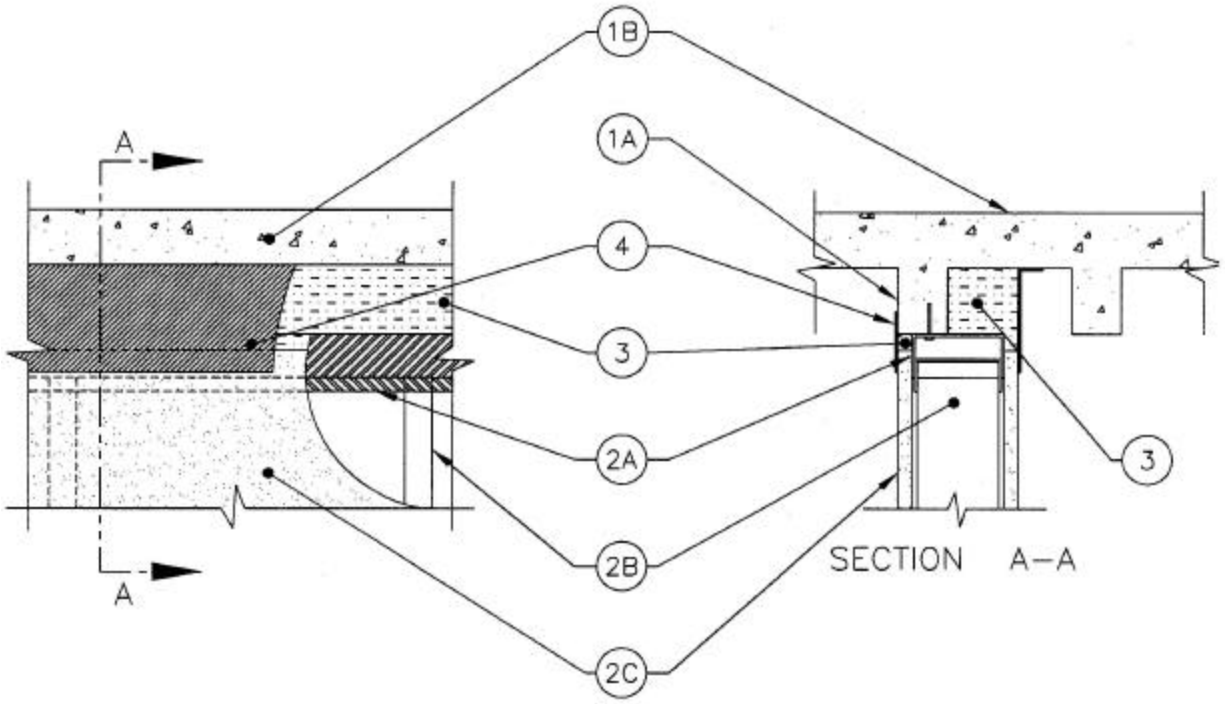
***WH Labeled Component**

**** Tested in accordance to Canadian Code Requirements for closed (supply) piping systems. Not tested to 50 Pa pressure differential as required by Canadian Code Requirements for combustible DWV pipes.**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

Design No. JWA/PHV 60-01

Metal Decking to Vertical Wall Assemblies
Test Standards: UL 2079 Rating: 1 hour "F"
Test Standards: ULC S115-M95 Rating: 1 hour "FTH"
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Joint System Cycled 500 Times at 10 cycles per Minute – 25% Compression or Extension



System Design Instructions

1. **Floor/Ceiling Assembly:** 1 hour ASTM E-119 or CAN/ULC S101 fluted steel deck roof/ceiling or floor/ceiling assemblies.
   - **A. Steel Deck:** Galvanized steel fluted units.
   - **B. Concrete:** Min. 2-1/2" (63mm) deep concrete, as measured from the top plane of the steel deck (1A).
2. **Wall Assembly:** 1 hour ASTM E-119 or ULC S101 metal framed gypsum wallboard (GWB) wall assemblies and shall include the following:
   - **A. Ceiling Runner & Deflection Channel:** 3-5/8" (91mm) x 1-1/2" (38mm) U-shaped runner with optional min. 24 Ga. with min. 2" (50mm) deep legs U-shaped deflection channel. When deflection channel is used, ceiling runner is installed within the deflection channel maintaining a 3/4" (19mm) gap between the top of the ceiling runner and top of the deflection channel and deflection channel is attached to floor/ceiling assembly. When deflection channel is not used ceiling runner is fastened directly to floor/ceiling assembly with steel fasteners or by welds spaced max. 24" (600mm) OC.
   - **A1. Slotted Ceiling Runner:** (As an alternative to 2A) 3-5/8" (91mm) U-shaped runner with slotted flanges, fastened to floor/ceiling assembly.
   - **B. Studs:** 3-5/8" (91mm) wide 'C' studs, spaced 24" (600mm), cut 1/2" (13mm) to 3/4" (19mm) less in length than assembly height.
   - **C. Wallboard*:** 5/8" (16mm) Type X gypsum wallboard, straight cut 3/4" (19mm) below lower surface of floor/ceiling assembly.

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

3. **Firestop System, Component 1:** Filler material- Min. 2 in. (50 mm) thick min. 4 PCF (64kg/m3) density mineral wool insulation compressed min. 25% between the top track and the underside of the top of the flute. Additional pieces of min. 5/8 in. (19 mm) thickness of min. 4 PCF (64kg/m3) density mineral wool insulation compressed min. 25% between the top of the gypsum wallboard and the underside of steel deck. Filler material to be flush with both sides of wall assembly.
4. **Firestop System, Component 2:** Min. 1/16" (60mil) dry thickness of John Wagner & Assoc. Inc. dba GRABBER CONSRTUCTION PRODUCTS – GrabberGard EFS* sprayed or brushed on each side of the wall assembly, fully covering all filler material and overlapping a min of 1" (25mm) onto the metal deck and wall assembly.

***WH Labeled Component**

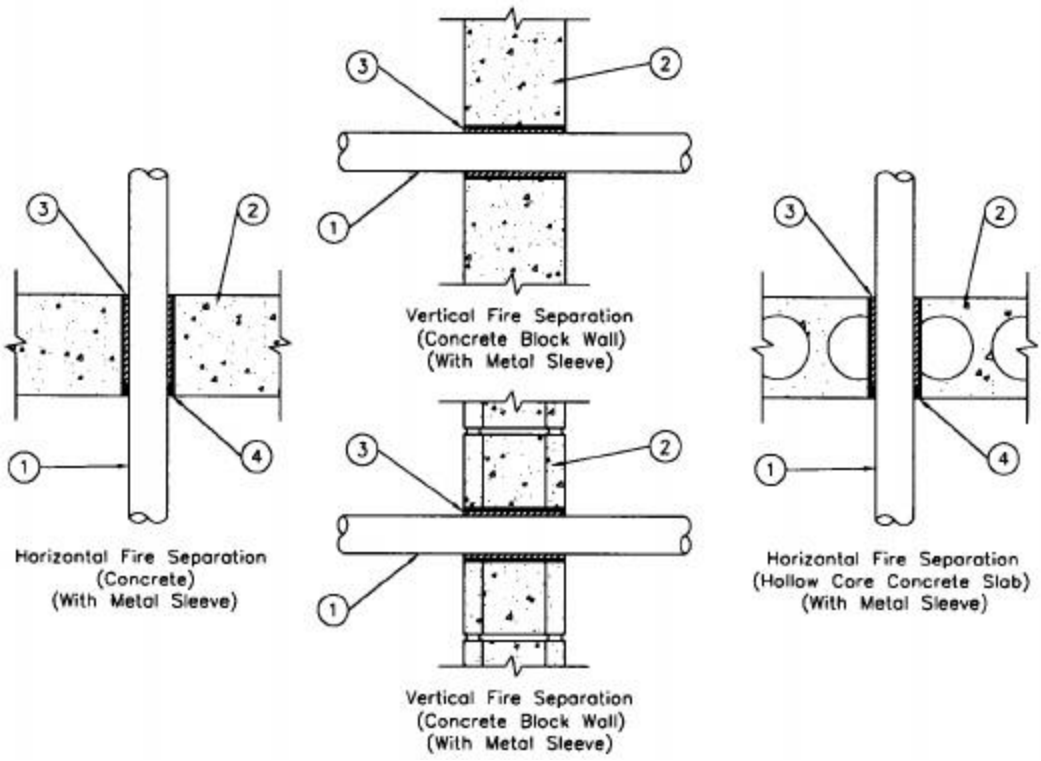
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard IFC

Design No. JWA/PHV 120-01

Single Penetrations Only
Horizontal (floor/ceiling) or Vertical (wall)
Test Standards: ASTM E-814, UL 1479: open and closed systems
ULC S115-M95: closed systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours
ccPVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours
CPVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
   a) Metal sleeve: Min 28 gauge or heavier metal sleeve cast in place or fit tightly into the opening.
2. **Floor/Ceiling Fire Separations:**
   a) Hollow core pre-cast concrete floor/ceiling assembly having a min cross-section thickness of 8 in. (200mm).
   b) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 8" (200mm).
   c) Cast in place concrete wall assemblies having a minimum cross section thickness of 8" (200mm) or,
   d) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
3. **Firestop System Component 1:** John Wagner & Assoc Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* installed at a minimum thickness of 7" (175mm) within the annulus flush with both top and bottom surfaces of floor or both sides of wall assembly.
4. **Firestop System Component 2:** Filler material: Optional, for damming only, mineral fiber insulation with a minimum density of 4-6 PCF (68 kg/m3).

***WH Labeled Component**

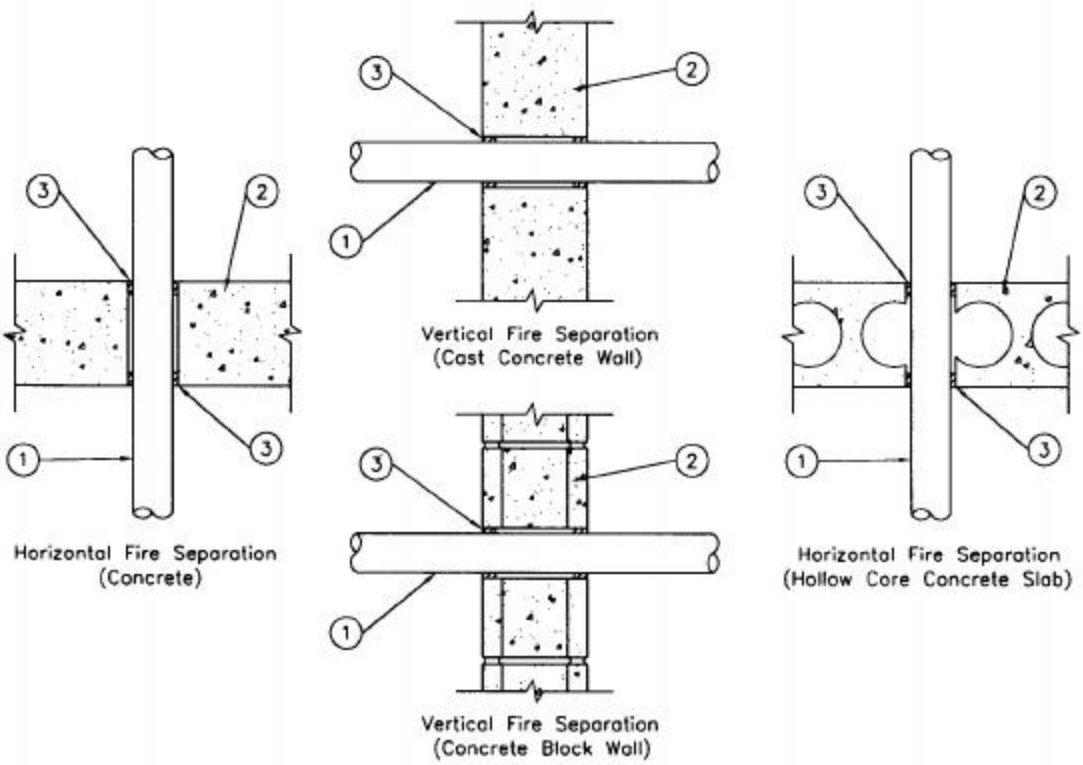
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard IFC

Design No. JWA/PHV 120-02

Single Penetrations Only
Horizontal (floor/ceiling) or Vertical (wall)
Test Standards: ASTM E-814, UL 1479: open and closed systems
ULC S115-M95: closed systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours
ccPVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours
CPVC Plastic pipe to 2"	3"	1/2"	2 Hours	2 Hours	2 Hours



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling Fire Separations:**
   a) Hollow core pre-cast concrete floor/ceiling assembly having a min cross-section thickness of 8 in. (200mm).
   b) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 8" (200mm).
   c) Cast in place concrete wall assemblies having a minimum cross section thickness of 8" (200mm) or,
   d) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
3. **Firestop System:** John Wagner & Assoc. Inc. dba GRABBER CONSRUCTION PRODUCTS – GrabberGard IFC* installed at a minimum thickness of 1" (25mm) within the annulus flush with both top and bottom surfaces of floor or both sides of wall assembly.

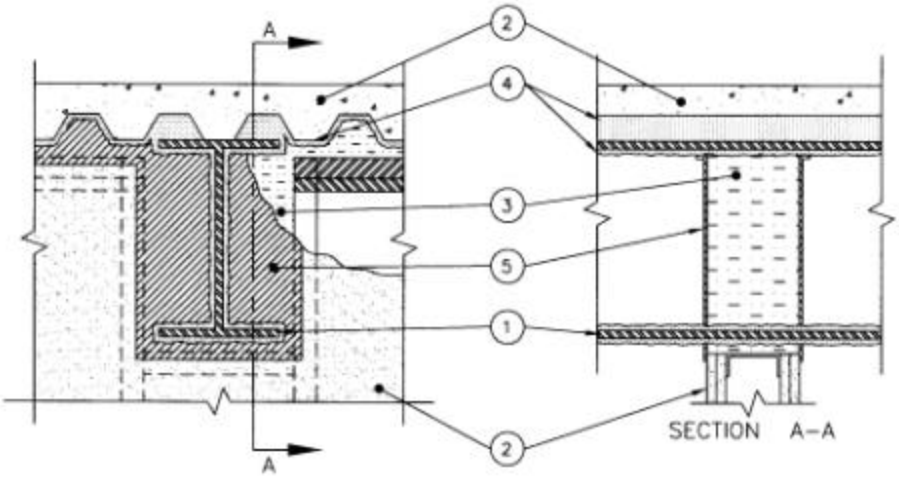
***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFS
GrabberGard EFC
GrabberGard IFC

Design No. JWA/PHV 120-03

Metal Decking to Vertical Wall Assemblies
Rating: Up to 2 Hours "FTH"
Test Standards: ASTM E-814, UL 2079, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Max Joint Width at Top of Wall – 3/4" (19 mm)
Joint System Cycled 500 Times at 10 Cycles Per Minute – 33% Compression or Extension



System Design Instructions

1. **Penetrating Item:** Steel beam or open-web steel joist, as specified in the individual roof/ceiling or floor/ceiling design, used to support fluted steel deck. Structural steel support oriented perpendicular to wall assembly. Where open-web steel joist pass through the fire rated wall, 3/8 in. diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lbs per sq yd shall be secured to one side of each joist with galvanized steel tie wire and the lath shall be fully covered with spray-applied fire resistive material applied in accordance with the specifications in the individual roof/ceiling or floor/ceiling design. The clearance between the top of the gypsum board and the bottom of the spray-applied structural steel member to be 0" to max 3/4" (19 mm).
2. **Roof/Ceiling of Floor/Ceiling Fire Separation:** 1 or 2 hour ASTM E-119 or CAN/ULC S101 fluted steel deck (GWB) roof/ceiling or floor/ceiling assemblies.
   Wall Fire Separation: 1 or 2 hour ASTM E-119 or CAN/ULC S101 metal framed gypsum wall board (GWB) wall assemblies consisting of a single or a double top track consisting of a single top track with a deflection channel or slip track.
   The hourly rating of the joint system is equal to the lesser hourly rating of either the roof/floor/ceiling or the wall assembly.
3. **Firestop System, Component 1:** Filler material, Min 4-6 PCF (68 kg/m3) density mineral wool insulation at a min depth of 6-1/8" (157mm) compressed into each flute opening in the steel deck and into the framed beam opening in the wall assembly flush with both sides of the wall assembly.
4. **Firestop System, Component 2:** Cafco 300 or WR Grace Type MK-6/HY applied to the underside of the roof/ceiling or floor/ceiling assembly and all surfaces of the structural steel support. Spray-applied in accordance with the specifications in the individual roof/ceiling or floor/ceiling design.
5. **Firestop System, Component 3:**
   Method 1: Spray or Brush: One heavy coat of John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFS*, 1/16" (63 mil) dry thickness, on both sides of the assembly, fully covering all voids and overlapping a minimum of 1" (25mm) onto the metal deck, steel beam and wall assembly.
   Method 2: Caulk: Min 1/8" (3 mm) thickness of John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC*, applied between the gypsum wall board and spray applied fire resistance material on both sides of the assembly, fully covering all voids, and overlapping a minimum of 1/8" (3 mm) onto the metal deck, steel beam and wall assembly.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

Design No. JWA/PHV 120-04

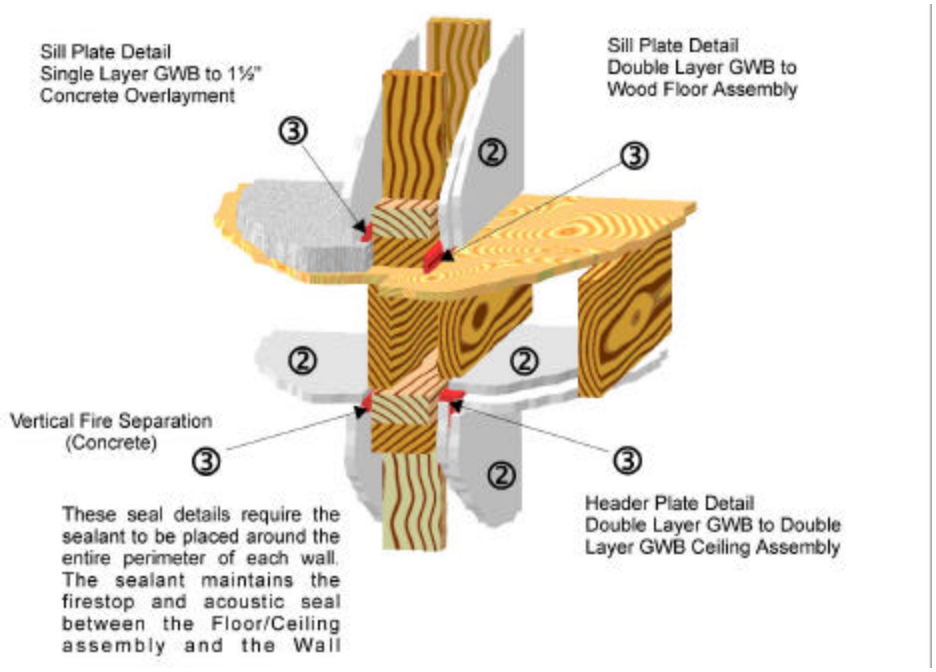
****Fire Rated Non-Flammable Acoustic Firestop Sealant**

Horizontal or Vertical (floor/ceiling and walls)

Test Standards: ASTM E-814, UL 1479, ULC S115-M95

Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

ASTM E-814		ULC S115
"F" Rating	**"T" Rating**	**"FTH" Rating**
2 Hour	2 Hour	2 Hour



System Design Instructions

1. **Penetrating Item:** Not applicable.
2. **Floor/Ceiling or Wall Fire Separations:** 1 and 2 hour rated ASTM E-119 or CAN/ULC S101 concrete, metal or wood framed fire rated gypsum wall board (GWB) floor/ceiling/wall assemblies.
3. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* firestop sealant at a minimum bead diameter of 3/8" (10mm) caulked into the corner and behind the GWB around the entire perimeter of the fire rated wall assembly. Attach gypsum wall board (GWB) membranes into the sealant within 15 min of sealant placement or prior to sealant skinning.
4. **Firestop System Component 2:** Filler material not required.

Optional - When max separation between bottom of ceiling membrane and wall membrane is less than 1/16 of an inch.

5. **Firestop System Component 3:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFS* firestop spray applied a minimum dry thickness of 1/16" (2mm) sprayed into the corner and behind the GWB around the entire perimeter of the fire rated wall assembly. Attach gypsum wall board (GWB) membranes into the sealant within 15 min of sealant placement or prior to sealant skinning

***WH Labeled Component**
****The acoustic claims have not been verified by Intertek Testing Services**

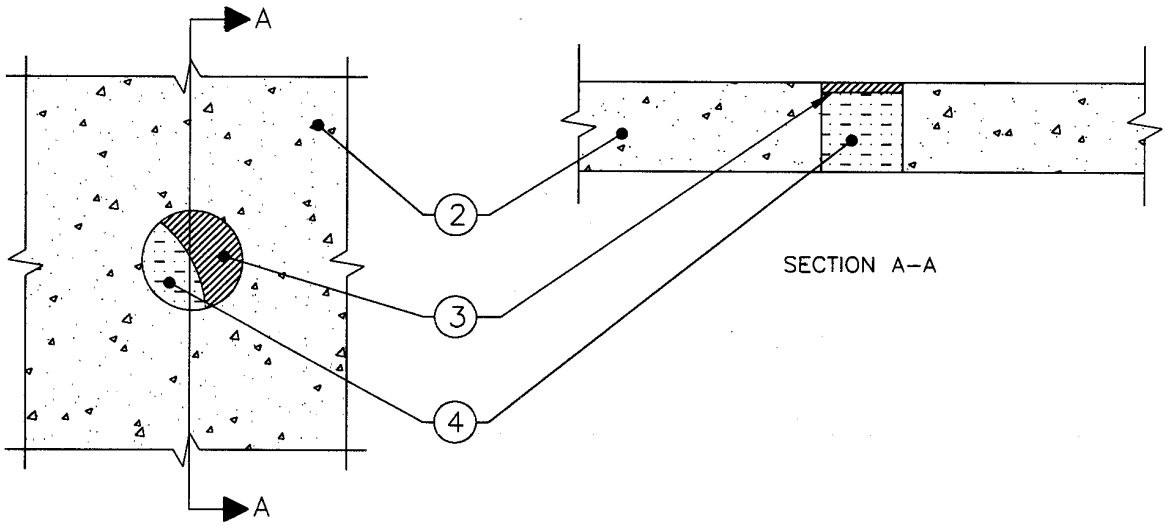
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

Design No. JWA/PHV 120-05

Horizontal or Vertical (floor/ceiling and walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Maximum Opening	ASTM E814/UL 1479 "F" Rating	ASTM E814/UL 1479 "T" Rating	ULC-S115-M95 "FTH" Rating
8"	Up to 2 Hours	Up to 2 Hours	Up to 2 Hours



System Design Instructions

1. **Penetrating Item:** None.
2. **Floor/Ceiling Assemblies:**
   a) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 4 ½" (114mm).
   b) Cast in place concrete wall assemblies having a minimum cross section thickness of 6" (150mm) or;
   c) Hollow or Concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
3. **Firestop System Component 1:**
   a) John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* for vertical or horizontal applications. GrabberGard EFC* or GrabberGard IFC* must be installed at a minimum thickness of ½" (13 mm) on top surface of floor or both surfaces of wall.
   b) John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GabberGard EFS* (sprayable mastic) for vertical or horizontal applications. GrabberGard EFS* to be sprayed into place with a minimum wet film thickness of ¼" (6 mm) on top surface of floor or both surfaces of wall. Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.
4. **Firestop System Component 2:** Filler Material, mineral rock wool or ceramic fiber insulation with a minimum density of 46 PCF (68 kg/m3) compressed to a minimum of 30% into the annular space at a minimum depth of 4" (100mm). Recess filler material ½" (13mm) for GrabberGard EFC* or GrabberGard IFC* caulk placement. Recess filler material ¼" (6mm) for GrabberGard EFS* spray applications.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

Design No. JWA/PHV 120-06

Single and Multiple Penetrations

Horizontal or Vertical (floor/ceiling and walls)

Test Standards: ASTM E-814, UL 1479, CAN/ULC S115-M95

Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

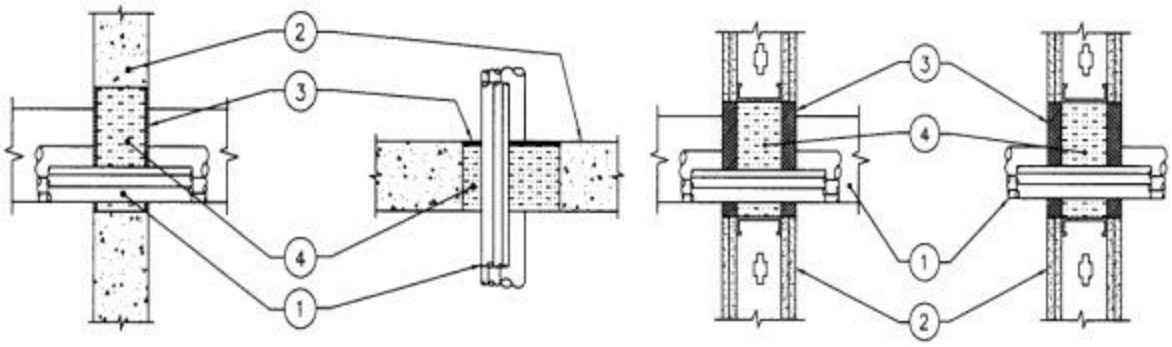
Configuration 1

		E814 & UL 1479		CAN/ULC S115-M95		
Penetrating Material & Size	**Annular Space**	**Fire "F" Rating**	**Temp "T" Rating**	**Fire "F" Rating**	**Fire/Hose "FH" Rating**	**Temp Rating "FTH" Rating**
EMT/Steel Conduit and Pipe (1/2 to 1) Sch 10 & up	0" - 3"	Up to 2 Hour	90 Min	Up to 2 Hour	Up to 2 Hour	90 Min
EMT/Steel Conduit and Pipe (1-1/4 to 6) Sch 40	0" - 3"	Up to 2 Hour	25 Min	Up to 2 Hour	Up to 2 Hour	25 Min
Copper Pipe and Tubing up to 2" ID	0" - 3"	Up to 2 Hour	55 Min	Up to 2 Hour	Up to 2 Hour	55 Min
Multiple BX/Teck Cable to 3-3/8 OD	0" - 3"	Up to 2 Hour	45 Min	Up to 2 Hour	Up to 2 Hour	45 Min

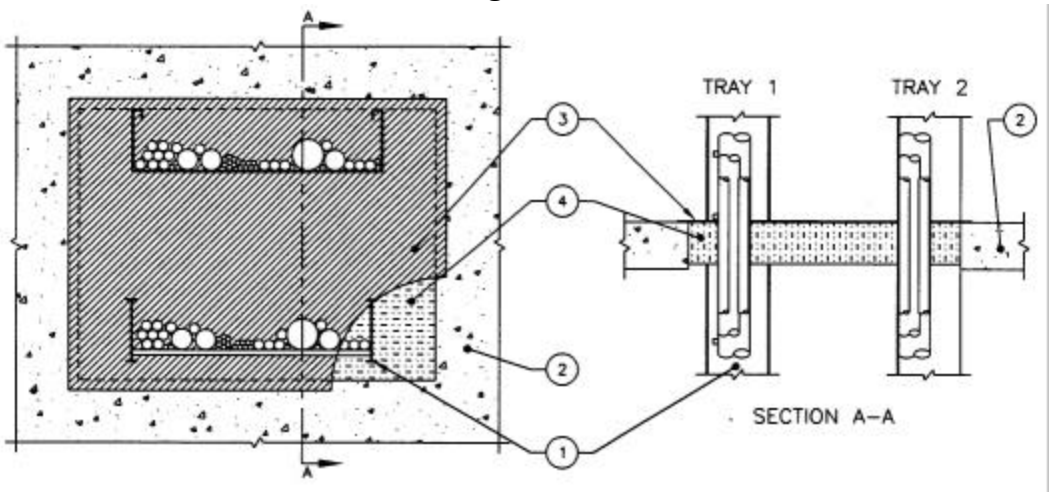
Configuration 2

L Rating At Ambient – 7.1 CFM
L Rating At 400° F – 5.8 CFM

		E814 & UL 1479		CAN/ULC S115-M95		
Penetrating Material & Size	**Annular Space**	**Fire "F" Rating**	**Temp "T" Rating**	**Fire "F" Rating**	**Fire/Hose "FH" Rating**	**Temp Rating "FTH" Rating**
Cable Trays	See Item 1	Up to 2 Hour	15 Min	Up to 2 Hour	Up to 2 Hour	15 Min
EMT/Steel Conduit and Pipe (1/2 to 4) Sch 10 & up	See Item 1	Up to 2 Hour	15 Min	Up to 2 Hour	Up to 2 Hour	15 Min
EMT/ Flexible Steel Conduit (1/2 to 4)	See Item 1	Up to 2 Hour	15 Min	Up to 2 Hour	Up to 2 Hour	15 Min
Insulated Copper Pipe and Tubing up to 4" ID	See Item 1	Up to 2 Hour	90 Min	Up to 2 Hour	Up to 2 Hour	90 Min
Multiple BX/Teck Cable to 3-3/8 OD	See Item 1	Up to 2 Hour	15 Min	Up to 2 Hour	Up to 2 Hour	15 Min



Configuration 1.



Configuration 2.

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

JWA/PHV 120-06

System Design Instructions

Configuration 1

1) **Penetrating Item:**
   a. Steel cable tray 4 in. x 30 in. (100 x 750 mm) filled to a maximum of 50% with any of the items in the table above or,
   b. Bundled cables, tubing, conduits and pipes listed in table above installed within the opening such that aggregate cross sectional area of penetrants in the opening is max 58 percent of the cross sectional area of the opening in assembly. The annular space between penetrants and the periphery of the opening are to be min 0 in. (point contact) to max 3 in. (75 mm).
   c. The maximum opening is 480 in^2 (0.31 m^2). All penetrating items must be reliably supported.

2) **Floor/Ceiling or Wall Assemblies:** 1 and 2 hour rated ASTM E-119 or CAN/ULC S101 wall or floor/ceiling assemblies as follows:
   a. Metal or wood framed gypsum wall board (GWB) wall assemblies with opening within the wall assembly completely framed to form a rectangular box or;
   b. Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 4-1/2 in. (112mm) or;
   c. Cast in place concrete wall assemblies having a minimum cross section thickness of 6 in. (150mm) or;
   d. Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8 in. (200mm).

3) **Firestop System Component 1:** John Wagner & Associates Inc. dba GRABBER CONSTRUCTION PRODUCTS –
   a. GrabberGard EFC* or GrabberGard IFC* for vertical or horizontal applications. Each product must be installed at a minimum wet film thickness of 1/4 in. (6mm).
   b. GrabberGard EFS* (mastic) for vertical or horizontal applications sprayed into place with a minimum wet film thickness of 1/8 in. (3mm). Always overlap GrabberGard EFS* onto the surface of the substrate a minimum of 1/2 in. (13mm). Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.

4) **Firestop System Component 2:** Filler Material, mineral rock wool or ceramic fiber insulation with a minimum density of 4**6** PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 4 in. (100 mm). Recess filler material 1/4 in. (6mm) for GrabberGard EFC* or GrabberGard IFC* sealant placement. Do not recess filler material for GrabberGard EFS* applications.

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

Configuration 2

1) **Penetrating Item:**
   a. **Cable Tray:** Maximum 2 cable trays per opening. Maximum 24 in. wide by 6 in. steel, aluminum or stainless steel cable tray solid back or ladder type. Cable tray spacing to be minimum 6 in. to a maximum 11 in. apart. The cable trays are to be installed a minimum of 0 in. (point contact) to max 6 in. from the periphery of the opening. Maximum cable tray fill to be 40% by area. All penetrating items must be reliably supported. Cable trays to may be filled with any combination of the following:
      - **Cables:** Communication or power cables, single or in bundles and installed with rigid support on both sides of opening.
      - **Steel Conduit / EMT:** Nominal 4 in. diameter or smaller flexible steel or steel tubing. Steel conduit or EMT to be installed with such that a min 1/2 in. annular space is maintained between steel conduit/EMT and other penetrants.
      - **Insulated Metallic Pipes:** Maximum 4 in. diameter (or smaller) copper piping or tubing. Pipes to be insulated with nominal 1 in. thick mineral wool pipe insulation.

2) **Floor/Ceiling or Wall Assemblies:** 1 and 2 hour rated ASTM E-119 or CAN/ULC S101 wall or floor/ceiling assemblies having a maximum opening size 884 sq. in. with max dimension of 34 in. as follows:
   a. Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 4-1/2 in. (112mm) or;
   b. Cast in place concrete wall assemblies having a minimum cross section thickness of 6 in. (150mm) or;
   c. Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8 in. (200mm).

3) **Firestop System Component 1:** John Wagner & Associates Inc. dba GRABBER CONSTRUCTION PRODUCTS –
   a. GarbberGard EFC* or GrabberGard IFC* for vertical or horizontal applications. Each product must be installed at a minimum wet film thickness of 1/4 in. (6mm).
   b. GrabberGard EFS* (mastic) for vertical or horizontal applications sprayed into place with a minimum wet film thickness of 1/8 in. (3mm). Always overlap GrabberGard EFS* onto the surface of the substrate a minimum of 1/2 in. (13mm). Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.

4) **Firestop System Component 2:** Filler Material, mineral rock wool or ceramic fiber insulation with a minimum density of 46 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 4 in. (100 mm). Recess filler material 1/4 in. (6mm) for GrabberGard EFC* or GrabberGard IFC* sealant placement. Do not recess filler material for GrabberGard EFS* applications.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PHV 120-07

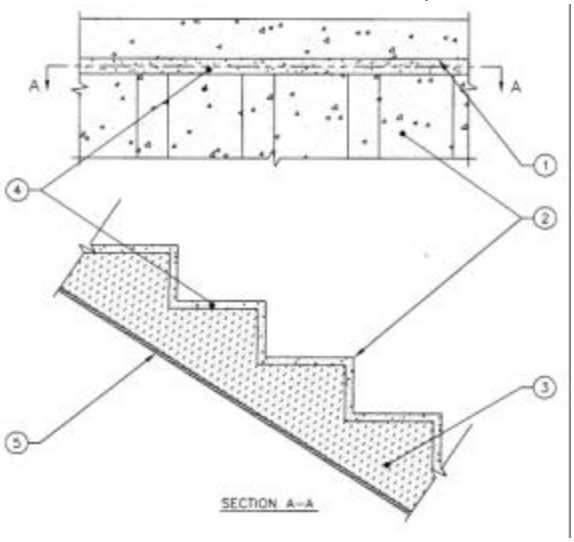
Horizontal or Vertical Static Stair Joints

Test Standards: UL 2079, ULC S115-M95

Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

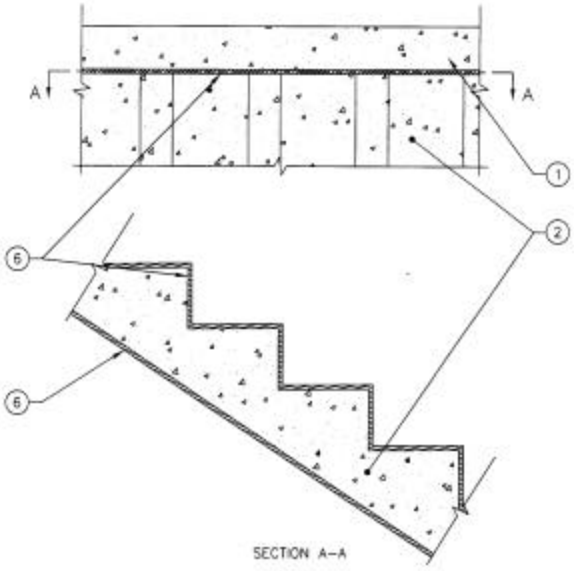
Configuration 1

Penetrating Material & Size	Max Width	UL 2079 "F" Rating	ULC S115-M95 "FTH" Rating
Vertical and Horizontal Joints	2"	up to 2hrs	up to 2hrs



Configuration 2

Penetrating Material & Size	Max Width	UL 2079 "F" Rating	ULC S115-M95 "FTH" Rating
Vertical and Horizontal Joints	1/2"	up to 2hrs	up to 2hrs



ITS Intertek Testing Services

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

JWA/PHV 120-07

System Design Instructions

1. **Wall Assemblies:** ASTM E-119 and CAN/ULC S101 up to 2 hour fire rated wall assemblies as follows:
   a) Cast in place concrete wall assemblies having a minimum cross section thickness of 5" (125mm) or;
   b) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
2. **Concrete Stair Assemblies**: Min 2 hour fire-rated concrete stair assembly having a min thickness of 6-1/2 in.

Configuration 1

3. **Firestop System Component 1:** Filler material mineral rock wool or ceramic fiber insulation with a minimum density of 4-6 PCF (68 kg/m^3) compressed a minimum of 25% into the joint space at a minimum depth of 5" (120 mm). Recess filler material to accommodate for grout (Item 4) placement on top side of staircase. Recess filler material to accommodate sealant placement (Item 5) placement on underside of staircase.
4. **Firestop System Component 2:** Min. 1" (25 mm) thick cementitious grout installed into joint on topside of staircase assembly.
5. **Firestop System Component 3:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* for vertical or horizontal applications installed at a minimum thickness of 1/2 in (12mm) into joint on underside of staircase assembly.

Configuration 2

6. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* for vertical or horizontal applications installed at a minimum thickness of 1/2 in (12mm) into joint on top and underside of staircase assembly.

***WH Labeled Component**

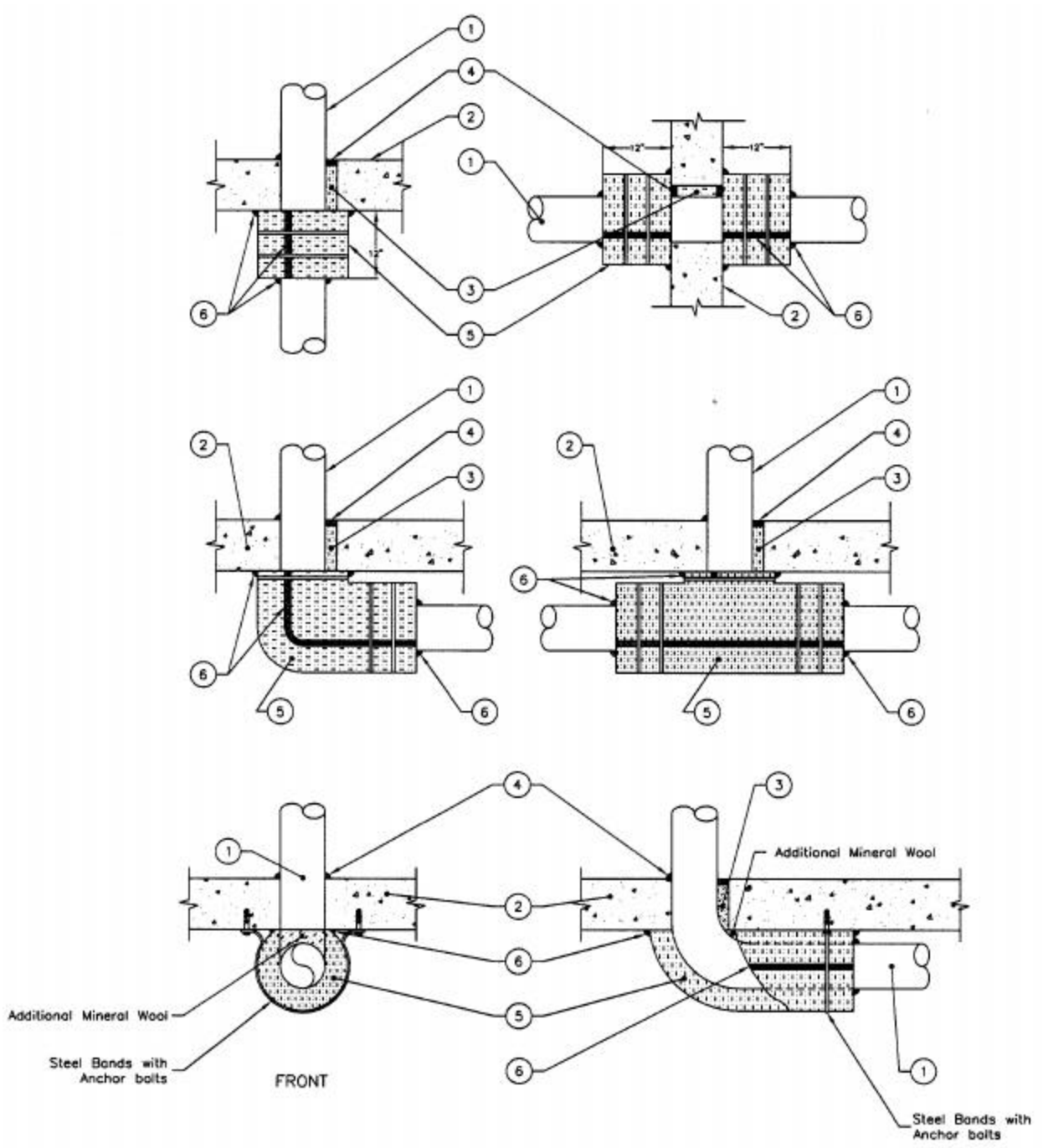
John Wagner & Associates Inc.
dba GRABBER CONSTRCUTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PHV 120-08

Single Penetrations
Horizontal or Vertical (floor/ceiling and walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material and Size	Max Hole Size	Annular Space	ASTM E814 / UL 1479 "F" Rating	ASTM E814 / UL 1479 "T" Rating	ULC S115-M95 "FTH" Rating
Steel Pipe Sch 40 (or heavier) up to 4"	5"	0" – 1"	2 hours	2 hours	2 hours
Cast Iron Pipe Sch 40 (or heavier) up to 4 " - Produced by Canadian Foundry Association Member Companies	5"	0" – 1"	2 hours	2 hours	2 hours



John Wagner & Associates Inc.
dba GRABBER CONSTRCUTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

JWA/PHV 120-08

System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above. Penetrating item may be connected to an elbow, coupler or tee fitting below slab.
2. **Floor/Ceiling or Wall Fire Separation:** Fire rated ASTM E-119 and CAN/ULC S101 floor/ceiling/wall assemblies as following:
   a) Cast in place normal or lightweight density concrete floor/ceiling assembly having a minimum cross section thickness of 7 in. (179 mm);
   b) Cast in place concrete wall assembly having a minimum cross section thickness of 7 in. (179 mm) or;
   c) Concrete block wall assembly solidly filled with cementitous grout having a minimum cross section of 8 in. (200 mm).
3. **Firestop System, Component 1:** Filler material, mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m^3) compressed a minimum of 25% into the annular space at a minimum depth of 6 in. (150 mm). Recess filler material 1/2 in. (13 mm) from top surface of floor and both sides of wall assembly for sealant placement.
4. **Firestop System, Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* to be installed at a minimum thickness of 1/2 in. (13 mm) within the annulus on top surface of floor or both surfaces of wall assembly. On 0 – 1/4 in. (6 mm) annular spaces, a 1/2 in. (13 mm) diameter fillet bead must be placed around the penetrating item on top surface of floor or both surfaces of wall assembly.
5. **Firestop System, Component 3:** Sleeve, min 2 in. thick by min 12 in. (306 mm) long mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m^3) installed around penetrating item. Sleeve to be held in place with steel hose clamps spaced min 6 in. (153 mm) OC and butted to the underside of the concrete floor or both surfaces of wall assembly. If pipe is connected to an elbow or tee under slab that is closer than 2" (50 mm) below slab, mineral wool may be fastened to underside of slab. If concrete slab is greater than 7" (180 mm) in thickness, the 12" (305 mm) length of insulation may be reduced by the value of that slab exceeds 7" (180 mm) in thickness.
6. **Firestop System, Component 4:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* min 1/2 in. (13 mm) diam bead applied at sleeve/concrete and sleeve/penetrant interface. An additional 1/16 in. (1-1/2 mm) thickness by 1/2 in. (13 mm) wide layer to be applied along seam of sleeve.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

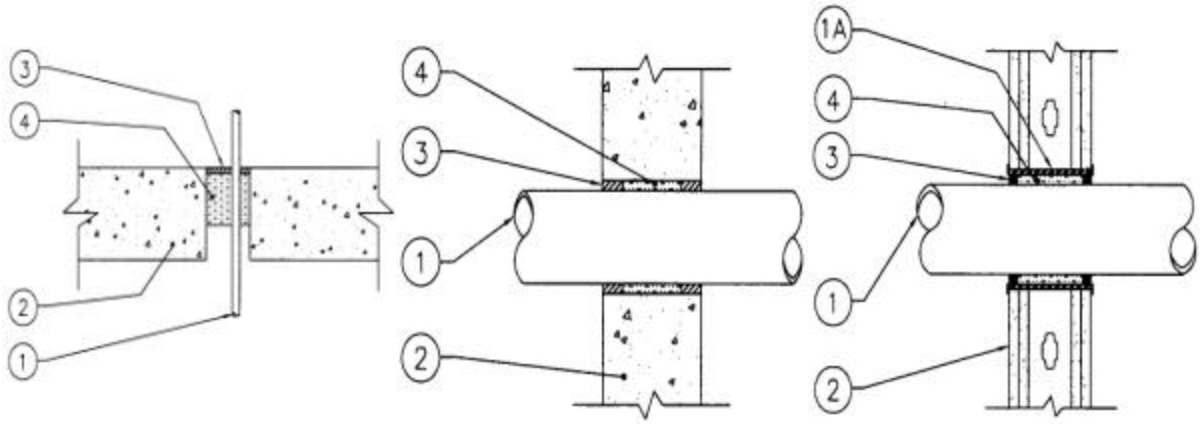
GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

Design No. JWA/PHV 120-09

Single and Multiple Penetrations

Horizontal or Vertical (floor/ceiling and walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E 814/UL 1479 "F" Rating	ASTM E 814/UL 1479 "T" Rating	ULC S115 M95 "FH" Rating	ULC S115 M95 "FTH" Rating
Steel and Cast Iron Pipe (1" to 3") Sch 10 & up	11"	¼" - 4"	2 Hour	35 Min	2 Hour	35 Min
Steel and Cast Iron Pipe (3½" to 8") Sch 10 & up	16"	¼" - 4"	2 Hour	19 Min	2 Hour	19 Min
Steel and Cast Iron Pipe (8½" to 24") Sch 10 & up	26"	¼" - 1"	2 Hour	15 Min	2 Hour	15 Min
EMT/Steel Conduit Pipe (½" to 1") Sch 10 & up	9"	¼" - 4"	2 Hour	60 Min	2 Hour	60 Min
EMT/Steel Conduit Pipe (1¼" to 6") Sch 10 & up	8"	¼" - 1"	2 Hour	15 Min	2 Hour	15 Min
Copper Pipe and Tubing up to 4" ID	12"	¼" - 4"	2 Hour	50 Min	2 Hour	50 Min
BX/Teck Cables up to 3-3/8" OD (Plastic Jacket)	7"	¼" - 2½"	2 Hour	2 Hour	2 Hour	2 Hour
Loomex/Romex Electrical Wiring to 1½"	6½"	¼" - 2½"	2 Hour	2 Hour	2 Hour	2 Hour
25Pr Telephone Cable (Plastic Jacket)	4"	1/8" - 1"	2 Hour	2 Hour	2 Hour	2 Hour
5/16" OD Cablevision Wire (Plastic Jacket)	4"	1/8" - 1"	2 Hour	2 Hour	2 Hour	2 Hour



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations for steel pipes 6" to 16" (150 to 400mm), up to 5 penetrations for steel pipe, conduit or electrical wiring 1" (25mm) or less in diameter, up to 3 penetrations for copper pipe when 2 are ½" (13mm) or less. Steel pipes over 8" (200mm) in diameter, require ceramic fiber filler material (Item 4).
   a) Metal Sleeve: Minimum 28 Ga or heavier metal sleeve fit tightly into the opening with a maximum annular space around sleeve to GWB of 1/16" (1.5mm). Metal sleeve used to support mineral wool filler material (Item 4) within hollow cavities.
2. **Floor/Ceiling or Wall Fire Separations:**
   a) 1 and 2 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed fire rated gypsum wallboard (GWB) wall assemblies. (Note all GWB assemblies require metal sleeves when using 4100NS*)
   b) Cast in place normal or light density concrete floor/ceiling assemblies minimum thickness of 4½" (114mm) or;
   c) Cast in place concrete wall assemblies having a minimum cross section thickness of 6" (150mm) or;
   d) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).

JWA/PHV 120-09

3. **Firestop System Component1:** John Wagner & Associates Inc. dba GRABBER CONSTRUCTION PRODUCTS –

    a. GrabberGard EFC* or GrabberGard IFC* for vertical or horizontal applications. GrabberGard EFC* or GrabberGard IFC* must be installed at a minimum wet film thickness of 1/4 in. (6mm).
    b. GrabberGard EFS* (mastic) for vertical or horizontal applications sprayed into place with a minimum wet film thickness of 1/8 in. (3mm). Always overlap GrabberGard EFS* onto the surface of the substrate a minimum of 1/2 in. (13mm). Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.

4. **Firestop System Component 2:** Filler Material, mineral rock wool or ceramic fiber insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 4 in. (100 mm). Recess filler material 1/4 in. (6mm) for GrabberGard EFC* or GrabberGard IFC* sealant placement. Do not recess filler material for GrabberGard EFS* applications. On GWB and metal sleeve installations fill to full depth of sleeve allowing ¼" (6mm) for sealant placement on each side.

***WH Labeled Component**

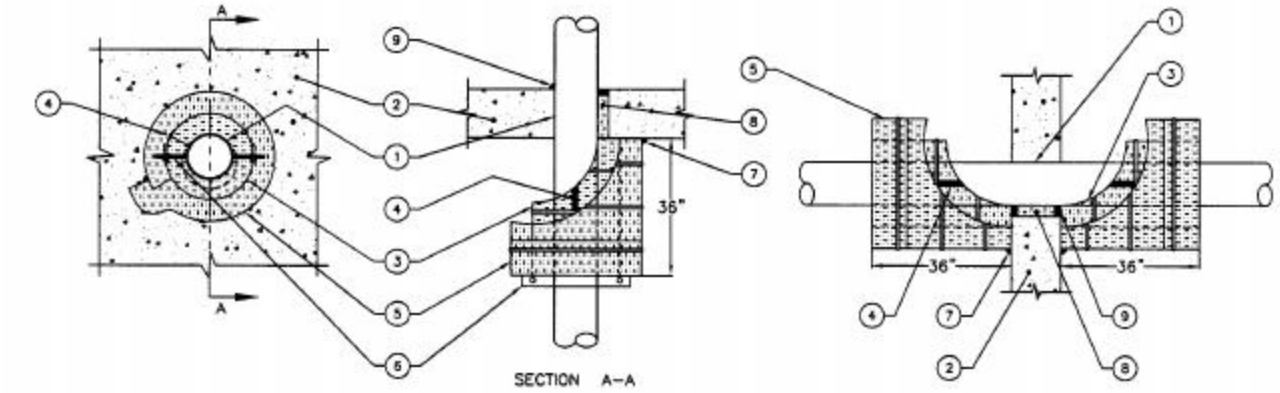
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

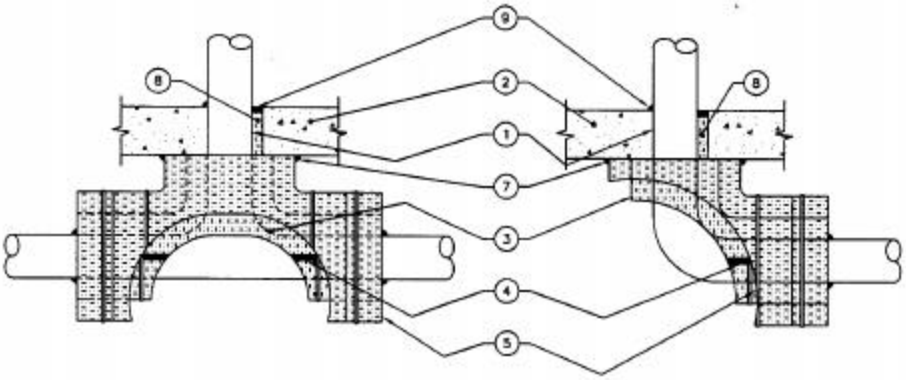
GrabberGard EFC
GrabberGard IFC

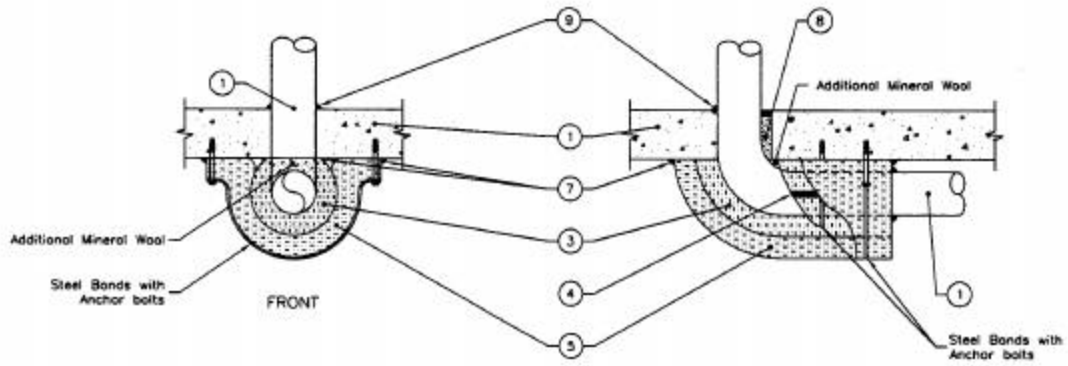
Design No. JWA/PHV 120-10

Single Penetrations
Horizontal (floor/ceiling) or Vertical (walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material and Size	Max Hole Size	Annular Space	ASTM E814 / UL 1479 "F" Rating	ASTM E814 / UL 1479 "T" Rating	ULC S115-M95 "FTH" Rating
Copper Pipe or Tubing up to 4"	5"	0" – 1"	2 hours	2 hours	2 hours
Rigid Steel Conduit or EMT up to 4"	5"	0" – 1"	2 hours	2 hours	2 hours







System Design Instructions

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

JWA/PHV 120-10

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above. Firestop system components may be installed over tees, elbows and couplers for pipes sized not to exceed table above.
2. **Floor/Ceiling or Wall Fire Separation:** 2 hour fire rated ASTM E119 and CAN/ULC S101 floor/ceiling/wall assemblies as follows:
    a) Cast in place normal or lightweight density concrete floor/ceiling assembly having a minimum cross section thickness of 5-1/2 in. (138 mm);
    b) Cast in place concrete wall assembly having a minimum cross section thickness of 5-1/2 in. (138 mm) or
    c) Concrete block wall assembly solidly filled with cementitous grout having a minimum cross section of 8 in. (200 mm).
3. **Firestop System, Component 1:** Min 2 in. thick by min 36 in. (650 mm) long hollow cylindrical mineral wool sleeve insulation with a minimum density of 8 PCF (128 kg/m^3) installed around penetrating item. Aluminum foil surface jacket is optional. Mineral wool to be tightly butted at longitudinal joint. Sleeve to be held in place with steel hose clamps spaced min 8 in. (200 mm) OC and butted to the underside of the concrete floor assembly. If pipe is connected to a tee or elbow that is closer than 4" (100 mm) below slab, sleeve to be fastened to underside of slab with 1/2 in. (13 mm) wide steel band and anchor bolts spaced max 8 in. (200 mm) OC. If pipe is connected to a tee or elbow that is closer than 2" (50 mm) below slab, additional mineral wool is to be packed between pipe and underside of slab and the "U" shape sleeve to be attached to be fastened to underside of slab with 1/2 in. (13 mm) wide steel band and anchor bolts spaced max 8 in. (200 mm) OC.
4. **Firestop System, Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* min 1/16 in. (1-1/2 mm) thickness by 1/2 in. (13 mm) wide layer to be applied along seam of sleeve of firestop component 1.
5. a) **Firestop System, Component 3a:** Min 2 in. thick by min 36 in. (650 mm) long hollow cylindrical mineral wool sleeve insulation with a minimum density of 8 PCF (128 kg/m^3) installed around first sleeve. Aluminum foil surface jacket is optional. Mineral wool to be tightly butted at longitudinal joint. Sleeve to be held in place with steel hose clamps spaced min 8 in. (200 mm) OC and butted to the underside of the concrete floor assembly. If pipe is connected to a tee or elbow that is closer than 4" (100 mm) below slab, sleeve to be fastened to underside of slab with 1/2 in. (13 mm) wide steel band and anchor bolts spaced max 8 in. (200 mm) OC.
    b) **Firestop System, Component 3b:** As an alternative to Item 5a, min 2 in. thick by min 36 in. (650 mm) long mineral wool insulation with a minimum density of 4-6 PCF (68 kg/m^3) wrapped around first sleeve. Mineral wool to overlap min 2 in. at longitudinal joints and be tightly butted at transverse joints. Sleeve to be held in place with steel hose clamps spaced min 8 in. (200 mm) OC and butted to the underside of the concrete floor assembly. If pipe is connected to a tee or elbow that is closer than 4" (100 mm) below slab, sleeve to be fastened to underside of slab with 1/2 in. (13 mm) wide steel bands and anchor bolts spaced max 8 in. (200 mm) OC.
6. **Firestop System, Component 4:** Riser Clamp, for vertical pipes only, where elbows and/or tees are not used, min 4 in. (100 mm) galv steel riser clamp installed below mineral wool sleeves to retain the material in position against the underside of the floor. Min 1/2 in (13mm) thick, min 4 PCF mineral wool to be installed between clamp and pipe to ensure a tight fit.
7. **Firestop System, Component 5:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* min 1/2 in. (13 mm) diam bead applied at sleeve/concrete and sleeve/penetrant interface.
8. **Firestop System, Component 6:** Filler material, mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m^3) compressed a minimum of 25% into the annular space at a minimum depth of 5 in. (125 mm). Recess filler material 1/2 in. (13 mm) for sealant placement.
9. **Firestop System, Component 7:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* to be installed at a minimum thickness of 1/2 in. (13 mm) within the annulus on top surface of floor assembly. On 0 – 1/4 in. (6 mm) annular spaces, a 1/2 in. (13 mm) diameter fillet bead must be placed around the penetrating item on top surface of floor assembly.

***WH Labeled Component**

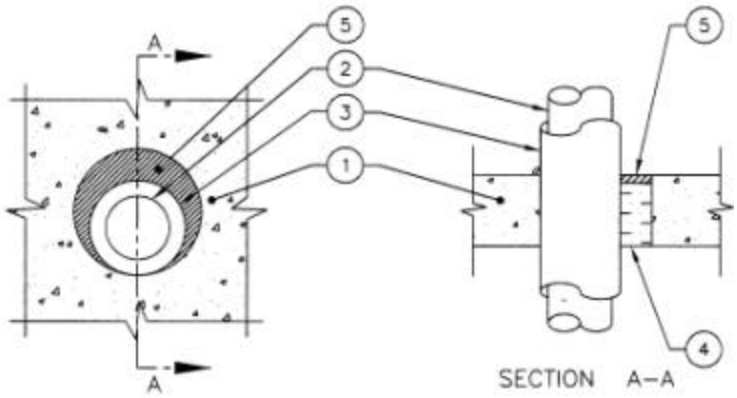
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

Design No. JWA/PHV 120-11

Single Penetrations

Horizontal or Vertical (floor/ceiling and walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	ASTM E 814/UL 1479 "F" Rating	ASTM E 814/UL 1479 "T" Rating	ULC S115 M95 "FH" Rating	ULC S115 M95 "FTH" Rating
Steel and Cast Iron Pipe up to 4" Sch 10 & up	8"	0" – 1½"	2 Hour	35 Min	2 Hour	35 Min
Copper Pipe and Tubing up to 4" ID	8"	0" – 1½"	2 Hour	35 Min	2 Hour	35 Min



System Design Instructions

1. **Floor/Ceiling or Wall Fire Separations:**
   a) Cast in place normal or light density concrete floor/ceiling assemblies minimum thickness of 4½" (114mm) or;
   b) Cast in place concrete wall assemblies having a minimum cross section thickness of 6" (150mm) or;
   c) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).

2. **Penetrating Item:** Centered or offset in hole, see table above. Single penetration only, maximum hole size not to exceed table above.

3. **Through Insulating Materials:** Max 1" wall thickness fiberglass or batt insulation (paper faced), tightly wrapped around the penetrating item, having a minimum density of 3.5 lbs/pcf and listed to provide a flame spread rating of 25 and a smoke developed rating of 50 or less.

4. **Firestop System Component 1:** Filler Material, mineral rock wool or ceramic fiber insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 4 in. (100 mm). Recess filler material 1/4 in. (6mm) for Firetemp® SI* sealant placement on each side.

5. **Firestop System Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFS* (mastic) for vertical or horizontal applications sprayed into place with a minimum wet film thickness of 1/4 in. (6mm). Always overlap GrabberGard EFS* onto the surface of the substrate a minimum of 1/2 in. (13mm). Do not thin GrabberGard EFS* firestop mastic when spraying, use equipment capable of applying material as supplied.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

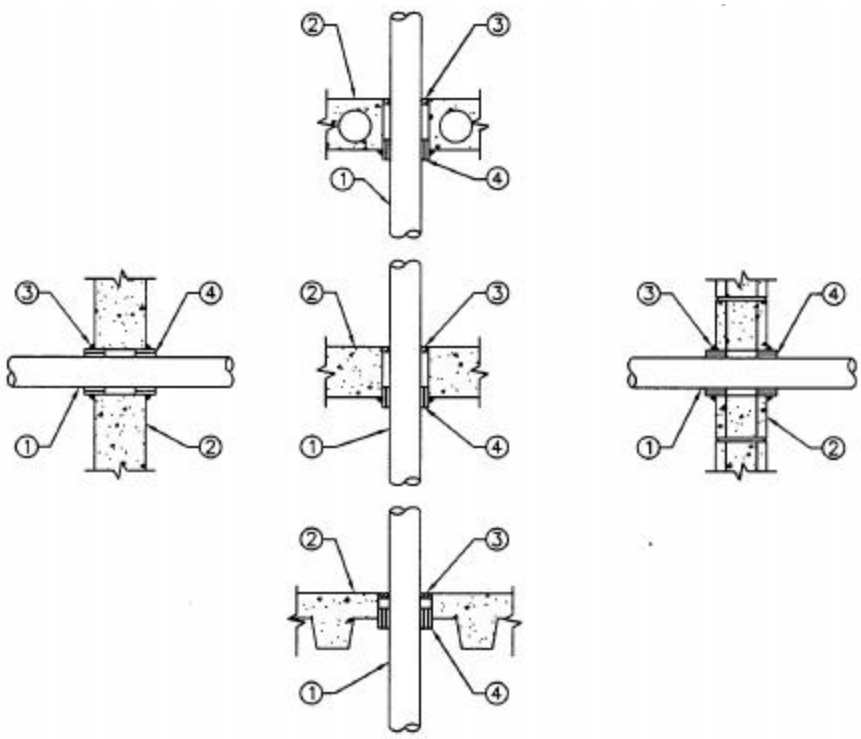
GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PHV 120-15

Single Penetrations

Horizontal (floor/ceiling) or Vertical (wall)
Test Standards: ASTM E-814, UL 1479: open and closed systems
ULC S115-M95**
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Item Material	Nom Pipe Size (in.)	Annular Space (in.)	Layers of Wrap Strip	ASTM E814/UL1479 "F" Rating	ASTM E814/UL1479 "T" Rating	ULC S115 "F" & "FH" Rating	ULC S115 "FTH" Rating
PVC Pipe	Up to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ccPVC Pipe	Up to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
CPVC Pipe	Up to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ABS Pipe	Up to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
FRPP Pipe	Up to 2"	1/8"	1	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
FRPP Pipe	Up to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
FRPP Pipe	Up to 4"	3/8"	3	Up to 2 Hours	0 Hours	Up to 2 Hours	0 Hours



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor/Ceiling or Wall Assembly:**
   a) Hollow core pre-cast concrete floor/ceiling assembly having a min cross-section thickness of 6 in. (150 mm).
   b) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 4 1/2" (113 mm).
   c) Cast in place concrete wall assemblies having a minimum cross section thickness of 4 1/2" (113 mm) or,
   d) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 6" (150mm).
   e) Min. 2 hour fire rated floor assembly. Min. 20 gauge or heavier galvanized steel decking with min. 4 ½" (113mm) concrete cover.

3. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/4" (6 mm) within the annulus at top surface of floor assembly. A minimum of 1/2 in. (13 mm) bead of GrabberGard EFC* or IFC* is to be applied between interface of the floor or wall and the outer layer of intumescent wrap strip (see Firestop System Component 2).
4. **Firestop System Component 2:** PFP Partners – Wrap Strip WS1* – Nominal 1/8 in. thick intumescent material supplied in 2 in. (50 mm) wide strips. See table for number of layers of wrap strip friction fitted into annular space. Wrap strip to extend max. 1/4 in. (6 mm) below the bottom surface of the floor or both sides of the wall and fastened in place with aluminum foil tape.

***WH Labeled Component**
**** Tested in accordance to Canadian Code requirements for FRPP pipes. PVC, ABS and CPVC not tested to 50 Pa pressure differential as required by Canadian Code Requirements for combustible DWV pipes.**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

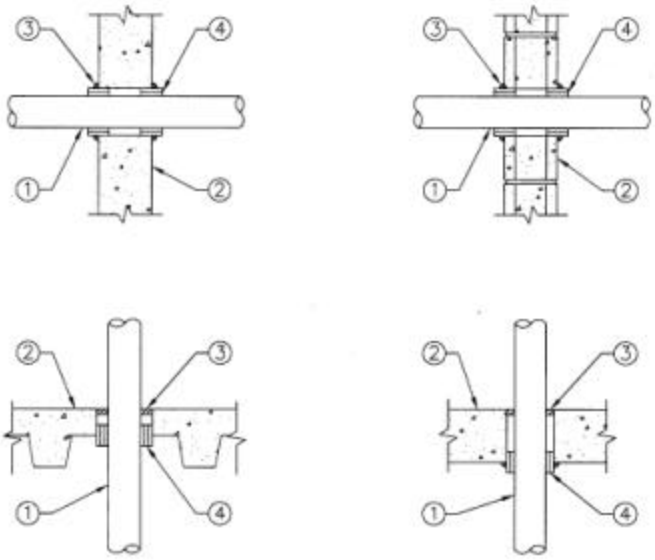
Design No.: JWA/PHV 120-16

Single Penetrations

Horizontal (floor/ceiling) or Vertical (wall)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Non-metallic open and closed systems
Positive Pressure Differential – 50 Pa (0.2 in. of water) Minimum

Penetrating Item Material	Nom Pipe Size (in.)	Annular Space (in.)	Layers of Wrap Strip	ASTM E814/UL1479 "F" Rating	ASTM E814/UL1479 "T" Rating	ULC S115 "F" & "FH" Rating	ULC S115 "FTH" Rating
PEX Pipe	Up to 2" ID	1/4"	2	Up to 2 Hours	1/4 Hour	Up to 2 Hours	1/4 Hour
PVC Pipe	Up to 2"	1/8"	1	Up to 2 Hours	3/4 Hour	Up to 2 Hours	3/4 Hour
PVC Pipe	< 2" to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
PVC Pipe	< 3" to 4"	3/8"	3	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ccPVC Pipe	Up to 2"	1/8"	1	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ccPVC Pipe	< 2" to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ccPVC Pipe	< 3" to 4"	3/8"	3	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
CPVC Pipe	Up to 2"	1/8"	1	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
CPVC Pipe	< 2" to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
CPVC Pipe	< 3" to 4"	3/8"	3	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ABS Pipe	Up to 2"	1/8"	1	Up to 2 Hours	1/4 Hour	Up to 2 Hours	1/4 Hour
ABS Pipe	< 2" to 3"	1/4"	2	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
ABS Pipe**	< 3" to 4"	3/8"	3	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours
FRPP Pipe**	Up to 2"	1/8"	1	Up to 2 Hours	2 Hours	Up to 2 Hours	2 Hours

****Not tested through concrete fluted steel deck floor assembly**



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above. Single penetrations only.
2. **Floor/Ceiling or Wall Assembly:**
   a) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum thickness of 4 1/2" (113 mm).
   b) Cast in place concrete wall assemblies having a minimum cross section thickness of 4 1/2" (113 mm) or,
   c) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
   d) Min 20 gauge or heavier galvanized steel decking with min 1-1/2" (38 mm) flute height firmly supported, with min 3" (75 mm) concrete cover.

3. **Firestop System Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/4" (6 mm) within the annulus at top surface of floor assembly. A minimum of 1/2 in. (13 mm) bead of GrabberGard EFC* or GrabberGard IFC* is to be applied between interface of the floor or wall and the outer layer of intumescent wrap strip (see Firestop System Component 2).
4. **Firestop System Component 2:** PFP Partners – Wrap Strip WS1* – Nominal 1/8 in. thick intumescent material supplied in 2 in. (50 mm) wide strips. See table for number of layers of wrap strip friction fitted into annular space. Wrap strip to extend max. 1/4 in. (6 mm) below the bottom surface of the floor or both sides of the wall and fastened in place with aluminum foil tape.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PHV 120-18

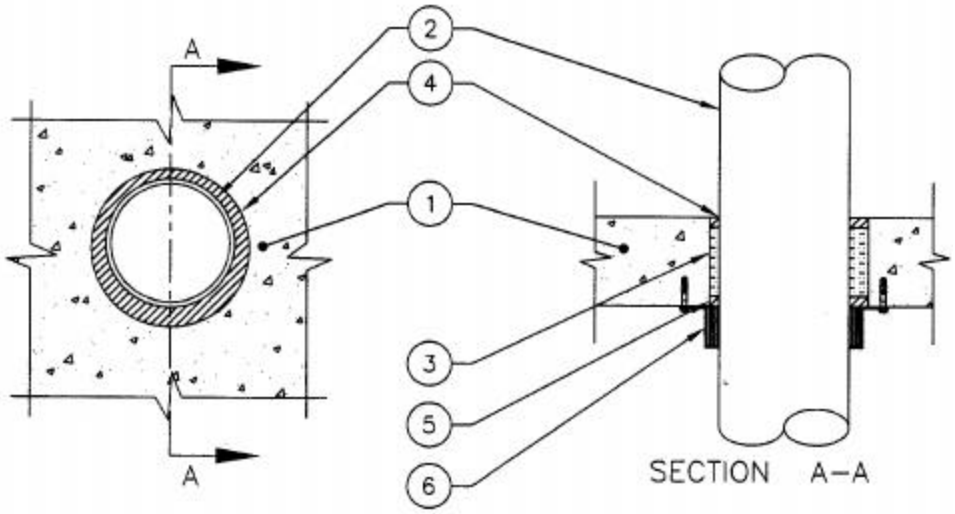
Single Penetrations

Horizontal (floor/ceiling)

Test Standards: ASTM E-814, UL 1479,
CAN/ULC S115-M95: open and closed systems

Test Furnace Internal Positive Pressure Differential – 50 Pa (0.2 in. of water)

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic Pipe 1-1/2" – 6"	8"	1/2" – 1"	Up to 2 Hr	Up to 2 Hr	Up to 2 Hr
ccPVC Plastic Pipe 1-1/2" - 6"	8'	1/2" – 1"	Up to 2 Hr	Up to 2 Hr	Up to 2 Hr
XFR-PVC (IPEX) Plastic Pipe 1-1/2" – 6"	8"	1/2" – 1"	Up to 2 Hr	Up to 2 Hr	Up to 2 Hr



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Floor or Wall Assembly:** Code conforming 2 hour rated floor or wall assembly having a min. nominal 4 1/2"(115mm) thick lightweight or normal weight concrete or hollow-core concrete. Wall may also be constructed of nominal 8"(203mm) thick concrete blocks (filled or unfilled).
   Hole Core Concrete (Not Shown): Seal the annular space at pipe penetration on the floor side with a min 1/2" (13mm) thickness of John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC*. Caulking is applied over min 2" (102mm) thickness of mineral wool
3. **Firestop System, Component 1:** Filler material, mineral rock wool insulation with a minimum density of 4-6 PCF (68 kg/m3) compressed a minimum of 25% into the annular space at a minimum depth of 2" (102mm) on each side of the floor or wall assembly. Recess filler material 1/2" (13mm) for sealant placement at top and bottom of floor assembly and on both sides of the wall assemblies.
4. **Firestop System, Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/2" (13mm) within the annulus on top surface of floor assembly or minimum thickness of 1/2" (13mm) on both sides of the wall assemblies.
5. **Firestop System, Component 3:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 1/4" (7 mm) within the annulus on bottom surface of floor assembly, or minimum thickness of 1/2" (13mm) on both sides of the wall assemblies.
6. **Firestop System, Component 4:** PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to floor/ceiling assembly or wall assembly using 1/4"(6mm) diameter by 1-1/4"(32mm) long steel masonry anchors over fender washers. For walls, the system shall be symmetrical, with PPC installed on each side of the assembly and fixed in the manner as described for floor penetrations.

***WH Labeled Component**

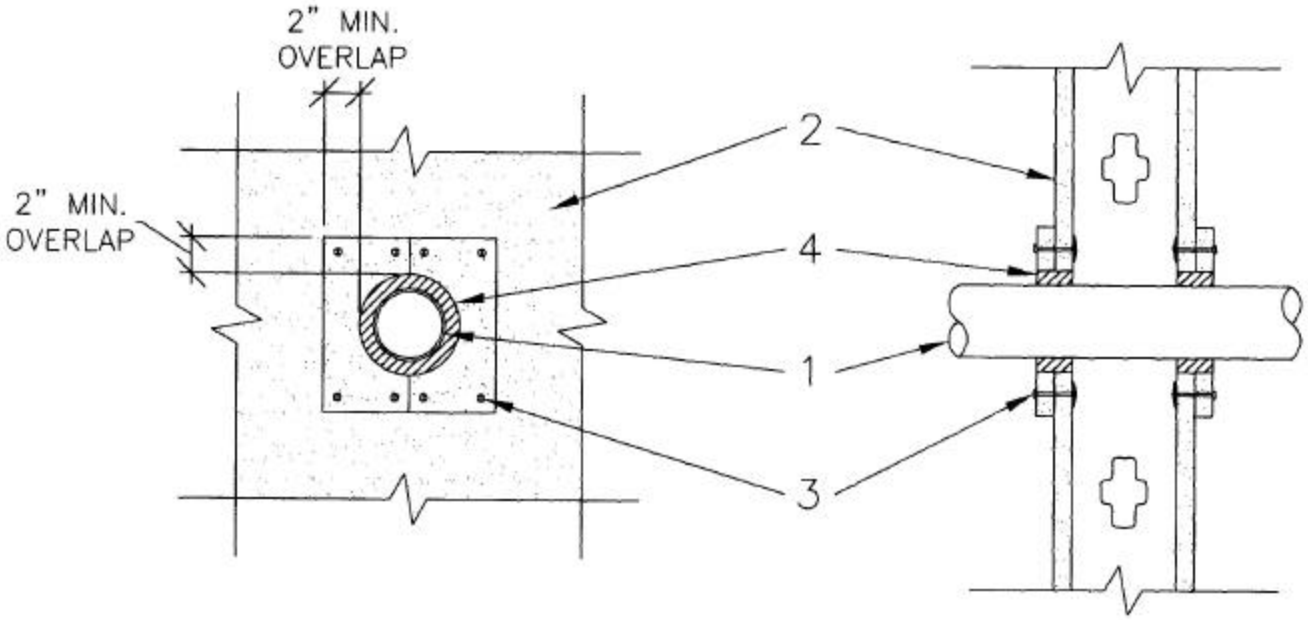
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard IFC

Design No. JWA/PV 60-01

Single Penetrations
Vertical (walls)
Test Standards: ASTM E-814, UL 1479: open and closed systems, ULC S115-M95: closed systems
Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	E 814 & UL 1479 "F" Rating	"T" Rating	S115-M95 "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic pipe to 2"	3-5/8"	1/4" to1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr
CPVC Plastic pipe to 2"	3-5/8"	1/4" to1/2"	Up to 1 Hr	22 min	Up to 1 Hr	Up to 1 Hr	22 min
X-Linked Polyethylene tubing to 1" ID	2-1/2"	1/4" to1/2"	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr	Up to 1 Hr



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above.
2. **Wall Fire Separations:** 1 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed insulated gypsum wall board (GWB) wall assemblies.
3. **Firestop System; Component 1:** One layer of 5/8" Type "X" gypsum wallboard collar securely fastened to gypsum wallboard with drywall anchors. Caulk a 3/8" (10mm) bead around perimeter edges of GWB collar after installation.
4. **Firestop System; Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* fully filling the annular space to the full depth of the membrane.

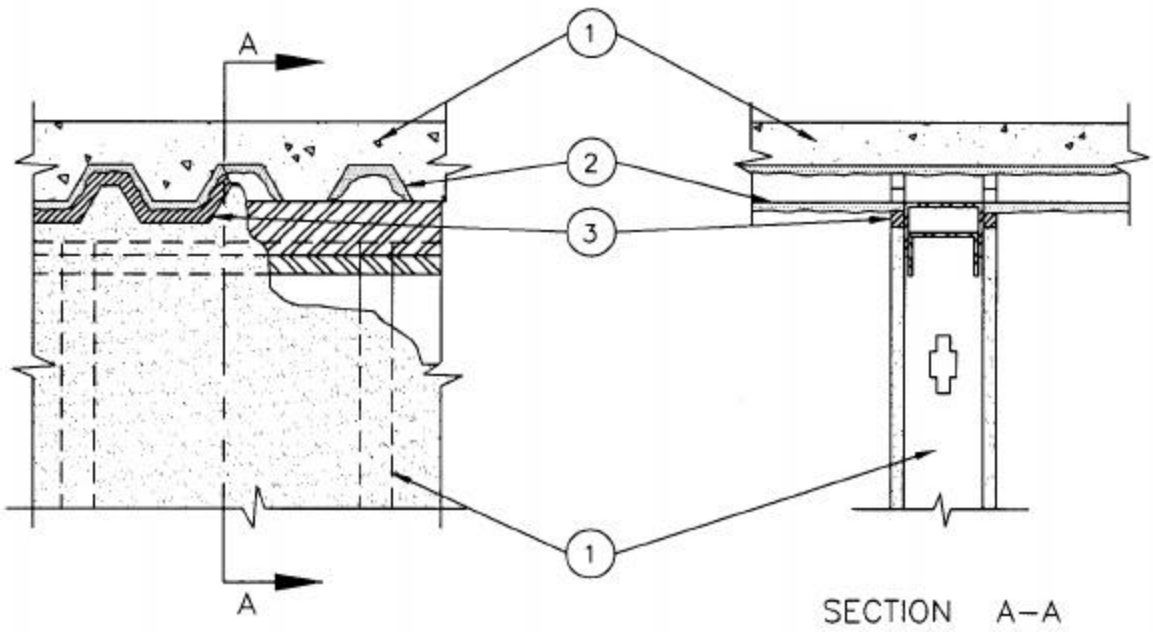
***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PV 60-02

Metal Decking to Vertical Wall Assemblies
Rating: Up to 1 Hour "FTH"
Test Standards: ULC S115-M95
Rating: Up to 1 Hour "F Rating"
Test Standards: ASTM E-814, UL 2079
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Joint System Cycled 500 Times at 10 Cycles Per Minute – 33% Compression or Extension



System Design Instructions

1. **Floor/Ceiling Fire Separation:** 1 or 2 hour ASTM E-119 or CAN/ULC S101 fluted steel deck roof/ceiling or floor/ceiling assemblies.
   Wall Fire Separation: 1 hour ASTM E-119 or ULC S101 metal framed gypsum wallboard (GWB) wall assemblies with a single slip track ceiling runner or a double top track system consisting of a single top track with a deflection channel. Gypsum board cut to profile of coated fluted steel deck with a nominal 3/4 in. (19mm) joint between the top of the gypsum board and the underside of the spray applied fire resistive material. Steel studs to be cut 1/2 to 3/4 in. less than assembly height.
2. **Firestop System Component 1:** Min 3/8 in. to max 15/16 in. thickness of MK-6 spray applied fire resistive material applied to the underside of the floor/ceiling assembly.
3. **Firestop System Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* into the gap between the top of the gypsum wallboard and the spray applied fire resistive material to the full depth of the gypsum board membrane on both sides of the wall assembly.

***WH Labeled Component**

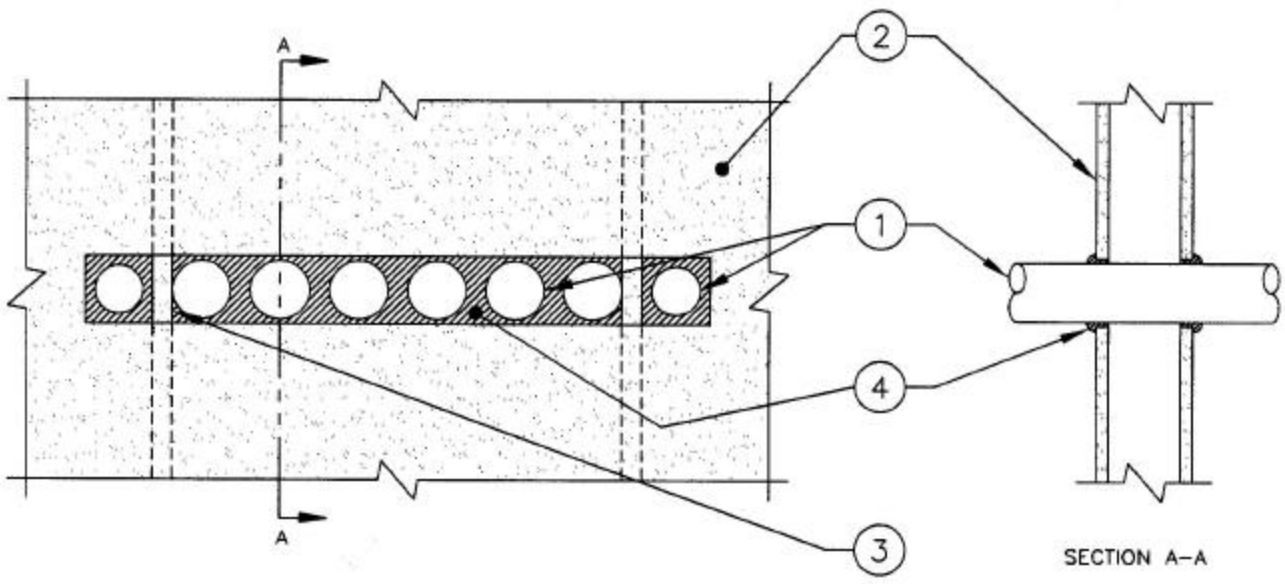
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PV 60-03

Multiple Penetrations
Vertical (wall)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Positive Pressure Differential – 2.5 pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Size Area	Annular Space	ASTM 814/UL1479		ULC S115-M95	
			"F" Rating	"T" Rating	"F" & "FH" Rating	"FT" Rating
Copper Pipe up to 3"	32" x 3-1/2"	0" – 3/4"	60 minutes	20 minutes	60 minutes	20 minutes
Cast Iron Pipe up to 3"	32" x 3-1/2"	0" – 3/4"	60 minutes	20 minutes	60 minutes	20 minutes
Steel Pipe up to 3"	32" x 3-1/2"	0" – 3/4"	60 minutes	20 minutes	60 minutes	20 minutes



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Multiple penetrations, maximum hole size not to exceed table above.
2. **Wall Assembly**: Code conforming 1 hour rated nominal 2 in. by 4 in. metal or wood framed gypsum wallboard (GWB) wall assemblies.
3. **Wall Assembly**: Where studs are exposed through opening a min 5/8 in. thick Type X gypsum wallboard to be fastened to exposed area on both sides of wall.
4. **Firestop System, Component 1**: John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 5/8" (18mm) within the annulus on both surfaces of wall assembly. Between 01/2" (12mm) annulus spaces, a 1/2" (13mm) diameter fillet bead must be placed around the penetrating item.

*WH Labeled Component

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

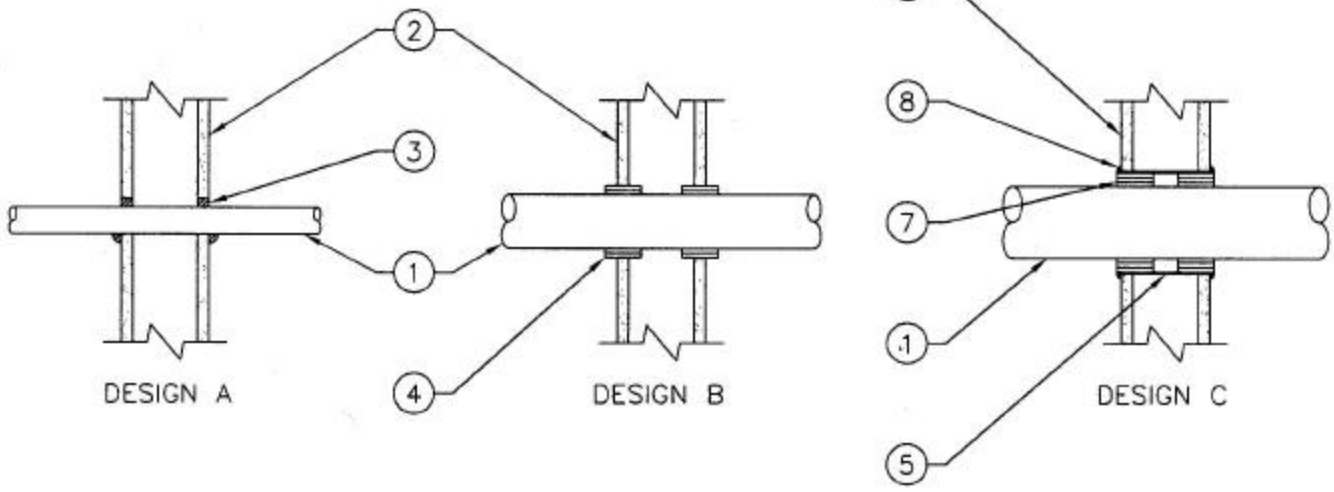
GrabberGard EFC
GrabberGard IFC

Design No.: JWA/PV 60-04

Single Penetrations

Vertical (wall) Assembly
Test Standards: ASTM E-814, UL 1479
CAN/ULC S115-M95: non-metallic open and closed systems
Positive Pressure Differential – 50 Pa (0.2 in. of water) Minimum

Penetration Material & Size	Design Number	Max Hole Size	Annular Space	ASTM E-814 "F"	ASTM E-814 "T"	ULC S115-M95 "F"	ULC S115-M95 "FTH"
ABS up to 1-1/2"	A	2"	0" – 1/2"	1 hour	50 min	1 hour	50 min
ccABS up to 1-1/2"	A	2"	0" – 1/2"	1 hour	50 min	1 hour	50 min
PVC up to 1-1/2"	A	2"	0" – 1/2"	1 hour	1 hour	1 hour	1 hour
ccPVC up to 1-1/2"	A	2"	0" – 1/2"	1 hour	1 hour	1 hour	1 hour
CPVC up to 1-1/2"	A	2"	0" – 1/2"	1 hour	1 hour	1 hour	1 hour
Nonmetallic Rigid Conduit up to 1-1/2"	A	2"	0" – 1/2"	1 hour	1 hour	1 hour	1 hour
ABS up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
ccABS up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
PVC up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
ccPVC up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
CPVC up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
Nonmetallic Rigid Conduit up to 3"	B	4"	1/4"	1 hour	1 hour	1 hour	1 hour
ABS up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour
ccABS up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour
PVC up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour
ccPVC up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour
CPVC up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour
Nonmetallic Rigid Conduit up to 4"	C	5-1/4"	3/8"	1 hour	1 hour	1 hour	1 hour



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above.
2. **Wall Assembly:** 1 hour ASTM E-119 or CAN/ULC S101 metal or wood framed fire rated gypsum wall board (GWB) wall fire assembly.

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

GrabberGard EFC
GrabberGard IFC

JWA/PV 60-04

Design A

3. **Firestop System; Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 5/8 in. (18mm) within the annulus of wall assembly. Between 0-1/4 in. (6mm) annulus spaces, a 1/2 in. (13mm) diameter fillet bead must be placed around the penetrating item.

Design B

4. **Firestop System; Component 2:** PFP Partners – Wrap Strip WS1* Nom 1/8 in. thick intumescent material supplied in 2 in. wide strips. Min two continuous layers of wrap strip to be wrapped around the circumference of the penetrant. Wrap strips are individually wrapped around penetrant with ends butted and held in place with aluminum foil tape. Butted ends of successive layers may be staggered or aligned. Layers of wrap strip to be centered in membrane such that there is the same distance on each side of membrane surface.
5. **Firestop System, Component 3:** (Optional) (Not Shown) John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* min 1/4 in. diam bead of caulk to be applied at wrap strip/wallboard interface on both surfaces of wall.

Design C

6. **Firestop System, Component 4:** Min 20 gauge sheet metal sleeve, outside diam of sleeve to be tightly fitted with inside diam of opening, flush with or extend max 1/2 in. past both surfaces of wall.
7. **Firestop System; Component 5:** PFP Partners – Wrap Strip WS1* Nom 1/8 in. thick intumescent material supplied in 2 in. wide strips. Min three continuous layers of wrap strip to be wrapped around the circumference of the penetrant. Wrap strips are individually wrapped around penetrant with ends butted and held in place with aluminum foil tape. Butted ends of successive layers may be staggered or aligned. Wrap strips to be flush with both ends of sheet metal sleeve.
8. **Firestop System, Component 6:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* min 1/4 in. diam bead of caulk shall be applied at sheet metal sleeve/wallboard interface on both surfaces of wall.

*WH Labeled Component

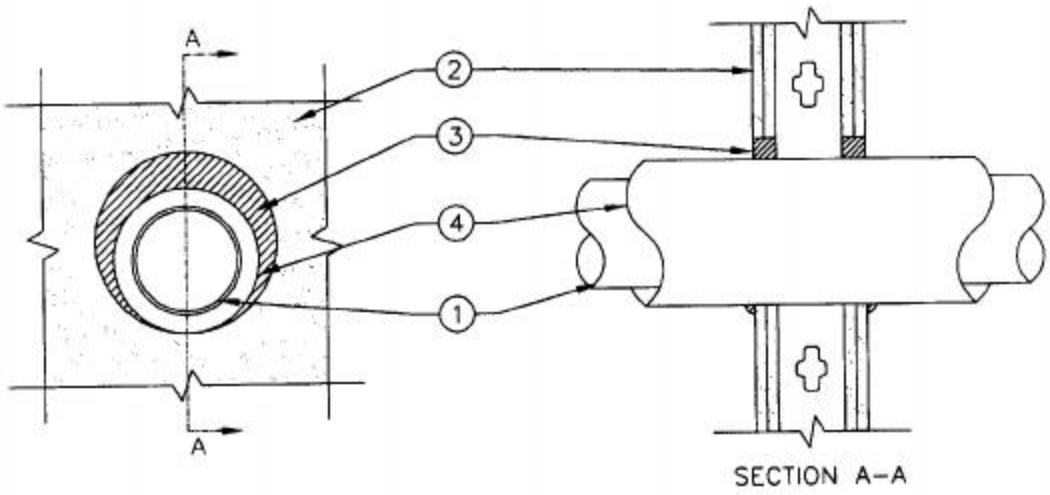
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard IFC

Design No. JWA/PV 120-01

Pipe Insulation Through Penetrations
Single Penetrations Only
Vertical (walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
Steel and Cast Iron Pipe up to 8" Sch 10 & up	11"	0" – 1/2"	2 Hour	2 Hour	2 Hour



SECTION A–A

System Design Instructions

1. **Penetrating Item:** See table above. Single penetrations only.
2. **Wall Assemblies:** 2 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed gypsum wall board (GWB) wall assemblies.
3. **Firestop System:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* fully filling the annular space to the full depth of the membrane. On 0 – 1/4" (6mm) annular spaces, a 3/8" (10mm) diameter fillet bead must be placed around the penetrating item on the surface of the gypsum wall board.
4. **Through Insulating Material:** Koolphen K rigid phenolic foam insulation having a 1" (25mm) wall thickness.

***WH Labeled Component**

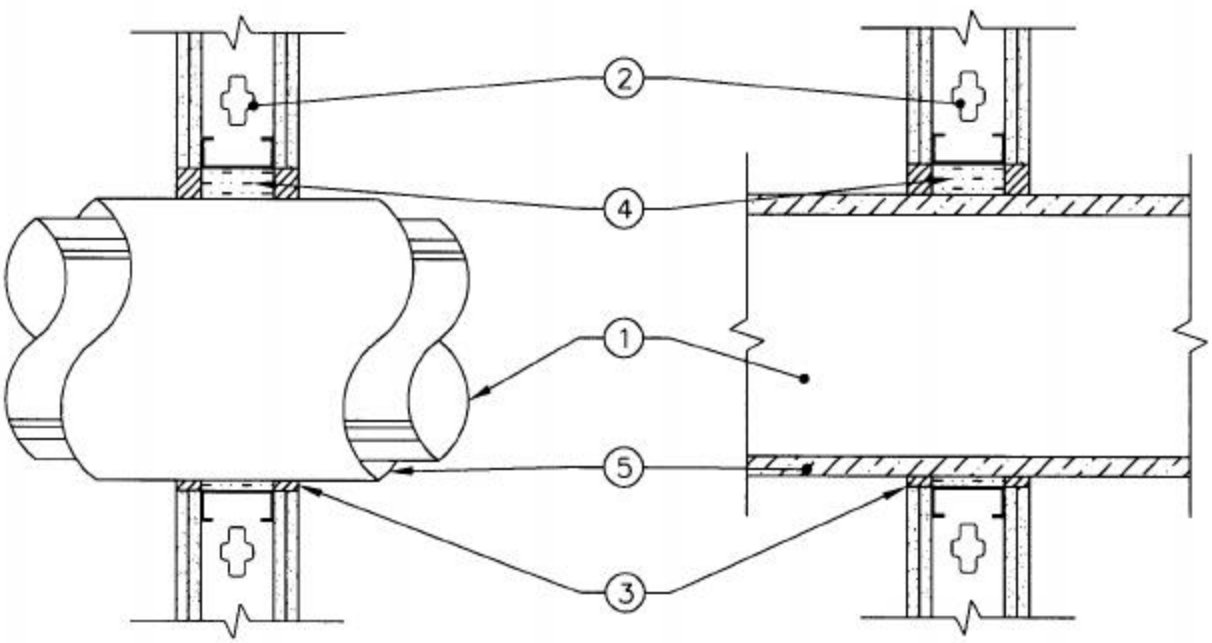
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PV 120-02

Pipe Insulation Through Penetrations
Single Penetrations Only
Vertical (walls)
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
24" x 24" Steel Duct – 16 gauge (or heavier)	27-1/4" x 27-1/4"	1/2" – 3/4"	Up to 2 Hours	Up to 2 Hours	*
16" Steel Duct – 24 gauge (or heavier)	20"	1/2" – 1-1/2"	Up to 2 Hours	Up to 2 Hours	Up to 2 Hours



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only.
   * Temperature rating is 52 min. and 2 hours for 1 hour and 2 hour wall assemblies respectively.
2. **Wall Assemblies:** 1 and 2 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed gypsum wall board (GWB) wall assemblies.
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* fully filling the annular space to the full depth of the gypsum wall board (GWB) on both sides of the fire separation.
4. **Firestop System, Component 2:** Filler material:
   a) Mineral fiber wool insulation with a minimum density of 4-6 pcf firmly packed into the annular space at a minimum depth of 3-5/8" (92mm).
5. **Through Insulating Material:** Fiberglass duct wrap insulation having a 2" (51mm) wall thickness with a minimum density of .75 - 1.5 pcf installed as per manufacturer's installation instructions.

***WH Labeled Component**

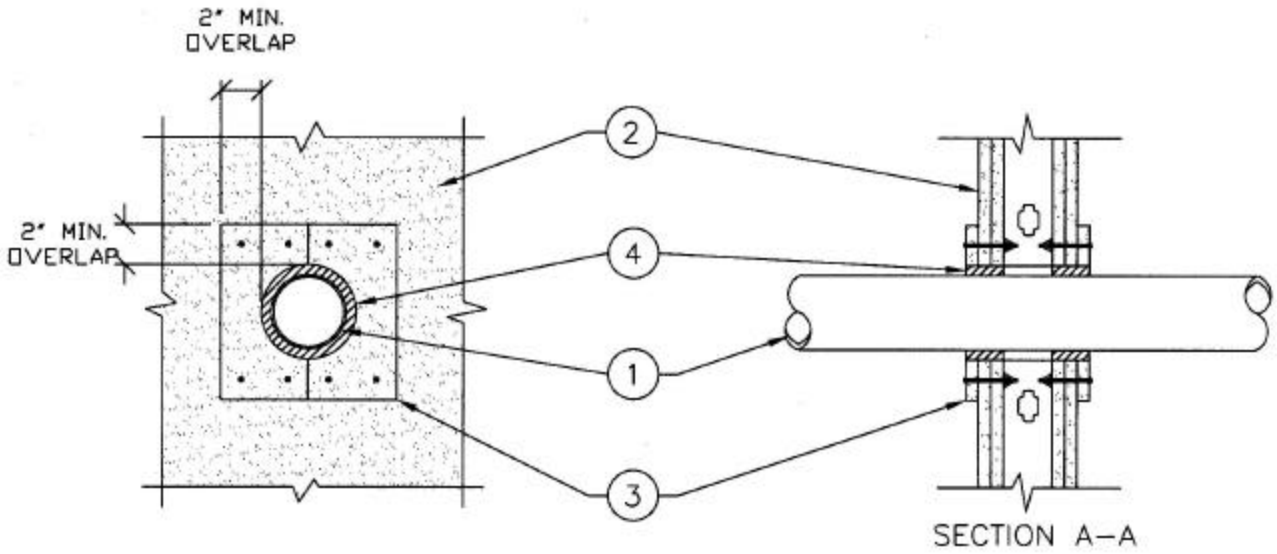
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard IFC

Design No. JWA/PV 120-03

Single Penetrations
Vertical (walls)
Test Standards: ASTM E-814, UL 1479: open and closed system, ULC S115-M95: closed systems
Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	E 814 & "F" Rating	UL 1479 "T" Rating	S115-M95 "F" Rating	Fire/Hose "FH" Rating	Temp Rating "FTH" Rating
PVC Plastic pipe to 2"	3"	1/4"	0 Hr	Up to 40 min	Up to 2 Hr	0 Hr	Up to 40 min
CcPVC Plastic pipe to 2"	3"	1/4"	0 Hr	Up to 40 min	Up to 2 Hr	0 Hr	Up to 40 min
CPVC Plastic pipe to 2"	3-5/8"	1/2"	Up to 2 Hr	Up to 20 min	Up to 2 Hr	Up to 2 Hr	Up to 20 min
CPVC Plastic pipe to 2"	3"	1/4"	0 Hr	Up to 115 min	Up to 2 Hr	0 Hr	Up to 115 min
X-Linked Polyethylene tubing to 1" ID	2-1/2"	1/2"	0 Hr	Up to 70 min	Up to 2 Hr	0 Hr	Up to 70 min
X-Linked Polyethylene tubing to 1" ID	2"	1/2"	Up to 2Hr	Up to 15 min	Up to 2Hr	Up to 2Hr	Up to 15 min



System Design Instructions

1. **Penetrating Item:** Centered in hole, see table above.
2. **Wall Fire Separations:** 2 hour rated ASTM E-119 or CAN/ULC S101 metal or wood framed insulated gypsum wall board (GWB) wall assemblies.
3. **Firestop System; Component 1:** One layer of 5/8" Type "X" gypsum wallboard collar securely fastened to gypsum wallboard with drywall anchors. Caulk a 3/8" (10mm) bead around perimeter edges of GWB collar after installation.
4. **Firestop System; Component 2:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard IFC* fully filling the annular space to the full depth of the membrane.

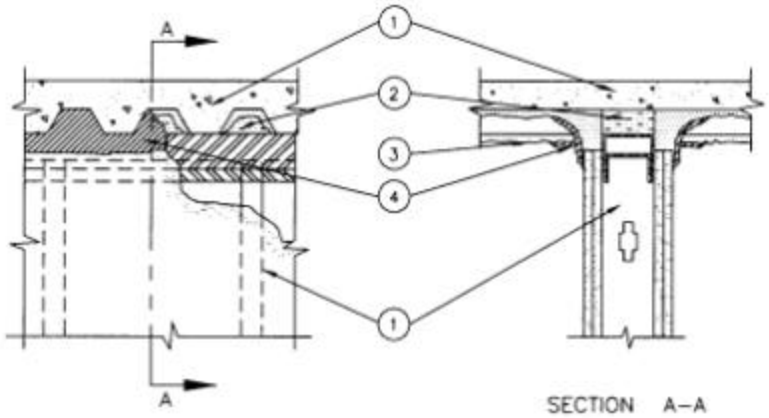
***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

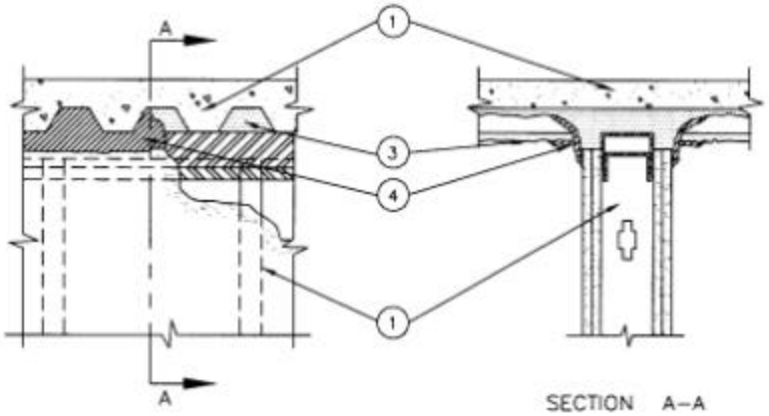
Design No. JWA/PV 120-04

Metal Decking to Vertical Wall Assemblies
Rating: Up to 2 Hours "FTH"
Test Standards: ASTM E-814, UL 2079, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Joint System Cycled 500 Times at 10 Cycles Per Minute – 33% Compression or Extension

Method 1



Method 2



System Design Instructions

1. **Floor/Ceiling Fire Separation:** 1 or 2 hour ASTM E-119 or CAN/ULC S101 fluted steel deck (GWB) roof/ceiling or floor/ceiling assemblies.
   Wall Fire Separation: 1 or 2 hour ASTM E-119 or ULC S101 metal framed gypsum wall board (GWB) wall assemblies with a double top track consisting of a single top track with a deflection channel or slip track.
   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Firestop System, Component 1:**
   Method 1: Filler material, 4 pcf mineral wool or 2.5 pcf fiberglass insulation compressed into each flute opening in the steel deck as a backing material for the Cafco 300.
   Method 2: Filler material, Cafco 300 applied into each flute opening in the steel deck.
3. **Firestop System, Component 2:** Min 3/8" to max 15/16" thickness of Cafco 300 applied to the underside of the floor/ceiling assembly with a 3" diameter radius formed at the steel deck/wall board interface on both sides of the wall assembly.
4. **Firestop System, Component 3:** Spray or brush one heavy coat of John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFS*, 1/8" (3mil) thick, on both sides of the assembly, fully covering all voids and overlapping a minimum of 1" (25mm) onto the metal deck and wall assembly.

***WH Labeled Component**

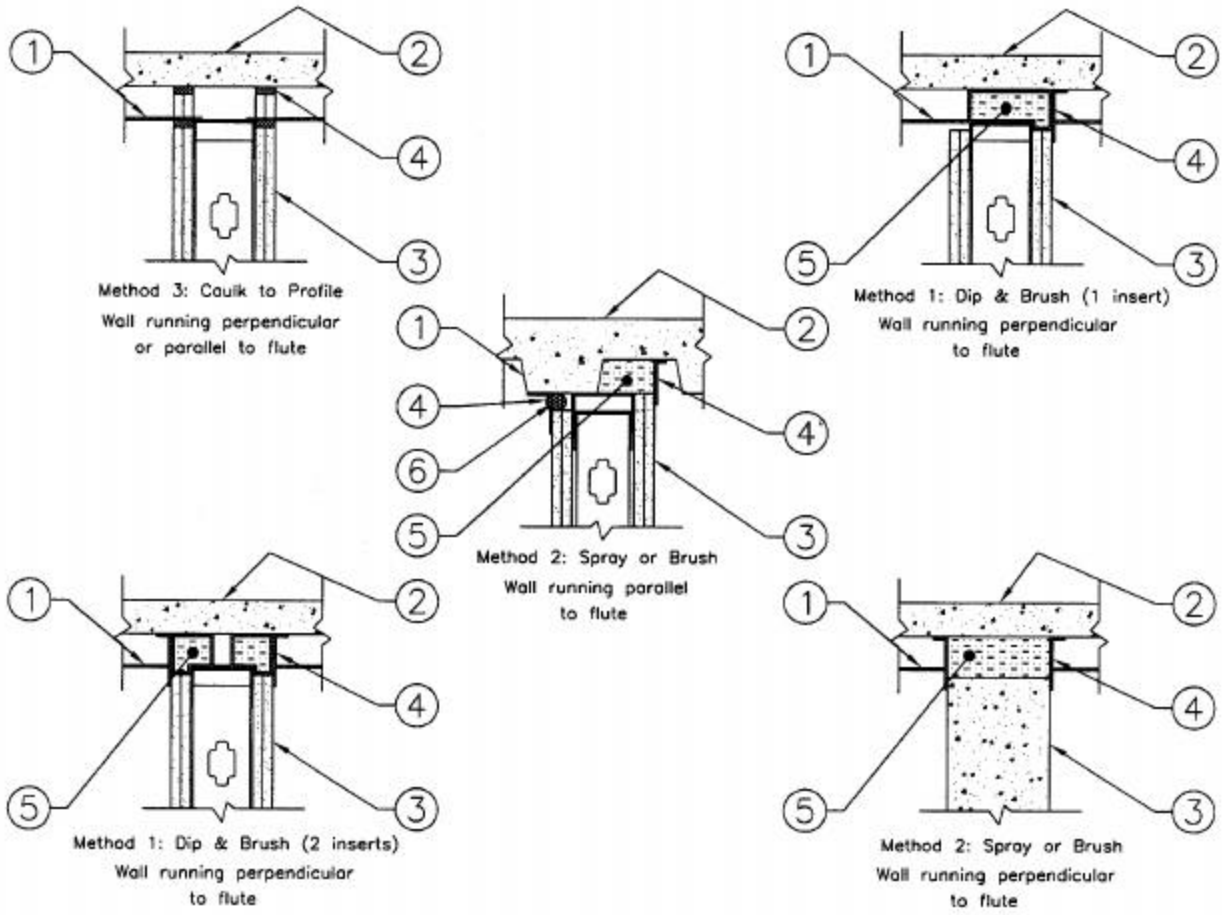
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC
GrabberGard EFS

Design No. JWA/PV 120-05

Metal Decking to Vertical Wall Assemblies

Rating: Up to 2 Hours "FTH"
Test Standards: ASTM E-814, UL 1479, ULC S115-M95
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Max Joint Width – 1in.
Joint System Cycled 500 Times at 10 Cycles Per Minute – 25% Compression or Extension



System Design Instructions

1. **Steel Decking:** Minimum 22 gauge or equal galvanized steel decking with up to 3½" (88mm) flute height firmly supported, with or without concrete cover.
2. **Floor/Ceiling Fire Separations:**
   a) 1 and 2 hour ASTM E-119 or CAN/ULC S101 fluted steel deck roof/ceiling or floor/ceiling assemblies.
3. **Wall Fire Separations Terminating at Fluted Steel Deck:**
   a) 1 and 2 hour ASTM E-119 or CAN/ULC S101 metal or wood framed gypsum wall board (GWB) assemblies or;
   b) Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 4½" (114mm) or;
   c) Cast in place concrete wall assemblies having a minimum cross section thickness of 6" (150mm) or;
   d) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).

4. **Firestop System Component 1:**
   Method 1: Dip & Brush: Dip each insert individually and fully coat in GrabberGard EFS* (firestop mastic), insert into flute opening to the desired depth. Brush exposed surface of insert on both sides smooth overlapping ½" (13mm) onto metal decking and/or the wall assembly to ensure complete coverage and no small gaps or pin holes exist. Brush excess material between flute foot and deflection/slip track to the next open flute cavity, sealing the seam between the steel decking and the deflection/slip track. If larger spaces are evident, fill tightly with mineral wool and brush a 1/16" (60mil) coat of GrabberGard EFS* to fully cover the area.
   Method 2: Spray or Brush: Install each insert at the desired location and spray or brush one heavy coat of GrabberGard EFS* 1/8" (120mil) thick, on both sides of the assembly, fully covering all voids and overlapping a minimum of ½"(13mm) onto the metal deck and wall assembly
   Method 3: Caulk to profile: Cut the gypsum wallboard to the profile of the deck and install to within ¾" of the deck. Caulk GrabberGard EFC* or GrabberGard IFC* into the gap between the gypsum board and the deck to the depth of the gypsum board membrane.
5. **Firestop System Component 2:** Flute Opening: Insert of 4-6 PCF (68kg/m3) mineral wool, cut 10% larger than the opening area. Depth: Cut the mineral wool insert to a depth of 5" (125mm) for the single insert detail, for the two-piece detail cut two 2½" deep inserts. Two-piece details can be installed one on each side of the assembly flush with the membrane surface. Additional pieces of mineral wool batt insulation are to be compressed 33 percent in thickness and are installed to completely fill the gap above the top of the wall and the bottom of the steel floor units, flush with both surfaces of wall. Mineral wool inserts can be installed in any of the configurations detailed in Methods 1 and 2. Exception: when flutes are running parallel with the wall, cut 4-6 PCF (68kg/m3) mineral wool inserts to the desired shape, 10% larger than the opening area and compress into the open cavity. All details require sealant as outlined in Section 3 of this system design.
6. **Firestop System Component 3:** (Optional) – When gaps between top of wall and bottom of the steel deck is less than or equal to 3/4 in. – Nom 1 in. diam polyethylene rod compressed and firmly packed into the nom 3/4 in. gap between the top of the wall and the bottom of the steel deck and forming material (Item 5) in areas of fluted deck. Backer rod compressed to be flush with surface of wall.

***WH Labeled Component**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

GrabberGard EFC
GrabberGard IFC

Design No. JWA/PV 120-06

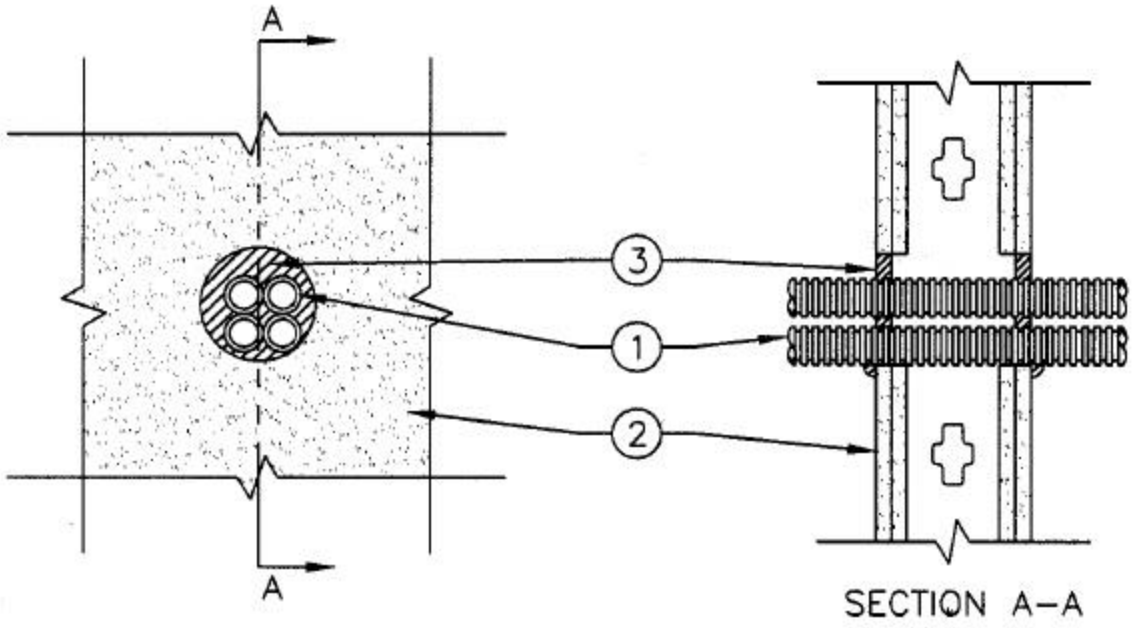
Single and Multiple Penetrations

Vertical (walls)

Test Standards: ASTM E-814, UL 1479: closed systems

Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	"F" Rating	"T" Rating
Up to 1" Diam. Electrical Non-metallic Tubing (PVC) up to 4	4-1/2"	0" – 1"	Up to 2 Hr	75 min



System Design Instructions

1. **Penetrating Item:** Either singly or combination, including all. Centered of offset in hole, see table above. All penetrating items must be reliably supported.

2. **Wall Assemblies:** 2 hour rated ASTM E-119 or CAN/ULC S101 wall assemblies as follows:
   a) metal or wood framed gypsum wall board (GWB) wall assemblies.
   b) cast in place lightweight or normal weight concrete wall assemblies having a minimum cross section thickness of 4-1/2 in.
   c) hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8 in.

3. **Firestop System:** John Wagner & Assoc. Inc. dba GRABBER CONSRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 5/8" within the annulus on both surfaces of wall assembly. Between 0" to 1/4" annular spaces, a 1/2 diameter fillet bead must be placed around the interface between penetrating item and the surface of the wall.

***WH Labeled Component**

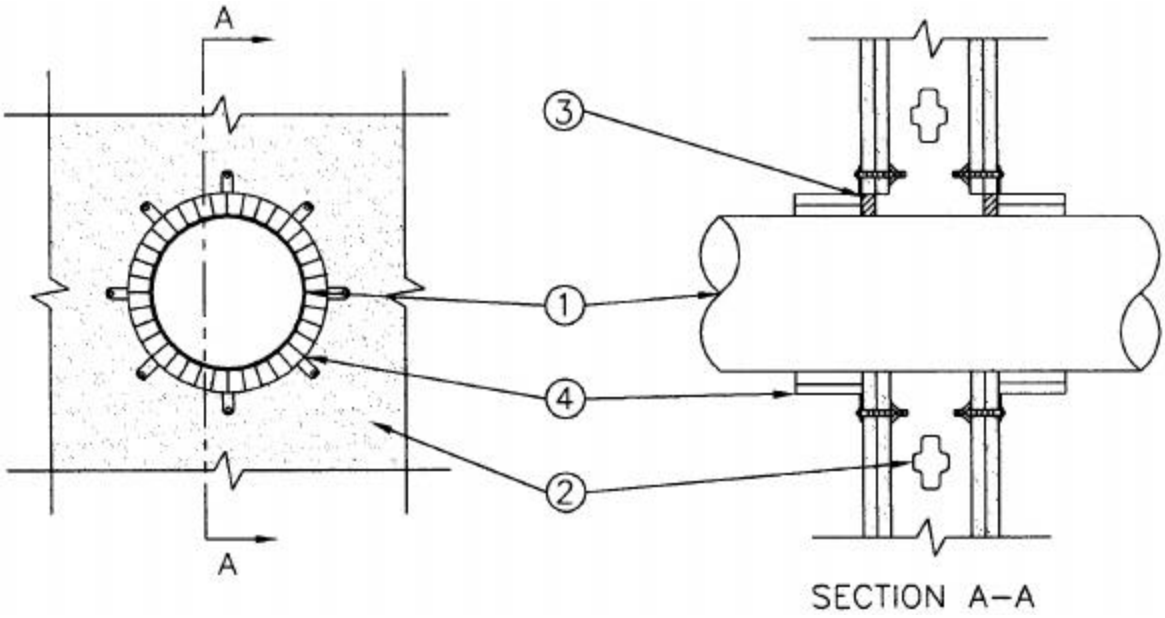
John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA 94520

Design No.: JWA/PV 120-07

Single Penetrations

Vertical (wall)
Test Standards: ASTM E-814, UL 1479: open and closed system,
ULC S115-M95**: closed systems
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum

Penetrating Material & Size	Max Hole Size	Annular Space	Fire "F" Rating	Temp Rating "T" Rating
PVC Plastic Pipe 1-1/2" – 4"	5"	0" – 1/2"	1 & 2 Hr	1 & 2 Hr
ccPVC Plastic Pipe 1-1/2" – 4"	5'	0" – 1/2"	1 & 2 Hr	1 & 2 Hr
CPVC Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	1 & 2 Hr	1 & 2 Hr
ccABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	1 & 2 Hr	38 & 80 Min
ABS Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	1 & 2 Hr	38 & 80 Min
FRPP Plastic Pipe 1-1/2" - 4"	5"	0" – 1/2"	1 & 2 Hr	38 & 80 Min



System Design Instructions

1. **Penetrating Item:** Centered or offset in hole, see table above. Single penetrations only, maximum hole size not to exceed table above. Ratings achieved will not be greater than the rating of the wall assembly.
2. **Wall Assembly:**
   a) 1 & 2 hour ASTME-119 or CAN/ULC S101 metal or wood framed fire rated gypsum wall board (GWB) wall fire assemblies framed with 3½" (88mm) studs or;
   b) Cast in place normal or light density concrete wall having a min cross section thickness of 4 1/2" (112 mm) or;
   c) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm)
3. **Firestop System, Component 1:** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFC* or GrabberGard IFC* installed at a minimum thickness of 5/8" (18mm) within the annulus on both surfaces of wall assembly. On 0 – 1/4" (6mm) annular spaces, a 1/2" (13mm) diameter fillet bead must be placed around the penetrating item.
4. **Firestop System, Component 2:** PFP Partners – Plastic Pipe Collar* (PPC) specifically sized for diameter of pipe. PPC secured to gypsum wall assemblies using 1-1/2" (38 mm) toggle bolts over fender washers, at stud locations use 1-1/2" (38 mm) drywall screws to fasten collar directly to studs. PPC secured to concrete wall assemblies using 1/4"(6 mm) diameter by 1-1/4" (32 mm) long steel masonry anchors over fender washers.

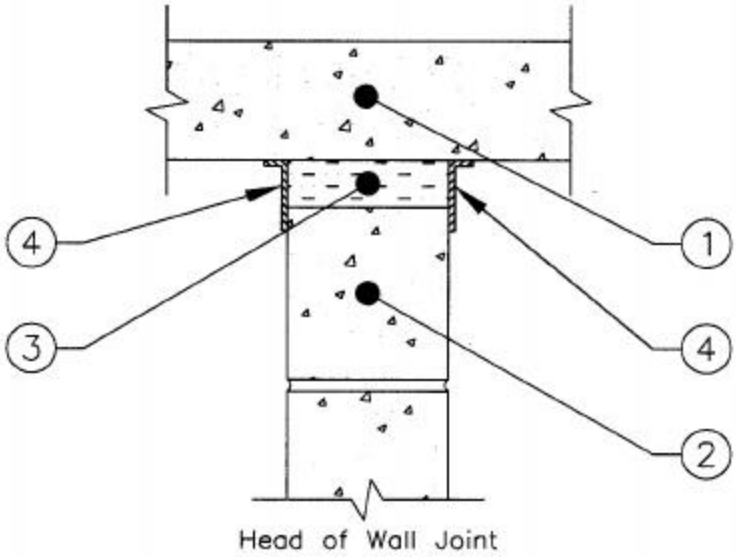
***WH Labeled Component**
****Not tested to 50 Pa pressure differential as required by Canadian code for combustible DWV (Drain, Waste or Vent) piping systems.**

John Wagner & Associates Inc.
dba GRABBER CONSTRUCTION PRODUCTS
205 Mason Circle, Concord, CA, 94520

Design No. JWA/PV 240-01

Concrete Deck to Vertical Wall Assemblies
Test Standards: ASTM E-814, UL 2079, CAN/ULC S115-M95
L-Rating At Ambient < 1 CFM/Lin Ft
L-Rating At 400° F < 1 CFM/Lin Ft
Test Furnace Internal Positive Pressure Differential – 2.5 Pa (0.01 in. of water) Minimum
Max. Joint Movement – 12.5% Compression or Extension

		UL 2079	CAN/ULC S115-M95		
	Max	Assembly	Fire	Fire/Hose	Temp.
Construction Joint	Width	Rating	"F" Rating	"FH" Rating	"FTH" Rating
Horizontal Joints	2"	4 Hrs	4 Hrs	4 Hrs	4 Hrs



Head of Wall Joint

System Design Instructions

1. **Floor/Ceiling Assemblies:** Cast in place normal or light density concrete floor/ceiling assemblies having a minimum cross section thickness of 5" (125 mm)
2. **Wall Assemblies:** ASTM E-119 or CAN/ULC S101 up to 4 hour rated wall assemblies conforming to as follows:
   a) Cast in place concrete wall assemblies having a minimum cross section thickness of 6-3/4" (171mm) or;
   b) Hollow or concrete filled unit masonry (concrete block) wall assemblies laid up with mortar having a minimum cross section thickness of 8" (200mm).
3. **Firestop System – Component 1 –** Filler material mineral rock wool or ceramic fiber insulation with a min density of 4 PCF (64 kg/m3) compressed a minimum of 40% into the joint space flush with both sides of wall assembly.
4. **Firestop System – Component 2 –** John Wagner & Assoc. Inc. dba GRABBER CONSTRUCTION PRODUCTS – GrabberGard EFS* – Minimum dry film thickness 1/16" (1.5mm) sprayed or brushed into place completely covering fillet material and overlapping onto all concrete surface a minimum of 1" (25mm).

***WH Labeled Component**

JWA/JS 120-01

CEJ 600 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

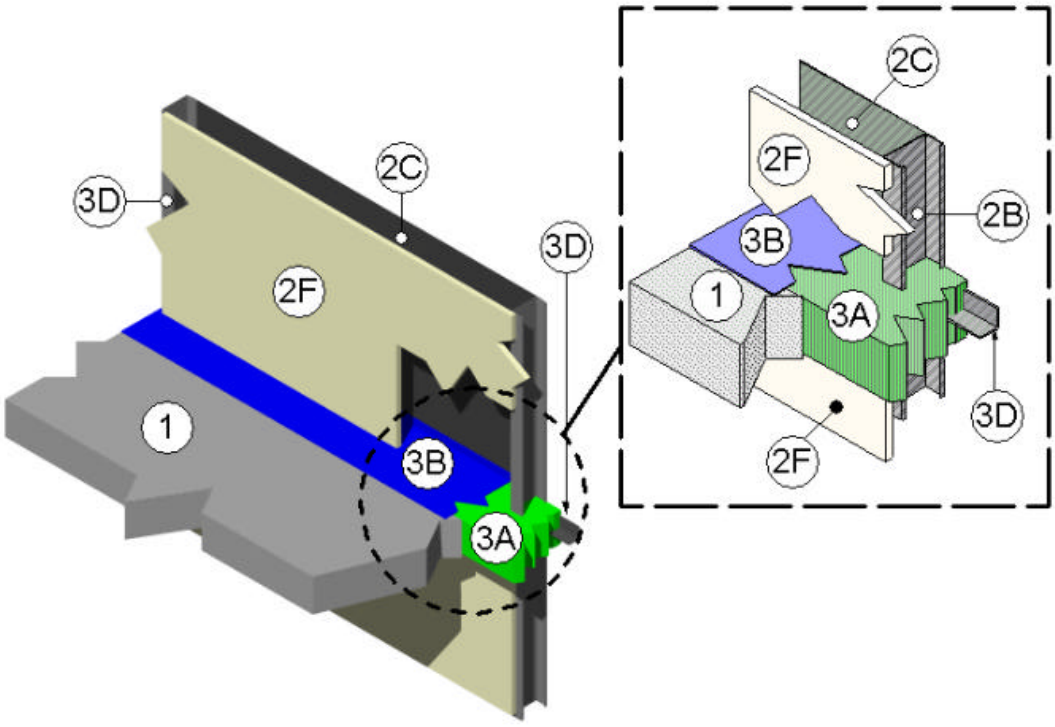
ASTM E 2307-04

T-Rating – 1-1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:

   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-1/4 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing.
   C. Steel Panels: Attach minimum 20 GA sheet steel with maximum dimensions of 48 inches by 144 inches to steel-stud framing (Item 2B) according to the curtain wall system manufacturer's guidelines or using self-tapping 1-inch pan head framing screws, spaced nominally 8 inches on center.
   D. Impaling Pins: (Not Shown – Optional) Install perimeter joint treatment (Item 3) before this material. Use impaling pins with curtain wall insulation (Item 2E). Position, size and install pins according to the curtain wall system manufacturer's guidelines.
   E. Curtain Wall Insulation: (Not Shown – Optional) Install perimeter joint treatment (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use mineral wool or fiberglass batt insulation. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation.
   F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 5/8 inch thick, Type X gypsum board. Fasten gypsum board to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center.
      i. Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F).
      ii. Create a minimum 3-5/8 inch cavity between unexposed side of gypsum wallboard (Item 2F) to unexposed side of steel panel (Item 2C).

3. PERIMETER JOINT TREATMENT – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint treatment incorporates the following construction features:

   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly

compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant

MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the steel panels (Item 2C) and steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

JWA/JS 120-02

CEJ 601 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

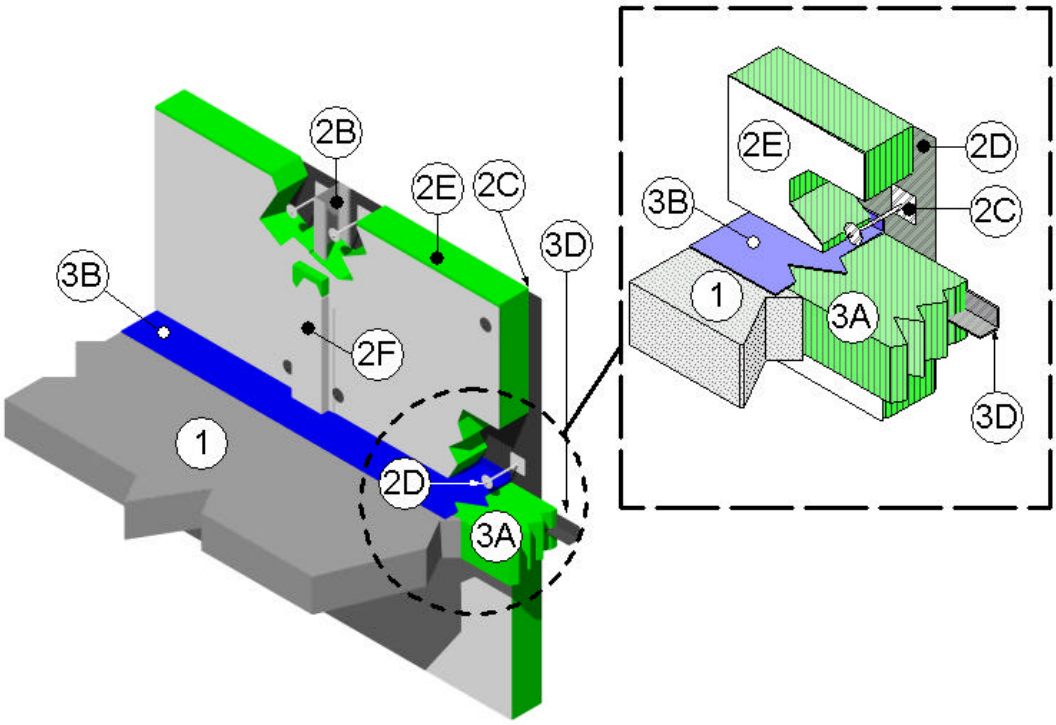
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:

   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-1/4 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing.

   C. Steel Panels: Attach minimum 20 GA sheet steel with maximum dimensions of 48 inches by 144 inches to steel-stud framing (Item 2B) according to the curtain wall system manufacturer's guidelines or using self-tapping 1-inch pan head framing screws, spaced nominally 8 inches on center.

   D. Impaling Pins: Install perimeter joint protection (Item 3) before this material. Option to steel angle (Item 2Ei), use impaling pins with curtain wall insulation (Item 2E). Position, size and install pins according to the curtain wall system manufacturer's guidelines or be a minimum 4-1/2 inches long, 12 GA steel pin, attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to steel panel (Item 2C) using a stud gun. Space pins a maximum of 12 inches on center and installed around the periphery (minimum). Install the interior face of the curtain wall insulation (Item 2E) flush with the interior face of the steel-stud framing (Item 2C) and steel panels (Item 2D).

   E. Curtain Wall Insulation: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation. Use a nominal 4 inch thick 4 pcf or nominal 2 inch thick 8 pcf mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior.

      i. Attach a minimum 16 GA 2 x 2 inch steel angle around the entire perimeter of each piece of curtain wall insulation. Attach the vertical 16 GA 2 x 2 inch steel angles to the mullions with screws spaced a maximum 8 inches on center.

      ii. At the horizontal butt joints of the curtain wall insulation in the field of the steel panels (Item 2C), Place the horizontal angles back to back to form a "T". Locate all horizontal seams in the curtain wall insulation a minimum 6 inches from the top surface of the perimeter joint protection (Item 3).

      iii. Fit curtain wall insulation tightly between vertical and horizontal angles and secure with screws placed a maximum 8 inches on center. Install the curtain wall insulation flush with the interior face of the steel-stud framing (Item 2B). Install the minimum 24-inch wide curtain wall insulation without vertical seams. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with curtain wall insulation. Seal all meeting edges of curtain wall insulation with nominal 4-inch wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 inches of tape covers each edge of the adjacent curtain wall insulation. Do not deform the

perimeter joint protection (Item 3) during or after installation of curtain wall insulation.

F. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint treatment. Butt framing covers to the top and bottom surfaces of the perimeter joint treatment.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

   B. CERTIFIED MANUFACTURER: Grabber Construction Products

      CERTIFIED PRODUCT: Sealant

      MODEL: Grabbergard EFS

      Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

   C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
   D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the steel panels (Item 2C) and steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

JWA/JS 120-03
CEJ 602 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

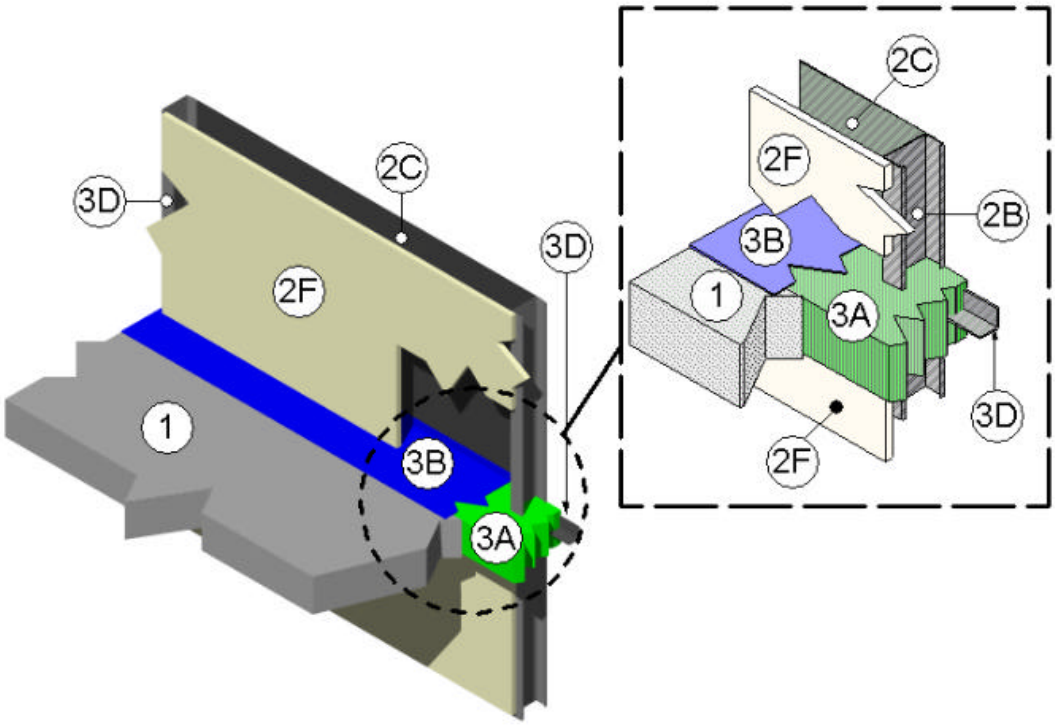
ASTM E 2307-04

T-Rating – 1-1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-1/4 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing.
   C. Steel Panels: Attach minimum 20 GA sheet steel with maximum dimensions of 48 inches by 144 inches to steel-stud framing (Item 2B) according to the curtain wall system manufacturer's guidelines or using self-tapping 1-inch pan head framing screws, spaced nominally 8 inches on center.
   D. Impaling Pins: (Not Shown – Optional) Install perimeter joint treatment (Item 3) before this material. Use impaling pins with curtain wall insulation (Item 2E). Position, size and install pins according to the curtain wall system manufacturer's guidelines.

   E. CERTIFIED MANUFACTURER:
   Rock Wool Manufacturing Company

   CERTIFIED PRODUCT: Insulation Mineral Wool
   MODEL: DELTA® Mineral Wool Curtain Wall Insulation

   Curtain Wall Insulation: (Not Shown – Optional) Install perimeter joint treatment (Item 3) before this material. Use mineral wool or fiberglass batt insulation. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation.

   F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 5/8 inch thick, Type X gypsum board. Fasten gypsum board to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center.
      i. Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F).
      ii. Create a minimum 3-5/8 inch cavity between unexposed side of gypsum wallboard (Item 2F) to unexposed side of steel panel (Item 2C).

3. PERIMETER JOINT TREATMENT – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint treatment incorporates the following construction features:
   A. Packing Material – Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

   B. CERTIFIED MANUFACTURER:

Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the steel panels (Item 2C) and steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

JWA/JS 120-04
CEJ 603 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

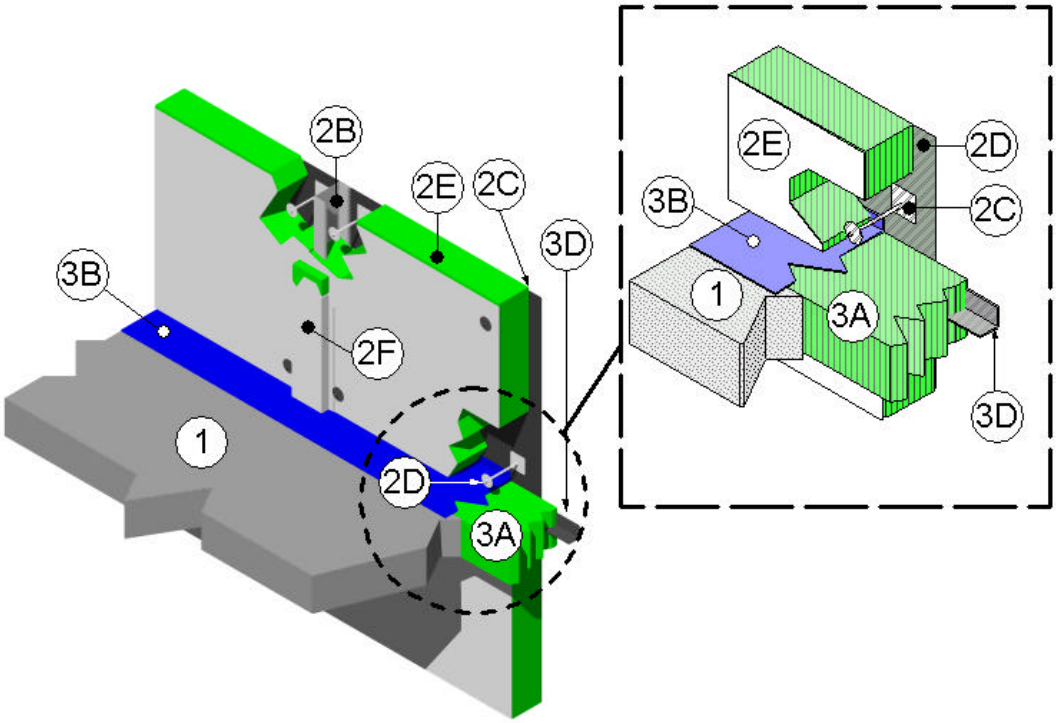
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-1/4 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing.
   C. Steel Panels: Attach minimum 20 GA sheet steel with maximum dimensions of 48 inches by 144 inches to steel-stud framing (Item 2B) according to the curtain wall system manufacturer's guidelines or using self-tapping 1-inch pan head framing screws, spaced nominally 8 inches on center.
   D. Impaling Pins: Install perimeter joint protection (Item 3) before this material. Option to steel angle (Item 2i), use impaling pins with curtain wall insulation (Item 2E). Position, size and install pins according to the curtain wall system manufacturer's guidelines or be a minimum 4-1/2 inches long, 12 GA steel pin, attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to steel panel (Item 2D) using a stud gun. Space pins a maximum of 12 inches on center and installed around the periphery (minimum). Install the interior face of the curtain wall insulation (Item 2E) flush with the interior face of the steel-stud framing (Item 2C) and steel panels (Item 2D).
   E. CERTIFIED MANUFACTURER:
   Rock Wool Manufacturing Company

   CERTIFIED PRODUCT: Insulation Mineral Wool
   MODEL: DELTA® Mineral Wool Curtain Wall Insulation

   Curtain Wall Insulation: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation. Use a nominal 4 inch thick 4 pcf or nominal 2 inch thick 8 pcf mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior.
      i. Attach a minimum 16 GA 2 x 2 inch steel angle around the entire perimeter of each piece of curtain wall insulation. Attach the vertical 16 GA 2 x 2 inch steel angles to the mullions with screws spaced a maximum 8 inches on center.
      ii. At the horizontal butt joints of the curtain wall insulation in the field of the steel panels (Item 2C), Place the horizontal angles back to back to form a "T". Locate all horizontal seams in the curtain wall insulation a minimum 6 inches from the top surface of the perimeter joint protection (Item 3).
      iii. Fit curtain wall insulation tightly between vertical and horizontal angles and secure with screws placed a maximum 8 inches on center. Install the curtain wall

insulation flush with the interior face of the steel-stud framing (Item 2B). Install the minimum 24-inch wide curtain wall insulation without vertical seams. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with curtain wall insulation. Seal all meeting edges of curtain wall insulation with nominal 4-inch wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 inches of tape covers each edge of the adjacent curtain wall insulation. Do not deform the perimeter joint protection (Item 3) during or after installation of curtain wall insulation.

F. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint treatment. Butt framing covers to the top and bottom surfaces of the perimeter joint treatment.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high

with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the steel panels (Item 2C) and steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

JWA/JS 120-05
CEJ 604 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

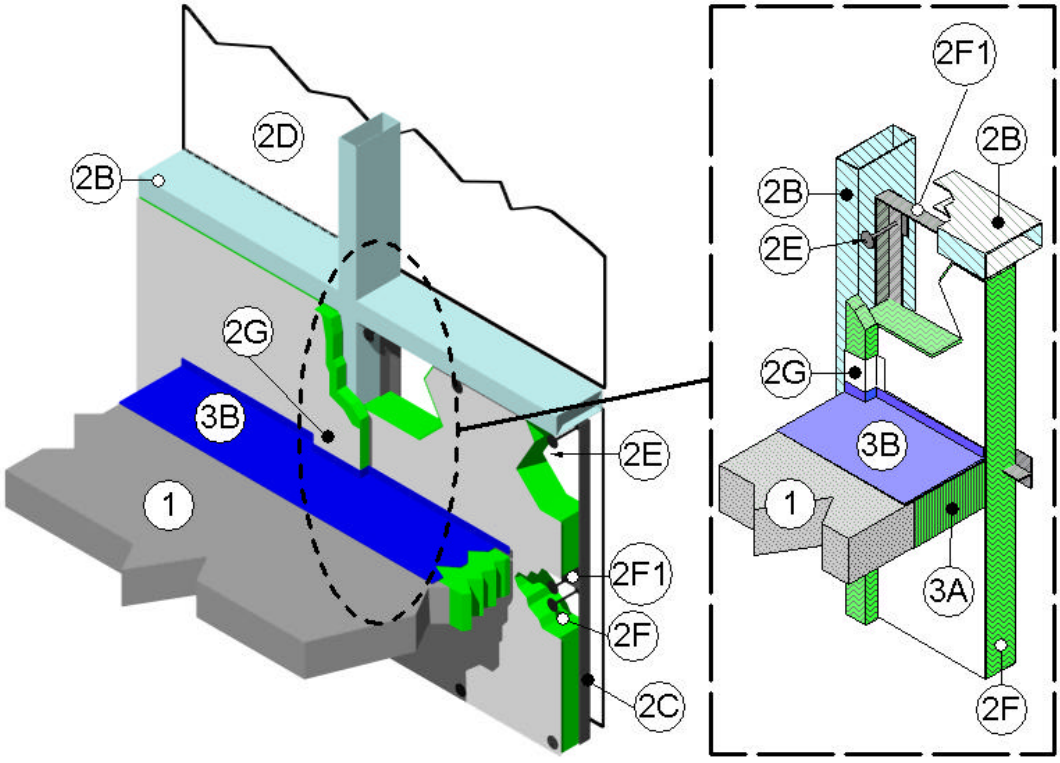
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Aluminum Framing: Erect vertical and horizontal framing mullions and transoms using extruded rectangular aluminum tubing with minimum 0.100 inch thick walls, a min. 5-1/4 inch height and a minimum of 2-1/2 inch width of the extrusion. Larger rectangular aluminum tubing mullions and transoms, sized according to the curtain wall system manufacturer's guidelines are acceptable. Space mullions a minimum 60 inches on center. and transoms a minimum 72 inches on center. Locate transoms at a height of 33 inches above the top surface of the concrete floor assembly (as measured from the bottom of the transom).
   C. Glass Spandrel Panels: Install glass spandrel panels according to curtain wall framing and the curtain wall system manufacturer's guidelines. Use a minimum 1/4 inch thick, tempered glass with a maximum width of 59 inches and height of 71 inches. Secure glass spandrel panels with a thermal break (thermoset rubber extrusion), pressure bar (aluminum extrusion), 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion). Insulate the glass spandrel panels shall be insulated according to Item 2F.
   D. Glass Vision Panels: Position glass vision panels at least 35-1/2 inches above the top surface of the floor assembly. Install according to curtain wall framing and the curtain wall system manufacturer's guidelines. Use a minimum 1/4 inch thick, clear tempered glass with a maximum width of 59 inches and height of 71 inches. Secure glass spandrel panels with a thermal break (thermoset rubber extrusion), pressure bar (aluminum extrusion), 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion). Insulate the glass spandrel panels shall be insulated according to Item 2F.
   E. Impaling Pins: When pins are used instead of screws to secure curtain wall insulation (Item 2F), position them in the same manner as the screws in Item 2F, sized and installed according to the curtain wall system manufacturer's guidelines, or be a min. 4 1/2 inch long, 12 GA steel pin attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to the framing using a stud gun. Space pins a maximum of 12 inches on center and install around the curtain wall insulation (Item 2F) periphery so that the interior face of the curtain wall insulation is flush with the interior face of the framing.
   F. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Insulate all spandrel panels using a minimum 2 inch thick, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder), which is exposed to the room interior.
      1 Fit curtain wall insulation tightly between vertical framing members, secured with screws placed a maximum 8 inches on center attached to a minimum 16 GA angle around the entire perimeter of each piece of curtain wall insulation (batt). Attach the vertical 16 GA angles to the mullions with screws. At the horizontal butt joints of the curtain wall insulation in the field of the glass spandrel panels

(Item 2C), place the horizontal angles back-to-back to form a "T", which is located at the horizontal centerline of the perimeter joint protection (Item 3). Locate all other horizontal seams in the curtain wall insulation at least 6 inches from the top surface of the perimeter joint protection (Item 3). Position the interior face of the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Create a minimum 2-inch air space between the glass spandrel panels and the curtain wall insulation. Install the 36-inch wide curtain wall insulation (batts) without vertical seams, spanning the full distance between the vertical and horizontal aluminum framing, which create the spandrel panel area.

G. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint protection. Butt framing covers to the top and bottom surfaces of the perimeter joint protection. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-06
CEJ 605 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

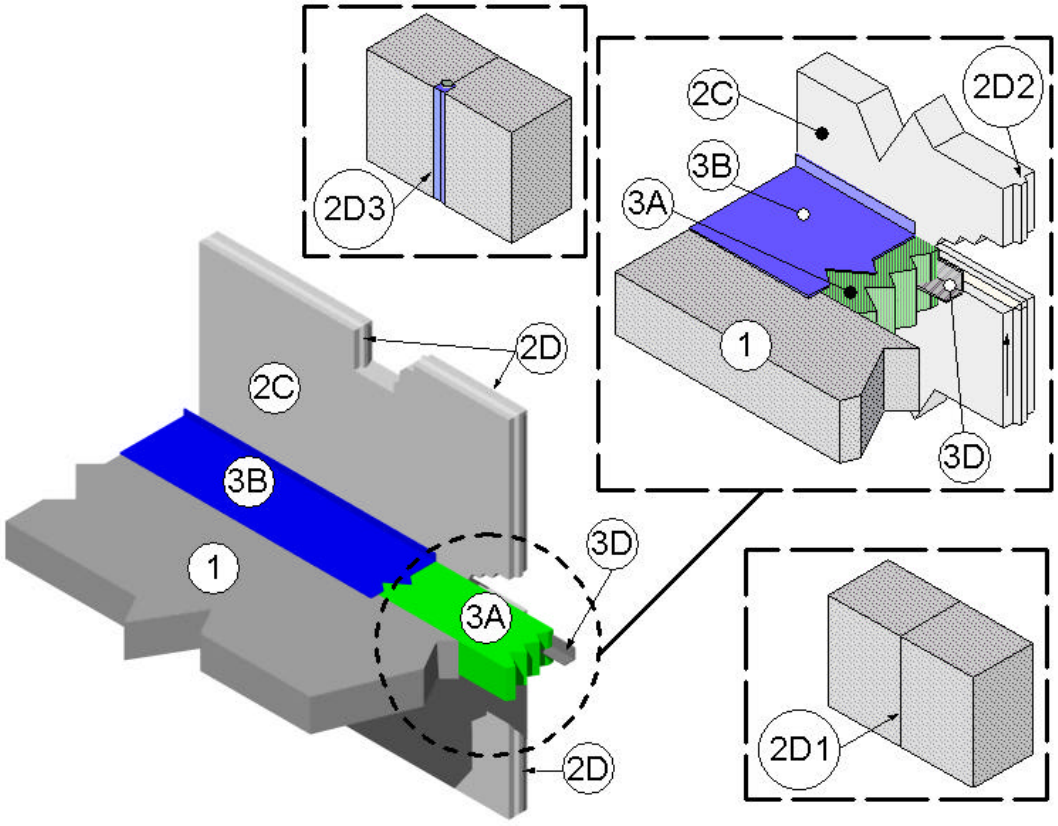
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Structural Framing: (Not shown) Provide structural framing members according to the curtain wall system manufacturer's requirements. Aluminum structural framing must be completely covered by concrete panels.
   C. Tilt-up Panels: Tilt-up concrete wall panels, minimum 2-1/2 inches thick, reinforced lightweight or normal weight (100 – 150 pcf). Install tilt-up panels to structural framing (Item 2B) according to the curtain wall system manufacturer's requirements.
   D. Tilt-up Panel Joints: Use either flush type (butt joint) (Item 2D1) or key way type (tongue and groove) (Item 2D2) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2D3).
   E. Impaling Pins: (Not Shown – Optional) When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.
   F. Curtain Wall Insulation: (Not Shown – Optional) Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of curtain wall insulation. Use either mineral wool or fiberglass insulation batts.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.
   B. CERTIFIED MANUFACTURER:
      Grabber Construction Products

      CERTIFIED PRODUCT: Sealant
      MODEL: Grabbergard EFS

      Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-07
CEJ 606 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

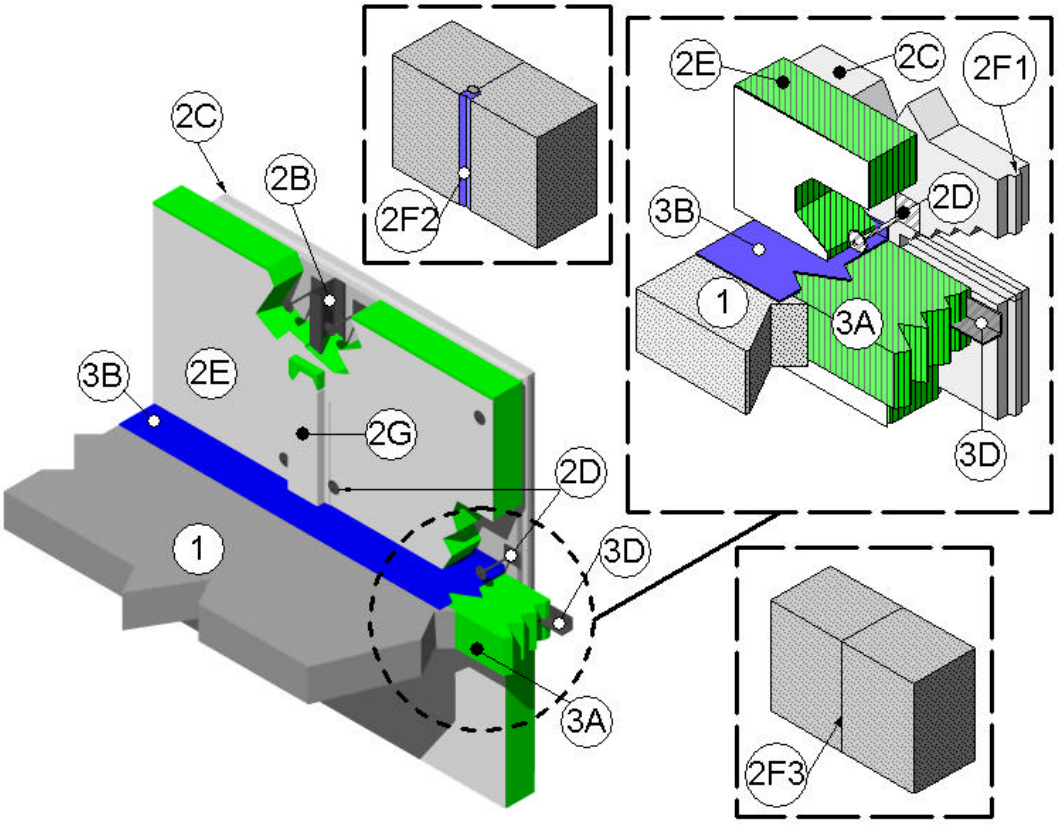
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-1/4 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 60 inch on center vertical framing spacing.
   C. Concrete Panels: Concrete wall panels, minimum 2-1/2 inches thick, 12 inches wide and 12 inches high, reinforced lightweight or normal weight (100 – 150 pcf). Install panels to structural framing (Item 2B) according to the curtain wall system manufacturer's requirements.
   D. Impaling Pins: (Optional) When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.
   E. Curtain Wall Insulation: (Optional) Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of curtain wall insulation. Use either mineral wool or fiberglass insulation batts.
   F. Concrete Panel Joints: Use either flush type (butt joint) (Item 2F3) or key way type (tongue and groove) (Item 2F1) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2F2).
   G. Framing Covers: (Optional) Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint protection. Butt framing covers to the top and bottom surfaces of the perimeter joint protection. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-08
CEJ 607 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

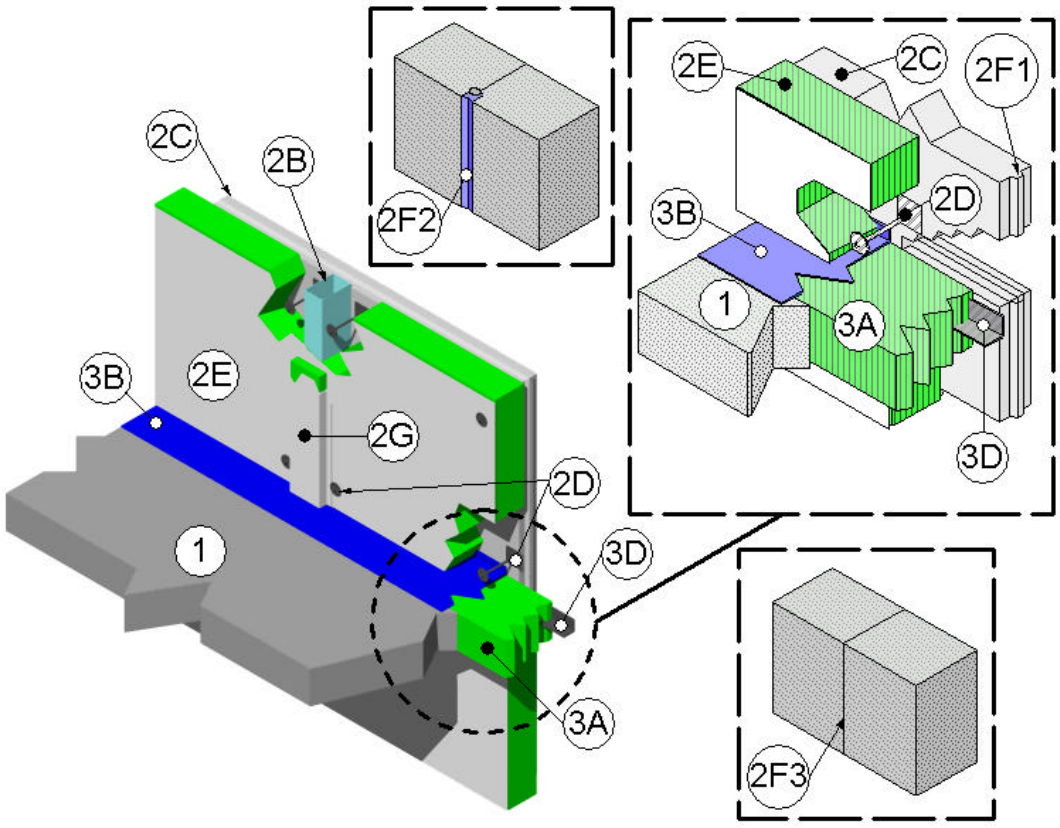
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Aluminum Framing: Erect vertical and horizontal mullions and transoms using extruded rectangular aluminum tubing with minimum 0.100 inch thick walls, a minimum 4 inches height and a minimum of 21/2 inch width of the extrusion. Larger rectangular aluminum tubing mullions and transoms, sized and attached according to the curtain wall system manufacturer's guidelines are acceptable. Space mullions a minimum 60 inches on center and completely cover mullions by the concrete panels (Item 2C). When required, install horizontal framing members according to the curtain wall system manufacturer's guidelines and completely cover transoms by the concrete panels (Item 2C).
   C. Concrete Panels: Concrete wall panels, minimum 2-1/2 inches thick, 12 inches wide and 12 inches high, reinforced lightweight or normal weight (100 – 150 pcf). Install panels to structural framing (Item 2B) according to the curtain wall system manufacturer's requirements.
   D. Impaling Pins: When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.
   E. Curtain Wall Insulation: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation. Use a nominal 4 inch thick 4 pcf or nominal 2 inch thick 8 pcf mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Locate a support angle (Item 3D) at the horizontal centerline of the perimeter joint protection (Item 3), which is installed between the concrete floor assembly (Item 1) and the concrete panels (Item 2C). Butt the curtain wall insulation to each side of the support angle (Item 3D). Set all other horizontal seams in the curtain wall insulation a minimum 6 inches from the top surface of the perimeter joint protection. Fit batts tightly between aluminum framing (Item 2B) and secure with screws placed a maximum 8 inches on center. Install the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Install the minimum 24-inch wide curtain wall insulation (batts) without vertical seams. Fill the spandrel panel area completely. Seal all meeting edges of curtain wall insulation (batts) with nominal 4-inch wide pressure sensitive aluminum foil faced tape centered over the junction so that approx. 2 inches of tape covers each edge of the adjacent curtain wall insulation (batt).
   F. Concrete Panel Joints: Use either flush type (butt joint) (Item 2F3) or key way type (tongue and groove) (Item 2F1) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2F2).
   G. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the

perimeter joint treatment (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint treatment. Butt framing covers to the top and bottom surfaces of the perimeter joint treatment. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.
   B. CERTIFIED MANUFACTURER: Grabber Construction Products

      CERTIFIED PRODUCT: Sealant
      MODEL: Grabbergard EFS

      Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.
   C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
   D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-09
CEJ 608 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

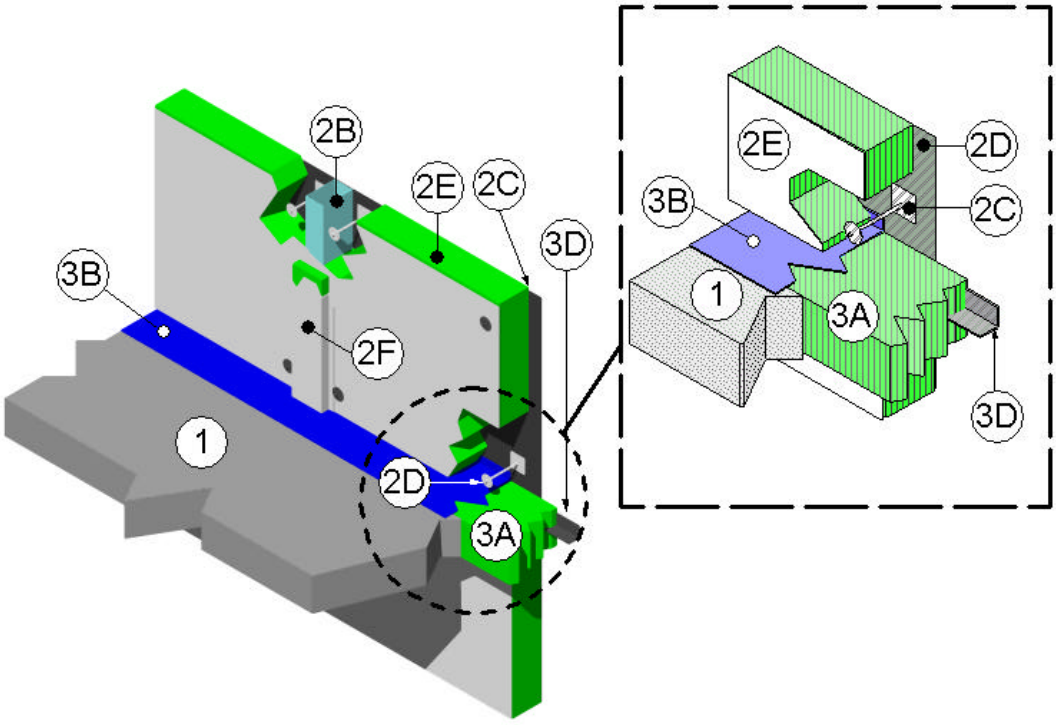
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Aluminum Framing: Erect vertical and horizontal mullions and transoms using extruded rectangular aluminum tubing with minimum 0.100 inch thick walls, a minimum 6-1/2 inches height and a minimum of 2-1/2 inch width of the extrusion. Larger rectangular aluminum tubing mullions and transoms, sized and attached according to the curtain wall system manufacturer's guidelines are acceptable. Space mullions a minimum 60 inches on center and transoms a minimum 72 in. on center. Transoms are to be located at a height of 33 in. above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.

C. Steel Panels: Install steel panels to aluminum framing (Item 2B) according to the curtain wall system manufacturer's guidelines. Use a minimum 20 GA sheet steel panel with maximum dimensions of 60 by 72 inches.

D. Impaling Pins: When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.

E. Curtain Wall Insulation: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation. Use a nominal 4 inch thick 4 pcf or nominal 2 inch thick 8 pcf mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Locate a support angle (Item 3D) at the horizontal centerline of the perimeter joint protection (Item 3), which is installed between the concrete floor assembly (Item 1) and the concrete panels (Item 2C). As the curtain wall insulation does not pass through joint treatment. Set all other horizontal seams in the curtain wall insulation a minimum 6 inches from the top surface of the perimeter joint protection. Fit batts tightly between aluminum framing (Item 2B) and secure with screws placed a maximum 8 inches on center. Install the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Install the minimum 24-inch wide curtain wall insulation (batts) without vertical seams. Fill the spandrel panel area completely. Seal all meeting edges of curtain wall insulation (batts) with nominal 4-inch wide pressure sensitive aluminum foil faced tape centered over the junction so that approx. 2 inches of tape covers each edge of the adjacent curtain wall insulation (batt).

F. Concrete Panel Joints: Use either flush type (butt joint) (Item 2F3) or key way type (tongue and groove) (Item 2F1) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2F2).

G. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over

each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint treatment. Butt framing covers to the top and bottom surfaces of the perimeter joint treatment. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

   B. CERTIFIED MANUFACTURER:
   Grabber Construction Products

   CERTIFIED PRODUCT: Sealant
   MODEL: Grabbergard EFS

   Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

   C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
   D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-10
CEJ 609 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

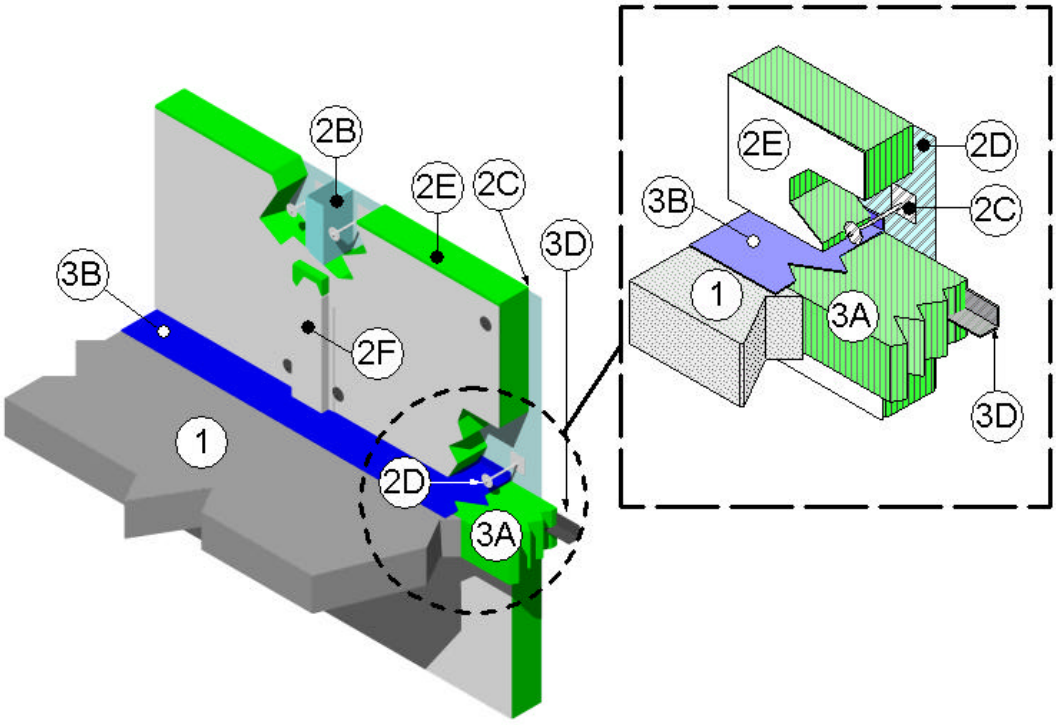
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Aluminum Framing: Erect vertical and horizontal mullions and transoms using extruded rectangular aluminum tubing with minimum 0.100 inch thick walls, a minimum 6-1/2 inches height and a minimum of 2-1/2 inch width of the extrusion. Larger rectangular aluminum tubing mullions and transoms, sized and attached according to the curtain wall system manufacturer's guidelines are acceptable. Space mullions a minimum 60 inches on center and transoms a minimum 72 in. on center. Transoms are to be located at a height of 33 in. above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.

C. Aluminum Panels: Install aluminum panels to aluminum framing (Item 2B) according to the curtain wall system manufacturer's guidelines. Use a minimum 1/8-inch thick aluminum sheet panel with maximum dimensions of 60 by 72 inches.

D. Impaling Pins: When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.

E. Curtain Wall Insulation: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of curtain wall insulation. Use a nominal 4 inch thick 4 pcf or nominal 2 inch thick 8 pcf mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Locate a support angle (Item 3D) at the horizontal centerline of the perimeter joint protection (Item 3), which is installed between the concrete floor assembly (Item 1) and the aluminum panels (Item 2C). As the curtain wall insulation does not pass through joint treatment. Set all other horizontal seams in the curtain wall insulation a minimum 6 inches from the top surface of the perimeter joint protection. Fit batts tightly between aluminum framing (Item 2B) and secure with screws placed a maximum 8 inches on center. Install the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Install the minimum 24-inch wide curtain wall insulation (batts) without vertical seams. Fill the spandrel panel area completely. Seal all meeting edges of curtain wall insulation (batts) with nominal 4-inch wide pressure sensitive aluminum foil faced tape centered over the junction so that approx. 2 inches of tape covers each edge of the adjacent curtain wall insulation (batt).

F. Concrete Panel Joints: Use either flush type (butt joint) (Item 2F3) or key way type (tongue and groove) (Item 2F1) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2F2).

G. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint treatment (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over

each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint treatment. Butt framing covers to the top and bottom surfaces of the perimeter joint treatment. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.
   B. CERTIFIED MANUFACTURER:
   Grabber Construction Products

   CERTIFIED PRODUCT: Sealant
   MODEL: Grabbergard EFS

   Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

   C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
   D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-11
CEJ 610 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

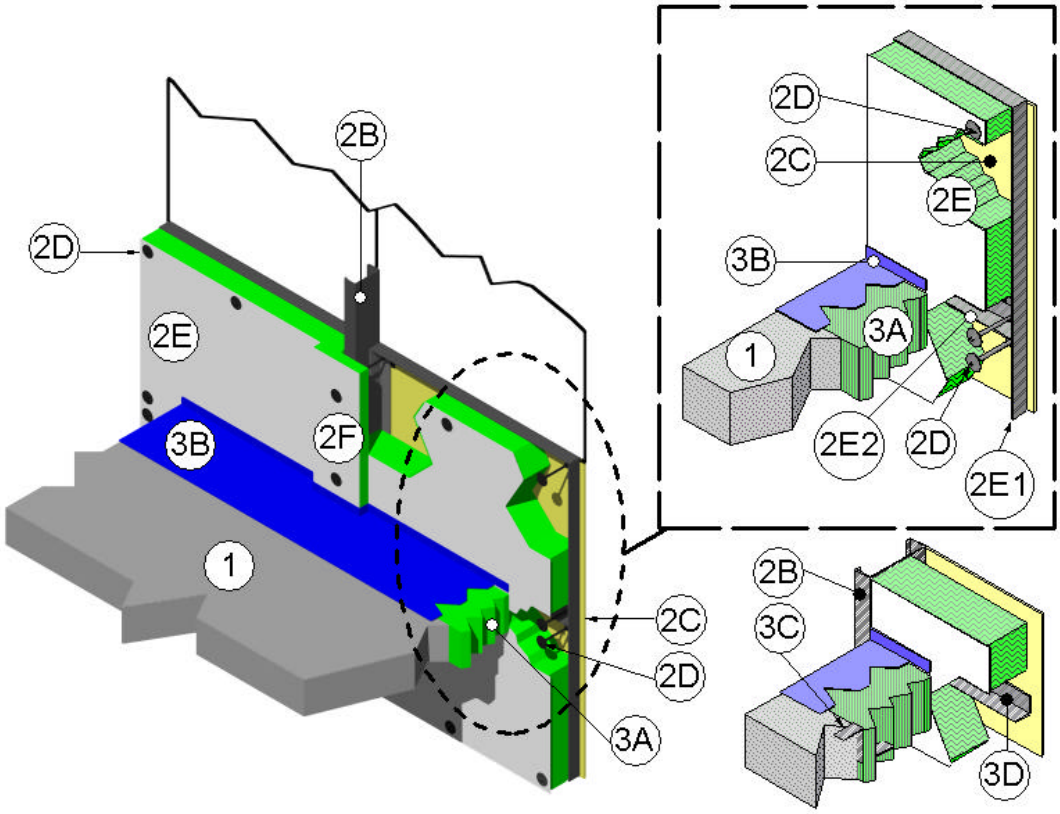
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 5-1/2 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing. Maximum 72 inch on center horizontal framing spacing. Locate transoms a minimum height of 33 inches above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.
   C. Glass Panels: Install glass spandrel and vision panels according to curtain wall framing and the curtain wall system manufacturer's guidelines. Use a minimum 1/4 inch thick, clear tempered glass with a maximum width of 59 inches and height of 71 inches. Secure glass spandrel panels with a thermal break (thermoset rubber extrusion), pressure bar (aluminum extrusion), 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion). Insulate the glass spandrel panels shall be insulated according to Item 2F.
   D. Impaling Pins: When pins are used instead of screws to secure curtain wall insulation (Item 2F), position them in the same manner as the screws in Item 2F, sized and installed according to the curtain wall system manufacturer's guidelines, or be a min. 4-1/2 inch long, 12 GA steel pin attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to the framing using a stud gun. Space pins a maximum of 12 inches on center and install around the curtain wall insulation (Item 2F) periphery so that the interior face of the curtain wall insulation is flush with the interior face of the framing.
   E. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Insulate all spandrel panels using a minimum 4 inch thick, 4 pcf, or 2 inch thick, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder), which is exposed to the room interior. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with batt insulation.
      i Fit curtain wall insulation tightly between vertical framing members, secured with screws placed a maximum 8 inches on center attached to a minimum 16 GA angle around the entire perimeter of each piece of curtain wall insulation (batt). Attach the vertical 16 GA angles to the mullions with screws. At the horizontal butt joints of the curtain wall insulation in the field of the glass spandrel panels (Item 2C), place the horizontal angles back-to-back to form a "T", which is located at the horizontal centerline of the perimeter joint protection (Item 3). Locate all other horizontal seams in the curtain wall insulation at least 6 inches from the top surface of the perimeter joint protection (Item 3).
      ii Position the interior face of the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Create a minimum 1 ½ -inch air space between the glass spandrel

panels (Item 2C) and the curtain wall insulation. Install the 36-inch wide curtain wall insulation (batts) without vertical seams, spanning the full distance between the vertical and horizontal aluminum framing (Item 2B), which create the spandrel panel area.

F. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint protection. Butt framing covers to the top and bottom surfaces of the perimeter joint protection. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER: Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-12
CEJ 611 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

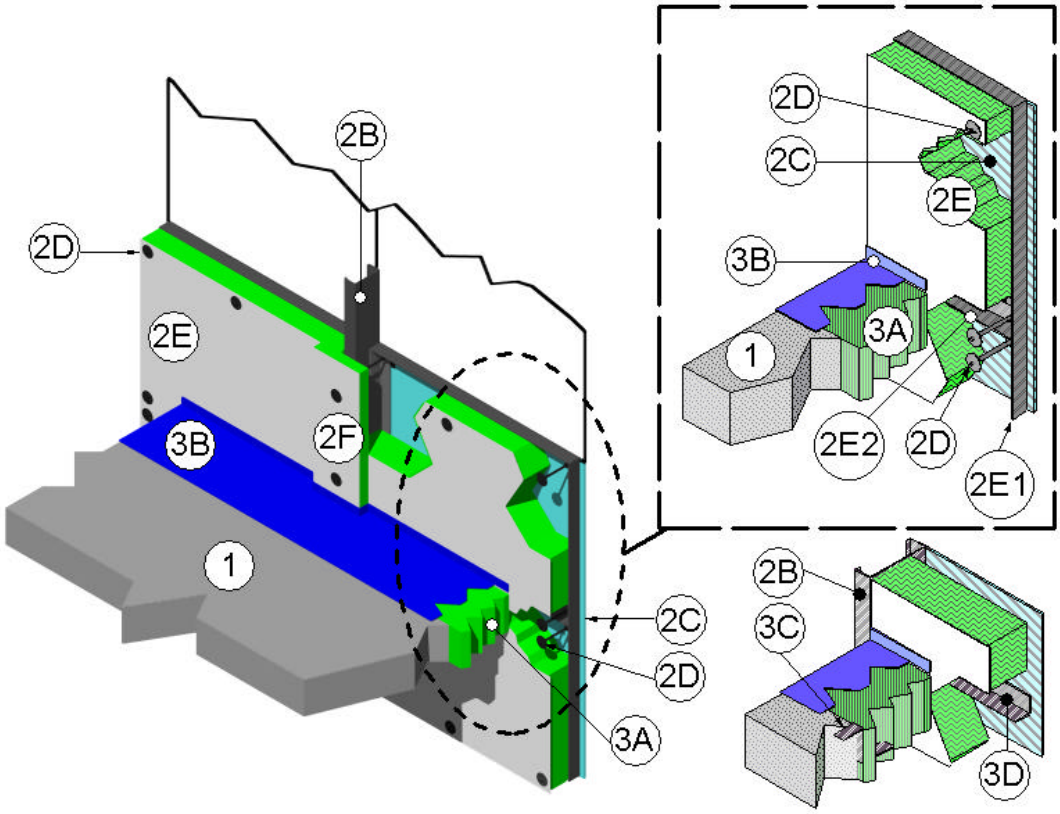
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing. Maximum 72 inch on center horizontal framing spacing. Locate transoms a minimum height of 33 inches above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.
   C. Aluminum Panels: Install aluminum panels to aluminum framing (Item 2B) according to the curtain wall system manufacturer's guidelines. Use a minimum 1/8-inch thick aluminum sheet panel with maximum dimensions of 60 by 72 inches.
   D. Impaling Pins: When pins are used instead of screws to secure curtain wall insulation (Item 2F), position them in the same manner as the screws in Item 2F, sized and installed according to the curtain wall system manufacturer's guidelines, or be a min. 4-1/2 inch long, 12 GA steel pin attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to the framing using a stud gun. Space pins a maximum of 12 inches on center and install around the curtain wall insulation (Item 2F) periphery so that the interior face of the curtain wall insulation is flush with the interior face of the framing.
   E. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Insulate all spandrel panels using a minimum 4 inch thick, 4 pcf, or 2 inch thick, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder), which is exposed to the room interior. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with batt insulation.
      i. Fit curtain wall insulation tightly between vertical framing members, secured with screws placed a maximum 8 inches on center attached to a minimum 16 GA angle around the entire perimeter of each piece of curtain wall insulation (batt). Attach the vertical 16 GA angles to the mullions with screws. At the horizontal butt joints of the curtain wall insulation in the field of the glass spandrel panels (Item 2C), place the horizontal angles back-to-back to form a "T", which is located at the horizontal centerline of the perimeter joint protection (Item 3). Locate all other horizontal seams in the curtain wall insulation at least 6 inches from the top surface of the perimeter joint protection (Item 3).
      ii Position the interior face of the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Create a minimum 2-inch air space between the glass spandrel panels (Item 2C) and the curtain wall insulation. Install the 36-inch wide curtain wall insulation (batts) without vertical seams, spanning the full distance between the vertical and

horizontal aluminum framing (Item 2B), which create the spandrel panel area.

F. Framing Covers: Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of framing covers. Use Strips minimum 1 inch thick by 4 inch wide, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder) exposed to the room's interior. Center framing covers over each vertical framing member and secured to the member with impaling pins (Item 2D) spaced nominally 12 inches. Do not pass framing covers through the perimeter joint protection. Butt framing covers to the top and bottom surfaces of the perimeter joint protection. Seal the sides of the framing covers with minimum 3-inch wide aluminum foil tape.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

   B. CERTIFIED MANUFACTURER: Grabber Construction Products

      CERTIFIED PRODUCT: Sealant
      MODEL: Grabbergard EFS

      Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

   C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-13
CEJ 612 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

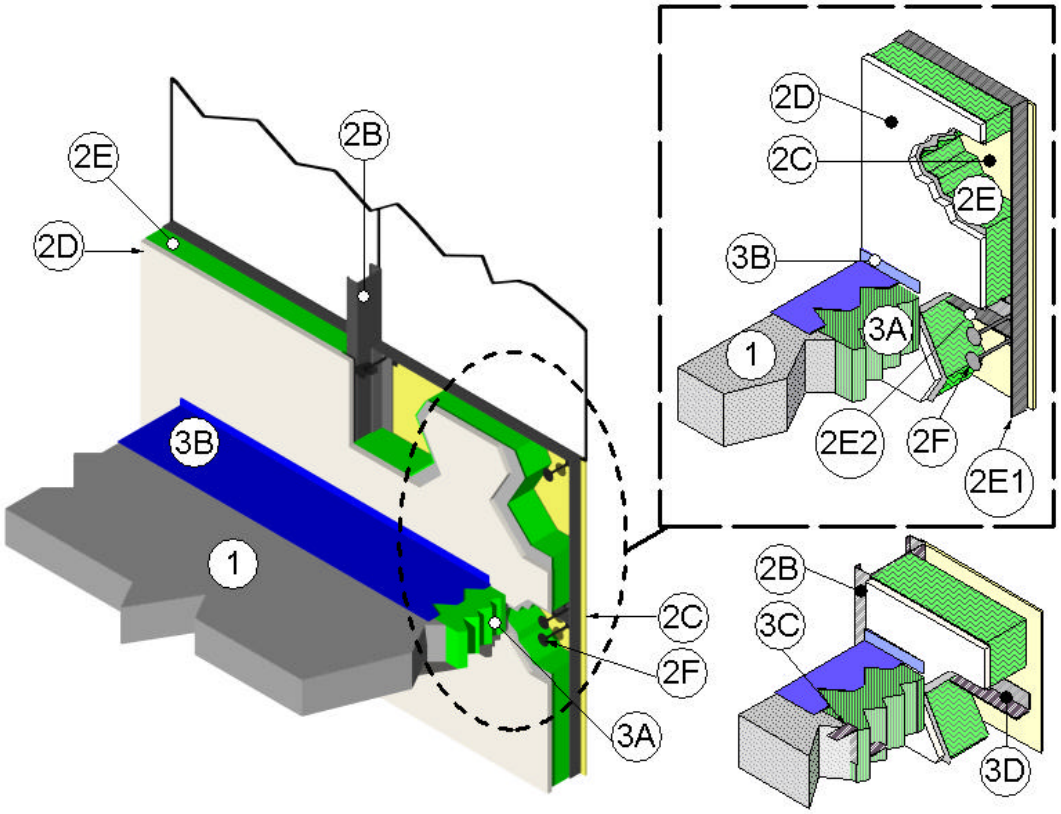
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 5-1/2 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing. Maximum 72 inch on center horizontal framing spacing. Locate transoms a minimum height of 33 inches above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.
   C. Glass Panels: Install glass spandrel and vision panels according to curtain wall framing and the curtain wall system manufacturer's guidelines. Use a minimum 1/4 inch thick, clear tempered glass with a maximum width of 47 inches and height of 71 inches. Secure glass spandrel panels with a thermal break (thermoset rubber extrusion), pressure bar (aluminum extrusion), 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion). Insulate the glass spandrel panels shall be insulated according to Item 2F
   D. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 5/8 inch thick, Type X gypsum board. The joint face of the curtain wall assembly (Item 2) covered as shown with one layer of gypsum wallboard. Fasten gypsum board to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center.
      1 Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F).
      2 Create a minimum 3-5/8 inch cavity between unexposed side of gypsum wallboard (Item 2F) to unexposed side of glass panel (Item 2D).
   E. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Insulate all spandrel panels using a minimum 4 inch thick, 4 pcf, or 2 inch thick, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder), which is exposed to the room interior. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with batt insulation.
      i Fit curtain wall insulation tightly between vertical framing members, secured with screws placed a maximum 8 inches on center attached to a minimum 16 GA angle around the entire perimeter of each piece of curtain wall insulation (batt). Attach the vertical 16 GA angles to the mullions with screws. At the horizontal butt joints of the curtain wall insulation in the field of the glass spandrel panels (Item 2C), place the horizontal angles back-to-back to form a "T", which is located at the horizontal centerline of the perimeter joint

protection (Item 3). Locate all other horizontal seams in the curtain wall insulation at least 6 inches from the top surface of the perimeter joint protection (Item 3).

ii Position the interior face of the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Create a minimum 1-1/2-inch air space between the glass spandrel panels (Item 2C) and the curtain wall insulation. Install the 36-inch wide curtain wall insulation (batts) without vertical seams, spanning the full distance between the vertical and horizontal aluminum framing (Item 2B), which create the spandrel panel area.

F. Impaling Pins: When pins are used instead of screws to secure curtain wall insulation (Item 2F), position them in the same manner as the screws in Item 2F, sized and installed according to the curtain wall system manufacturer's guidelines, or be a min. 4-1/2 inch long, 12 GA steel pin attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to the framing using a stud gun. Space pins a maximum of 12 inches on center and install around the curtain wall insulation (Item 2F) periphery so that the interior face of the curtain wall insulation is flush with the interior face of the framing

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-14
CEJ 613 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

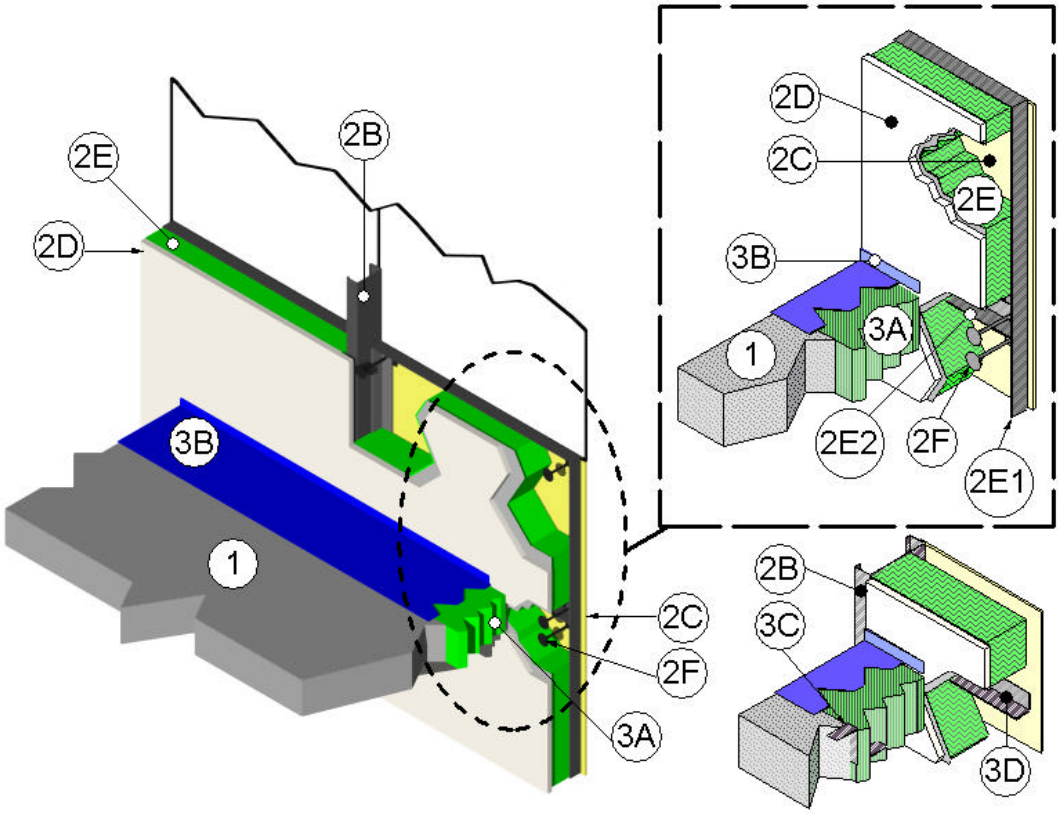
ASTM E 2307-04

T-Rating – 3/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33.34% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint

system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Steel-Stud Framing: Erect vertical framing members using a minimum 5-1/2 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 48 inch on center vertical framing spacing. Maximum 72 inch on center horizontal framing spacing. Locate transoms a minimum height of 33 inches above the top surface of the concrete floor assembly (Item 1) as measured from the bottom of the transom.
   C. Aluminum Panels: Install aluminum panels to aluminum framing (Item 2B) according to the curtain wall system manufacturer's guidelines. Use a minimum 1/8-inch thick aluminum sheet panel with maximum dimensions of 60 by 72 inches.
   D. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 5/8 inch thick, Type X gypsum board. The joint face of the curtain wall assembly (Item 2) covered as shown with one layer of gypsum wallboard. Fasten gypsum board to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center.
      1 Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F).
      2 Create a minimum 3-5/8 inch cavity between unexposed side of gypsum wallboard (Item 2F) to unexposed side of glass panel (Item 2D).
   E. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Insulate all spandrel panels using a minimum 4 inch thick, 4 pcf, or 2 inch thick, 8 pcf, mineral wool batt insulation faced on one side with aluminum foil scrim (vapor retarder), which is exposed to the room interior. Fill the spandrel panel area completely. Fill the cavity of all "C"-shaped studs with batt insulation.
      i Fit curtain wall insulation tightly between vertical framing members, secured with screws placed a maximum 8 inches on center attached to a minimum 16 GA angle around the entire perimeter of each piece of curtain wall insulation (batt). Attach the vertical 16 GA angles to the mullions with screws. At the horizontal butt joints of the curtain wall insulation in the field of the glass spandrel panels (Item 2C), place the horizontal angles back-to-back to form a "T", which is located at the horizontal centerline of the perimeter joint protection (Item 3). Locate all other horizontal seams in the curtain wall insulation at least 6 inches from the top surface of the perimeter joint protection (Item 3).

ii Position the interior face of the curtain wall insulation (batts) flush with the interior face of the aluminum framing (Item 2B). Create a minimum 2-inch air space between the aluminum panels (Item 2C) and the curtain wall insulation. Install the 36-inch wide curtain wall insulation (batts) without vertical seams, spanning the full distance between the vertical and horizontal aluminum framing (Item 2B), which create the spandrel panel area.

F. Impaling Pins: When pins are used instead of screws to secure curtain wall insulation (Item 2F), position them in the same manner as the screws in Item 2F, sized and installed according to the curtain wall system manufacturer's guidelines, or be a min. 4-1/2 inch long, 12 GA steel pin attached to a nominal 2 by 2 inch galvanized sheet steel plate, a nominal 2 by 2 by 2 inch long angle, or directly attached to the framing using a stud gun. Space pins a maximum of 12 inches on center and install around the curtain wall insulation (Item 2F) periphery so that the interior face of the curtain wall insulation is flush with the interior face of the framing

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33.34% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

B. CERTIFIED MANUFACTURER: Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-15
CEJ 614 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

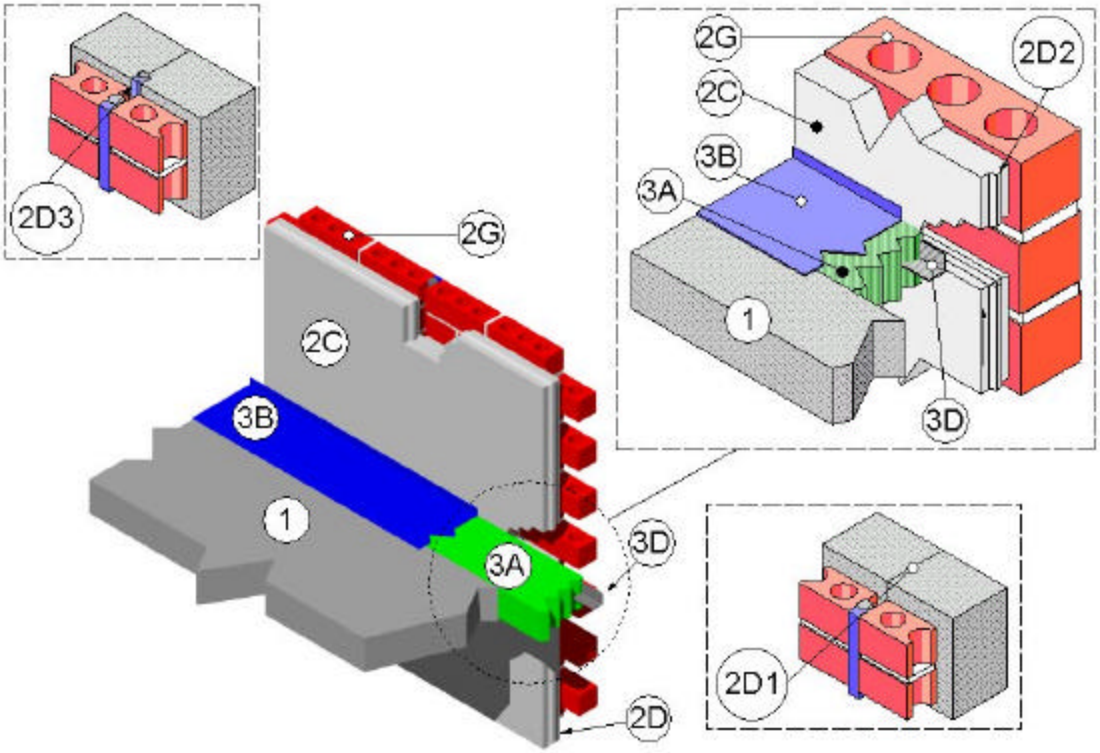
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
B. Structural Framing: (Not shown) Provide structural framing members according to the curtain wall system manufacturer's requirements. Aluminum structural framing must be completely covered by concrete panels.
C. Tilt-up Panels: Tilt-up concrete wall panels, minimum 2-1/2 inches thick, reinforced lightweight or normal weight (100 – 150 pcf). Install tilt-up panels to structural framing (Item 2B) according to the curtain wall system manufacturer's requirements.
D. Tilt-up Panel Joints: Use either flush type (butt joint) (Item 2D1) or key way type (tongue and groove) (Item 2D2) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2D3).
E. Curtain Wall Insulation: (Not Shown – Optional) Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of curtain wall insulation. Use either mineral wool or fiberglass insulation batts.
F. Impaling Pins: (Not Shown – Optional) When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.
G. Exterior Curtain Wall Surface: Use a minimum 4-inch thick brick veneer applied in accordance with standard construction practices using a cement-based mortar.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.
   B. CERTIFIED MANUFACTURER: Grabber Construction Products

      CERTIFIED PRODUCT: Sealant
      MODEL: Grabbergard EFS

      Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-16
CEJ 615 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

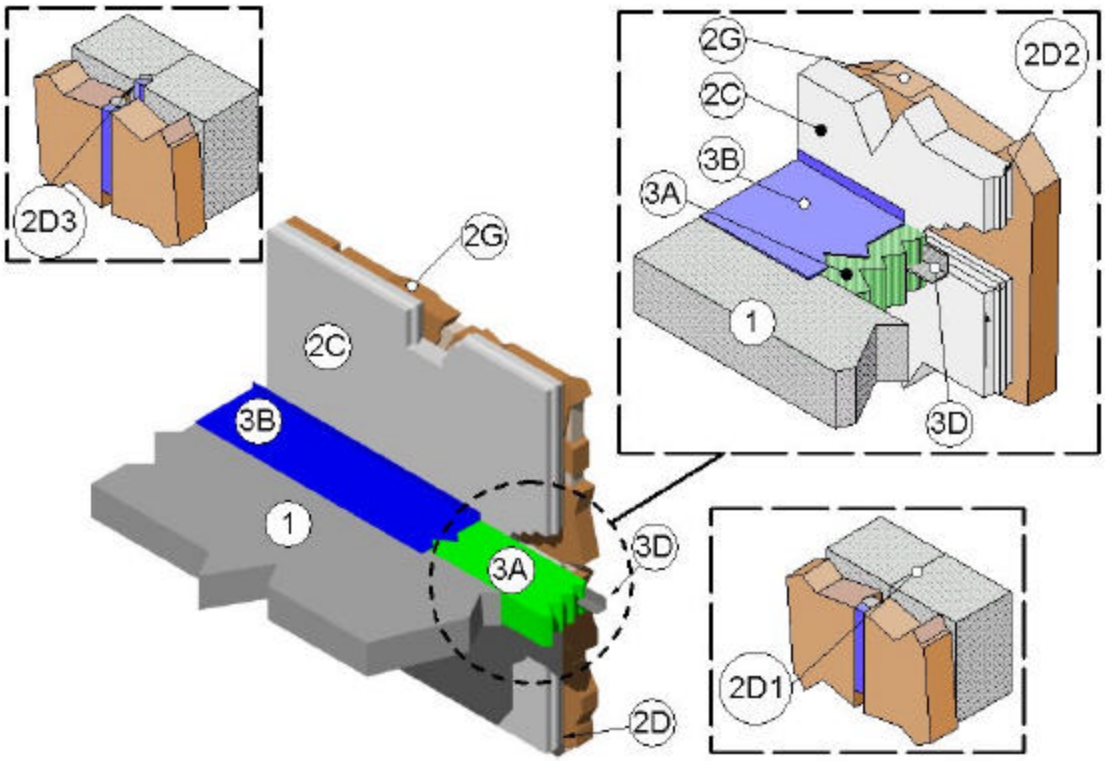
ASTM E 2307-04

T-Rating – 1/4 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 15% Horizontal Movement @ 50% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:
   A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.
   B. Structural Framing: (Not shown) Provide structural framing members according to the curtain wall system manufacturer's requirements. Aluminum structural framing must be completely covered by concrete panels.
   C. Tilt-up Panels: Tilt-up concrete wall panels, minimum 2-1/2 inches thick, reinforced lightweight or normal weight (100 – 150 pcf). Install tilt-up panels to structural framing (Item 2B) according to the curtain wall system manufacturer's requirements.
   D. Tilt-up Panel Joints: Use either flush type (butt joint) (Item 2D1) or key way type (tongue and groove) (Item 2D2) for vertical and horizontal tilt-up panel joints. All tilt-up panel edges at butt joints in contact with each other. When required, seal the surface of the tilt-up panel joints with gaskets or sealant (Item 2D3).
   E. Curtain Wall Insulation: (Not Shown – Optional) Install perimeter joint protection (Item 3) before this material. Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Do not deform the perimeter joint protection (Item 3) during or after installation of curtain wall insulation. Use either mineral wool or fiberglass insulation batts.
   F. Impaling Pins: (Not Shown – Optional) When pins are used position, size and install them according to the curtain wall system manufacturer's guidelines.
   G. Exterior Curtain Wall Surface: Use a minimum 2-inch thick stone veneer applied in accordance with standard construction practices using a cement-based mortar.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:
   A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 50% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material.

   B. CERTIFIED MANUFACTURER:
   Grabber Construction Products

   CERTIFIED PRODUCT: Sealant
   MODEL: Grabbergard EFS

   Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Clips: (Not Shown – Optional) Required when using 24 GA Support Angle (Item 3D), use standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.
D. Support Angle: Horizontally install a minimum 24 GA 1.5 inch x 1.5 inch steel angle mechanically fastened to the interior of the tilt-up panels (Item 2C) at the mid point location of the packing material (Item 3A). When 16 GA support angles are used Z-clips (Item 3C) are not required.

JWA/JS 120-17
CEJ 616 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

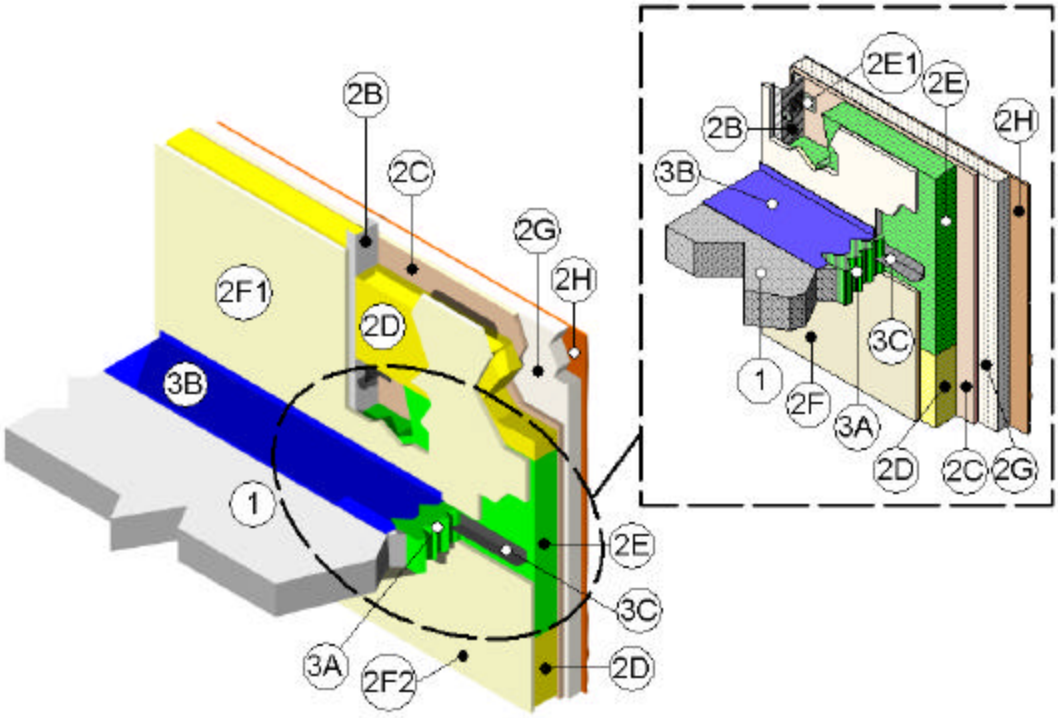
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 24 inch on center vertical framing spacing.

C. Sandwiched Wall Surface: Use a minimum 1/2-inch thick, 48-inch wide by 96 in. long, exterior grade gypsum wallboard (ASTM C 79), placed over and secured to framing with minimum 1-1/4 inch long Type S drywall screws spaced 8 inches on center.

D. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 48-inch tall by 4 inch thick faced or un-faced fiberglass insulation (batt) in each stud cavity in the steel stud framing (Item 2B). Completely fill the recess of the minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs with curtain wall insulation, except locations where the barrier insulation (Item 2E) in the steel stud framing (Item 2B) is installed.

E. Barrier Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 24-inch tall by 4 inch thick minimum 4 pcf un-faced mineral wool insulation (batt) in each stud cavity in the steel stud framing (Item 2B) at the floor assembly (Item 1) elevation so that nominal 12-inches of un-faced mineral wool insulation is above the surface of the perimeter joint protection (Item 3). Use a minimum un-faced mineral wool insulation (batt) length of 24-inches and fitted tightly between vertical framing members of the steel stud framing (Item 2B).

   i Mechanically fasten the un-faced mineral wool insulation (batt) with minimum 2 x 2 inch, 20 GA steel clips with a minimum 5 inch copper coated steel pin extending from the center of the side of the clip installed parallel with the sandwiched wall surface (Item 2C). Locate the steel clips within each stud cavity in the steel stud framing (Item 2B). Locate one pin within 1-inch of each corner of each piece of un-faced mineral wool insulation (batt) and not less than 12-inch on center. The un-faced mineral wool insulation (batt) shall completely fill the recess of the min. 3-5/8 in. by 1-5/8 in., 18 GA steel "C" studs.

F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 1/2 inch thick, Type X gypsum board (ASTM C 36). The joint face of the curtain wall assembly (Item 2) is not covered as shown with the 1/2 inch thick, Type X gypsum board (ASTM C 36). Fasten 1/2 inch thick, Type X gypsum board (ASTM C 36) to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center. Continuously place gypsum wallboard (2F1) a minimum 72 inches above surface of perimeter joint protection (Item 3). Optional gypsum wallboard (2F2) below the floor assembly (Item 1).

   i Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-

stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F). Gypsum board installed below the slab is optional

G. Exterior Curtain Wall Insulation: Create an Exterior Insulation Finish System (EIFS) composed of expanded polystyrene foam (EPS) insulation, and an Exterior Curtain Wall Finish (Item 2H). Use a monolithic assembly without expansion or control joints as the EIFS system. Use EPS foam boards measuring nominal 24 inches wide by 48 inches long by 4 inches thick with a nominal density of 1 pcf. Attach the EPS foam to the sandwiched wall surface (Item 2C) using mechanical fasteners or an adhesive in accordance with manufacturer's recommendations. Install the EPS boards in a running bond (brick-like) pattern and staggered over sandwiched wall surface (Item 2C) joints. Apply pressure to the EPS boards to assist in the bonding process. Butt all EPS boards together with no gaps or voids between them. Allow a minimum of 12 hours before continuing the application process when using adhesive. Rasp the EPS boards to remove all irregular seams and establish a continuous flat surface.

H. Exterior Curtain Wall Finish: Apply the cementious base coat and reinforcing mesh over the Exterior Curtain Wall Insulation (Item 2G). Precut the mesh, which is a woven fiberglass reinforcement fabric that is compatible with the cementious base coat and finish coat materials. Apply 1/16 to 1/8-inch thick cementious base coat to the exposed surface of the EPS foam. Apply the mesh; embed the mesh into the cementious base coat using a trowel. Start at the middle and work outwards towards edges. Established a final thickness of approximately 1/16-inches of the cementious base coat with the mesh embedded. Let the cementious base coat dry completely before applying the cementious finish coat, which is a cement-based wall coating which may contain silica sand or marble aggregates. Apply the cementious finish coat using a trowel in the same manner as the cementious base coat.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material, minimum compression 0.25-in. per piece. Notch packing material to receive support angle (Item 3C) so that packing material is in contact with barrier insulation (Item 2E).

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2F1) and

floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Angle: Horizontally install a minimum 20 GA 2 inch x 2 inch steel angle mechanically fastened to the interior of the steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).
D. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-18
CEJ 617 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

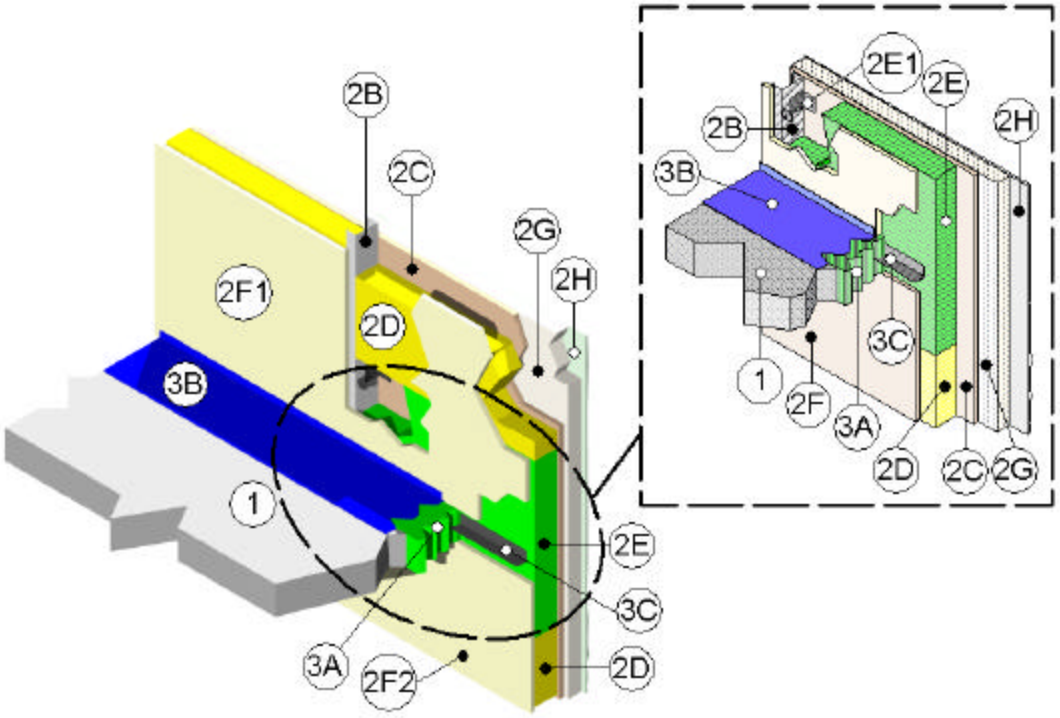
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 24 inch on center vertical framing spacing.

C. Sandwiched Wall Surface: Use a minimum 1/2-inch thick, 48-inch wide by 96 in. long, exterior grade gypsum wallboard (ASTM C 79), placed over and secured to framing with minimum 1-1/4 inch long Type S drywall screws spaced 8 inches on center.

D. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 48-inch tall by 4 inch thick faced or un-faced fiberglass insulation (batt) in each stud cavity in the steel stud framing (Item 2B). Completely fill the recess of the minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs with curtain wall insulation, except locations where the barrier insulation (Item 2E) in the steel stud framing (Item 2B) is installed.

E. Barrier Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 24-inch tall by 4 inch thick minimum 4 pcf un-faced mineral wool insulation (batt) in each stud cavity in the steel stud framing (Item 2B) at the floor assembly (Item 1) elevation so that nominal 12-inches of un-faced mineral wool insulation is above the surface of the perimeter joint protection (Item 3). Use a minimum un-faced mineral wool insulation (batt) length of 24-inches and fitted tightly between vertical framing members of the steel stud framing (Item 2B).

   i Mechanically fasten the un-faced mineral wool insulation (batt) with minimum 2 x 2 inch, 20 GA steel clips with a minimum 5 inch copper coated steel pin extending from the center of the side of the clip installed parallel with the sandwiched wall surface (Item 2C). Locate the steel clips within each stud cavity in the steel stud framing (Item 2B). Locate one pin within 1-inch of each corner of each piece of un-faced mineral wool insulation (batt) and not less than 12-inch on center. The un-faced mineral wool insulation (batt) shall completely fill the recess of the min. 3-5/8 in. by 1-5/8 in., 18 GA steel "C" studs.

F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 1/2 inch thick, Type X gypsum board (ASTM C 36). The joint face of the curtain wall assembly (Item 2) is not covered as shown with the 1/2 inch thick, Type X gypsum board (ASTM C 36). Fasten 1/2 inch thick, Type X gypsum board (ASTM C 36) to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center. Continuously place gypsum wallboard (2F1) a minimum 72 inches above surface of perimeter joint protection (Item 3). Optional gypsum wallboard (2F2) below the floor assembly (Item 1).

   i Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-

stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F). Gypsum board installed below the slab is optional

G. Exterior Curtain Wall Insulation: Create an Exterior Insulation Finish System (EIFS) composed of expanded polystyrene foam (EPS) insulation, and an Exterior Curtain Wall Finish (Item 2H). Use a monolithic assembly without expansion or control joints as the EIFS system. Use EPS foam boards measuring nominal 24 inches wide by 48 inches long by 4 inches thick with a nominal density of 1 pcf. Attach the EPS foam to the sandwiched wall surface (Item 2C) using mechanical fasteners or an adhesive in accordance with manufacturer's recommendations. Install the EPS boards in a running bond (brick-like) pattern and staggered over sandwiched wall surface (Item 2C) joints. Apply pressure to the EPS boards to assist in the bonding process. Butt all EPS boards together with no gaps or voids between them. Allow a minimum of 12 hours before continuing the application process when using adhesive. Rasp the EPS boards to remove all irregular seams and establish a continuous flat surface.

H. Exterior Curtain Wall Finish: Apply the plaster base coat and reinforcing mesh over the Exterior Curtain Wall Insulation (Item 2G). Precut the mesh, which is a woven fiberglass reinforcement fabric that is compatible with the plaster base coat and finish coat materials. Apply 1/16 to 1/8-inch thick plaster base coat to the exposed surface of the EPS foam. Apply the mesh; embed the mesh into the plaster base coat using a trowel. Start at the middle and work outwards towards edges. Established a final thickness of approximately 1/16-inches of the plaster base coat with the mesh embedded. Let the plaster base coat dry completely before applying the plaster finish coat, which is a plaster-based wall coating which may contain silica sand or marble aggregates. Apply the plaster finish coat using a trowel in the same manner as the plaster base coat.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material, minimum compression 0.25-in. per piece. Notch packing material to receive support angle (Item 3C) so that packing material is in contact with barrier insulation (Item 2E).

B. CERTIFIED MANUFACTURER:
Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2F1) and floor assembly (Item 1). After stopping the application process, and when the

applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Angle: Horizontally install a minimum 20 GA 2 inch x 2 inch steel angle mechanically fastened to the interior of the steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).
D. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-19
CEJ 618 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

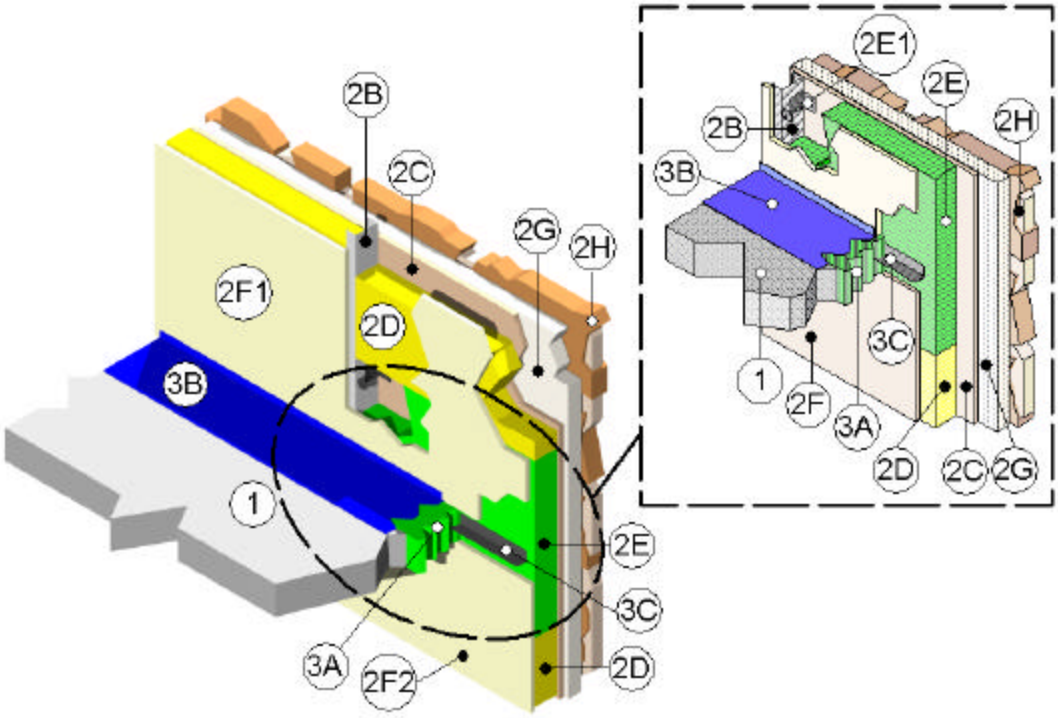
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 24 inch on center vertical framing spacing.

C. Sandwiched Wall Surface: Use a minimum 1/2-inch thick, 48-inch wide by 96 in. long, exterior grade gypsum wallboard (ASTM C 79), placed over and secured to framing with minimum 1-1/4 inch long Type S drywall screws spaced 8 inches on center.

D. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 48-inch tall by 4 inch thick faced or un-faced fiberglass insulation (batt) in each stud cavity in the steel stud framing (Item 2B). Completely fill the recess of the minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs with curtain wall insulation, except locations where the barrier insulation (Item 2E) in the steel stud framing (Item 2B) is installed.

E. Barrier Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 24-inch tall by 4 inch thick minimum 4 pcf un-faced mineral wool insulation (batt) in each stud cavity in the steel stud framing (Item 2B) at the floor assembly (Item 1) elevation so that nominal 12-inches of un-faced mineral wool insulation is above the surface of the perimeter joint protection (Item 3). Use a minimum un-faced mineral wool insulation (batt) length of 24-inches and fitted tightly between vertical framing members of the steel stud framing (Item 2B).

   i Mechanically fasten the un-faced mineral wool insulation (batt) with minimum 2 x 2 inch, 20 GA steel clips with a minimum 5 inch copper coated steel pin extending from the center of the side of the clip installed parallel with the sandwiched wall surface (Item 2C). Locate the steel clips within each stud cavity in the steel stud framing (Item 2B). Locate one pin within 1-inch of each corner of each piece of un-faced mineral wool insulation (batt) and not less than 12-inch on center. The un-faced mineral wool insulation (batt) shall completely fill the recess of the min. 3-5/8 in. by 1-5/8 in., 18 GA steel "C" studs.

F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 1/2 inch thick, Type X gypsum board (ASTM C 36). The joint face of the curtain wall assembly (Item 2) is not covered as shown with the 1/2 inch thick, Type X gypsum board (ASTM C 36). Fasten 1/2 inch thick, Type X gypsum board (ASTM C 36) to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center. Continuously place gypsum wallboard (2F1) a minimum 72 inches above surface of perimeter joint protection (Item 3). Optional gypsum wallboard (2F2) below the floor assembly (Item 1).

   i Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-

stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F). Gypsum board installed below the slab is optional.

G. Exterior Curtain Wall Insulation: Create an Exterior Insulation Finish System (EIFS) composed of expanded polystyrene foam (EPS) insulation, and an Exterior Curtain Wall Finish (Item 2H). Use a monolithic assembly without expansion or control joints as the EIFS system. Use EPS foam boards measuring nominal 24 inches wide by 48 inches long by 4 inches thick with a nominal density of 1 pcf. Attach the EPS foam to the sandwiched wall surface (Item 2C) using mechanical fasteners or an adhesive in accordance with manufacturer's recommendations. Install the EPS boards in a running bond (brick-like) pattern and staggered over sandwiched wall surface (Item 2C) joints. Apply pressure to the EPS boards to assist in the bonding process. Butt all EPS boards together with no gaps or voids between them. Allow a minimum of 12 hours before continuing the application process when using adhesive. Rasp the EPS boards to remove all irregular seams and establish a continuous flat surface.

H. Exterior Curtain Wall Finish: Use a minimum 2-inch thick stone veneer applied in accordance with standard construction practices using a cement-based mortar.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material, minimum compression 0.25-in. per piece. Notch packing material to receive support angle (Item 3C) so that packing material is in contact with barrier insulation (Item 2E).

B. CERTIFIED MANUFACTURER: Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS

Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2F1) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Angle: Horizontally install a minimum 20 GA 2 inch x 2 inch steel angle mechanically fastened to the interior of the steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

D. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-20
CEJ 619 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

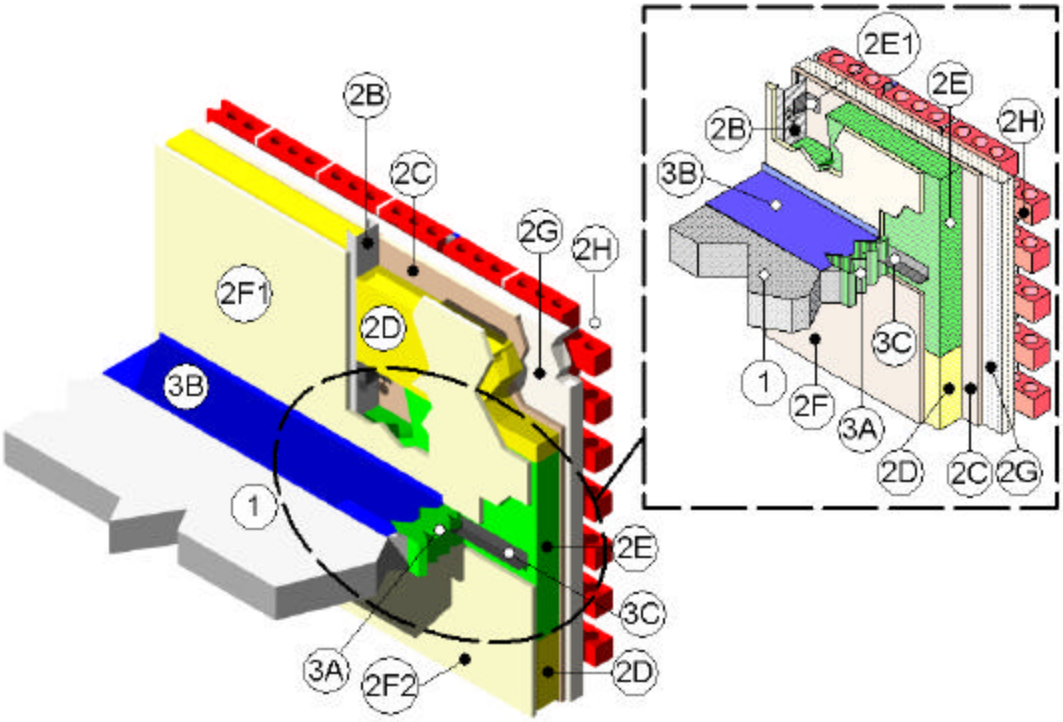
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
   A. Two-hour rated reinforced concrete slab using either nominal density 100 pcf lightweight or nominal density 150 pcf normal weight concrete with a minimum thickness of 4-1/2-inches.
   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

2. CURTAIN WALL ASSEMBLY: The curtain wall assembly incorporates the following construction features:

A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

B. Steel-Stud Framing: Erect vertical framing members using a minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs. Erect vertical framing, and when required install horizontal framing members, according to the curtain wall system manufacturer's guidelines. Maximum 24 inch on center vertical framing spacing.

C. Sandwiched Wall Surface: Use a minimum 1/2-inch thick, 48-inch wide by 96 in. long, exterior grade gypsum wallboard (ASTM C 79), placed over and secured to framing with minimum 1-1/4 inch long Type S drywall screws spaced 8 inches on center.

D. Curtain Wall Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 48-inch tall by 4 inch thick faced or un-faced fiberglass insulation (batt) in each stud cavity in the steel stud framing (Item 2B). Completely fill the recess of the minimum 3-5/8 inch by 1-5/8 inch, 18 GA steel "C" studs with curtain wall insulation, except locations where the barrier insulation (Item 2E) in the steel stud framing (Item 2B) is installed.

E. Barrier Insulation: Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Install a nominal 24-inch wide by 24-inch tall by 4 inch thick minimum 4 pcf un-faced mineral wool insulation (batt) in each stud cavity in the steel stud framing (Item 2B) at the floor assembly (Item 1) elevation so that nominal 12-inches of un-faced mineral wool insulation is above the surface of the perimeter joint protection (Item 3). Use a minimum un-faced mineral wool insulation (batt) length of 24-inches and fitted tightly between vertical framing members of the steel stud framing (Item 2B).

   i Mechanically fasten the un-faced mineral wool insulation (batt) with minimum 2 x 2 inch, 20 GA steel clips with a minimum 5 inch copper coated steel pin extending from the center of the side of the clip installed parallel with the sandwiched wall surface (Item 2C). Locate the steel clips within each stud cavity in the steel stud framing (Item 2B). Locate one pin within 1-inch of each corner of each piece of un-faced mineral wool insulation (batt) and not less than 12-inch on center. The un-faced mineral wool insulation (batt) shall completely fill the recess of the min. 3-5/8 in. by 1-5/8 in., 18 GA steel "C" studs.

F. Interior Curtain Wall Surface: Install perimeter joint treatment (Item 3) before this material. Cover interior face of steel-stud framing (Item 2B) with one layer of minimum 1/2 inch thick, Type X gypsum board (ASTM C 36). The joint face of the curtain wall assembly (Item 2) is not covered as shown with the 1/2 inch thick, Type X gypsum board (ASTM C 36). Fasten 1/2 inch thick, Type X gypsum board (ASTM C 36) to steel-stud framing (Item 2B) with minimum #6 1-1/8 inches long bugle-head phillips drywall screws spaced 12 inches on center. Continuously place gypsum wallboard (2F1) a minimum 72 inches above surface of perimeter joint protection (Item 3). Optional gypsum wallboard (2F2) below the floor assembly (Item 1).

   i Joint Tape and Compound – Apply vinyl or casein, dry or premixed joint compound to face layer of gypsum board (Item 2F) in two coats to all exposed screw heads and gypsum board steel-

stud framing (Item 2B) butt joints. A minimum 2-inch wide paper, plastic or fiberglass tape embedded in first layer of compound over joints in gypsum board (Item 2F). Gypsum board installed below the slab is optional.

G. Exterior Curtain Wall Insulation: Create an Exterior Insulation Finish System (EIFS) composed of expanded polystyrene foam (EPS) insulation, and an Exterior Curtain Wall Finish (Item 2H). Use a monolithic assembly without expansion or control joints as the EIFS system. Use EPS foam boards measuring nominal 24 inches wide by 48 inches long by 4 inches thick with a nominal density of 1 pcf. Attach the EPS foam to the sandwiched wall surface (Item 2C) using mechanical fasteners or an adhesive in accordance with manufacturer's recommendations. Install the EPS boards in a running bond (brick-like) pattern and staggered over sandwiched wall surface (Item 2C) joints. Apply pressure to the EPS boards to assist in the bonding process. Butt all EPS boards together with no gaps or voids between them. Allow a minimum of 12 hours before continuing the application process when using adhesive. Rasp the EPS boards to remove all irregular seams and establish a continuous flat surface.

H. Exterior Curtain Wall Finish: Use brick and mortar of any type. Mortar joints not to exceed 7/8-inches. Secure bricks to curtain wall assembly (Item 2) using conventional acceptable masonry techniques.

3. PERIMETER JOINT PROTECTION – Maximum 8 inch nominal joint width (joint width at installation) of perimeter joint (linear opening). Perimeter joint protection incorporates the following construction features:

A. Packing Material – Use only materials bearing an Intertek Certified Product Label and meeting the following minimum requirements. Use a minimum 4 inch thick, 4 pcf density, mineral wool batt insulation installed to fill all openings with the fibers running parallel to the concrete slab (Item 1A) edge and curtain wall assembly (Item 2). Compress packing material 33% in the nominal joint width. Install top of packing material flush with the top surface of the concrete slab (Item 1A). Tightly compress together splices (butt joints) in the lengths of packing material, minimum compression 0.25-in. per piece. Notch packing material to receive support angle (Item 3C) so that packing material is in contact with barrier insulation (Item 2E).

B. CERTIFIED MANUFACTURER: Grabber Construction Products

CERTIFIED PRODUCT: Sealant
MODEL: Grabbergard EFS
Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2F-1) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

C. Support Angle: Horizontally install a minimum 20 GA 2 inch x 2 inch steel angle mechanically fastened to the interior of the steel-stud framing (Item 2B) at the mid point location of the packing material (Item 3A).

D. Support Clips: (Not Shown – Optional) Recommend use of support clips for when vertical movement required. Standard Z-shaped clips consist of 20 GA galvanized steel with the following dimensions: 1 inch wide by 3 inch high with a 2 inch upper leg and 3 inch lower leg.

JWA/JS 120-21
CEJ 620 P

PERIMETER JOINT PROTECTION

CERTIFIED PRODUCT: Grabbergard EFS

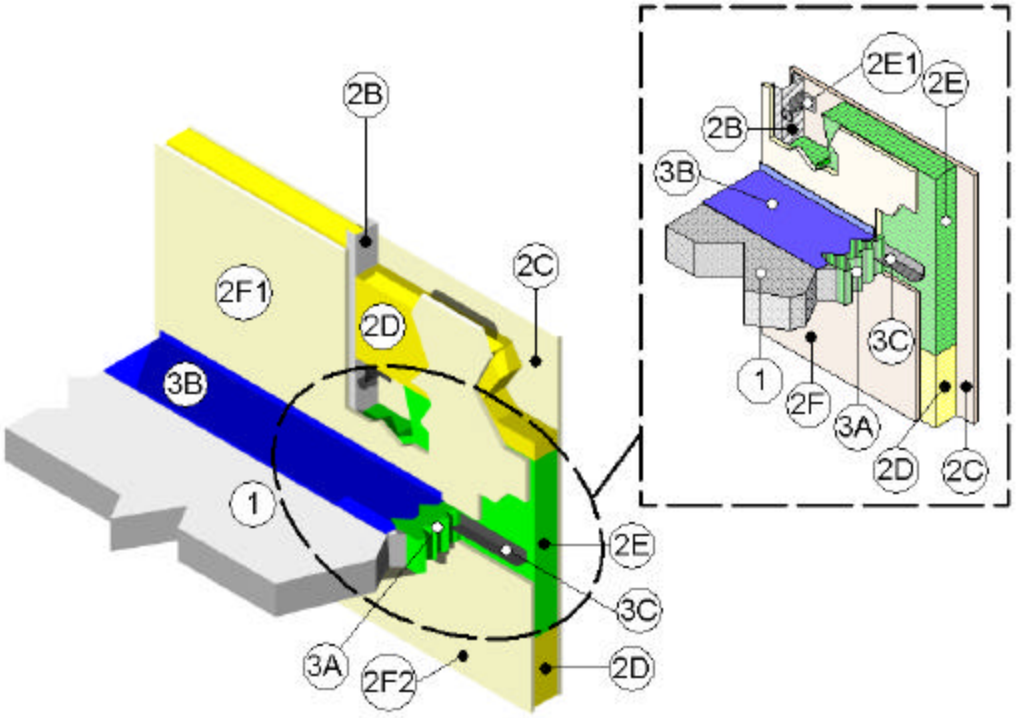
ASTM E 2307-04

T-Rating – 1 hr.

F-Rating – 2 hr.

ASTM E 1966-01

CYCLING TYPE IV: ± 16.7% Horizontal Movement @ 33% Compression (Reference Item 3A)



1. FLOOR ASSEMBLY – The floor assembly consists of the following construction features:
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   B. When required to accommodate the installation of an architectural joint system, increase overall concrete slab (Item 1A) thickness. Maintain minimum 4-1/2-inch thickness below blockout (longitudinal recesses) formed in the concrete slab (Item 1A) to accommodate the architectural joint system. Vary blockout width without restriction.

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A. Mounting Attachment: (Not Shown) Attach curtain wall framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the floor slab to the joint face of the floor slab, according to the curtain wall manufacturer's instructions. Maximum 10-foot distance between mounting attachments.

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   B. CERTIFIED MANUFACTURER:
   Grabber Construction Products

   CERTIFIED PRODUCT: Sealant
   MODEL: Grabbergard EFS

   Fill, Void or Cavity Material – Apply sealant, (sprayed, brushed, or painted), to cover the top exposed surface of the packing material (Item 3A) compressed in the perimeter joint. Apply a minimum dry film thickness of 1/16 inch and overlap sealant a minimum 1 inch onto the adjacent curtain wall assembly (Item 2F-1) and floor assembly (Item 1). After stopping the application process, and when the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured sealant at least 1/8 inch with the new sealant being applied.

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GRABBER CONSTRUCTION PRODUCTS
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Calculation Guide Through Penetrations

Step 1:

For sealant depth of 1 in.

Use this chart to calculate the volume (cu. in.) of Grabber sealant required for each penetration.

Diameter of Hole	Nominal Diameter of Penetrating Items (inches)												
	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	6.00	8.00	10.00	12.00
	Actual Outside Diameter of Sch 40 Penetrating Items (inches)												
(inches)	0.840	1.050	1.315	1.900	2.375	2.875	3.500	4.000	4.500	6.625	8.625	10.75	12.75
1.00	0.23												
1.50	1.21	0.90	0.41										
2.00	2.59	2.28	1.78	0.31									
2.50	4.35	4.04	3.55	2.07	0.48								
3.00	6.51	6.20	5.71	4.23	2.64	0.58							
3.50	9.07	8.76	8.26	6.79	5.19	3.13							
4.00	12.01	11.70	11.21	9.73	8.14	6.07	2.95						
4.50	15.35	15.04	14.55	13.07	11.47	9.41	6.28	3.34					
5.00	19.08	18.77	18.28	16.80	15.20	13.14	10.01	7.07	3.73				
5.50	23.20	22.89	22.40	20.92	19.33	17.27	14.14	11.19	7.85				
6.00	27.72	27.41	26.92	25.44	23.84	21.78	18.65	15.71	12.37				
6.50	32.63	32.32	31.82	30.35	28.75	26.69	23.56	20.62	17.28				
7.00	37.93	37.62	37.13	35.65	34.05	31.99	28.86	25.92	22.58	4.01			
7.50	43.62	43.31	42.82	41.34	39.75	37.69	34.56	31.61	28.27	9.71			
8.00	49.71	49.40	48.91	47.43	45.84	43.77	40.64	37.70	34.36	15.79			
8.50	56.19	55.88	55.39	53.91	52.31	50.25	47.12	44.18	40.84	22.27			
10.00	77.99	77.67	77.18	75.70	74.11	72.05	68.92	65.97	62.64	44.07	20.11		
12.00	112.54	112.23	111.74	110.26	108.67	106.61	103.48	100.53	97.19	78.63	54.67	22.33	
14.00	153.38	153.07	152.58	151.10	149.51	147.45	144.32	141.37	138.03	119.47	95.51	63.18	26.26

Note: These calculations are for a sealant depth of 1in. only.
For a different sealant depth, go to **Step 2.**
To calculate number of containers required, go to **Step 3.**

Step 2:

For a depth of:	Multiply by:
1/8"	0.13
1/4"	0.25
1/2"	0.50
3/4"	0.75
2"	2.00
3"	3.00
4"	4.00

Step 3:

Container Size:	Volume:
10.1fl.oz tube (300ml)	18 cu. in.
20 fl.oz foil pack (600ml)	36 cu. in.
29 fl.oz tube (850ml)	51 cu. in.
1 gallon pail (3.8L)	231 cu. in.
3 gallon pail (11.4L)	693 cu. in.
5 gallon pail (18.9L)	1155 cu. in.

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

Calculation Guide
Construction Joints

Use this chart to calculate:

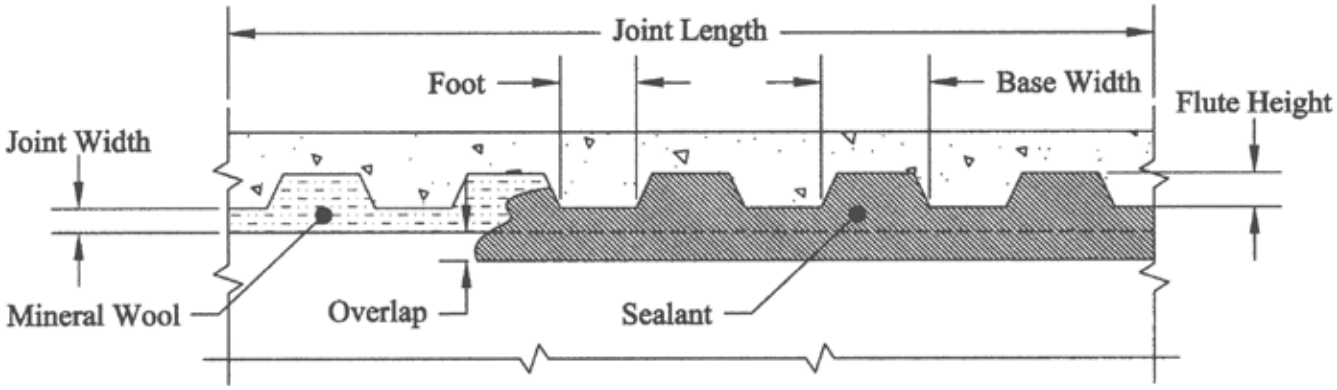
The lineal feet of coverage per US gallon (3.8L) of Grabber Sealant
For GrabberGard EFS use the next larger joint width to allow for 1/2 in. (12.5mm) overlap on both sides of gap.

JOINT WIDTH			DEPTH OF SEALANT							
MM	INCHES		0.125	0.250	0.375	0.500	0.625	0.750	0.875	1.000
3.17	1/8"	0.125	1232.0	616.0	410.7	308.0	246.4	205.3	176.0	154.0
6.35	1/4"	0.250	616.0	308.0	205.3	154.0	123.2	102.7	88.0	77.0
9.52	3/8"	0.375	410.7	205.3	136.9	102.7	82.1	68.4	58.7	51.3
12.70	1/2"	0.500	308.0	154.0	102.7	77.0	61.6	51.3	44.0	38.5
15.87	5/8"	0.625	246.4	123.2	82.1	61.6	49.3	41.1	35.2	30.8
19.05	3/4"	0.750	205.3	102.7	68.4	51.3	41.1	34.2	29.3	25.7
22.22	7/8"	0.875	176.0	88.0	58.7	44.0	35.2	29.3	25.1	22.0
25.40	1"	1.000	154.0	77.0	51.3	38.5	30.8	25.7	22.0	19.3
28.57	1-1/8"	1.125	136.9	68.4	45.6	34.2	27.4	22.8	19.6	17.1
31.75	1-1/4"	1.250	123.2	61.6	41.1	30.8	24.6	20.5	17.6	15.4
34.92	1-3/8"	1.375	112.0	56.0	37.3	28.0	22.4	18.7	16.0	14.0
38.10	1-1/2"	1.500	102.7	51.3	34.2	25.7	20.5	17.1	14.7	12.8
41.27	1-5/8"	1.625	94.8	47.4	31.6	23.7	19.0	15.8	13.5	11.8
44.45	1-3/4"	1.750	88.0	44.0	29.3	22.0	17.6	14.7	12.6	11.0
47.62	1-7/8"	1.875	82.1	41.1	27.4	20.5	16.4	13.7	11.7	10.3
50.80	2"	2.000	77.0	38.5	25.7	19.3	15.4	12.8	11.0	9.6
76.20	3"	3.000	51.3	25.7	17.1	12.8	10.3	8.6	7.3	6.4
101.60	4"	4.000	38.5	19.3	12.8	9.6	7.7	6.4	5.5	4.8
127.00	5"	5.000	30.8	15.4	10.3	7.7	6.2	5.1	4.4	3.9
152.40	6"	6.000	25.7	12.8	8.6	6.4	5.1	4.3	3.7	3.2
177.80	7"	7.000	22.0	11.0	7.3	5.5	4.4	3.7	3.1	2.8
203.20	8"	8.000	19.3	9.6	6.4	4.8	3.9	3.2	2.8	2.4
228.60	9"	9.000	17.1	8.6	5.7	4.3	3.4	2.9	2.4	2.1
254.00	10"	10.000	15.4	7.7	5.1	3.9	3.1	2.6	2.2	1.9
279.40	11"	11.000	14.0	7.0	4.7	3.5	2.8	2.3	2.0	1.8
304.80	12"	12.000	12.8	6.4	4.3	3.2	2.6	2.1	1.8	1.6
330.20	13"	13.000	11.8	5.9	3.9	3.0	2.4	2.0	1.7	1.5
			LINEAL FEET PER US GALLON (3.8L)							

Note: 231 cu. in. per US gallon (3.8L)
61 cu. in. per quart (1L)

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

Calculation Guide Spraying Fluted Metal Deck Joints



GrabberGard EFS

Sprayable mastic for top of gypsum wallboard wall assemblies cut straight across or concrete wall assemblies to fluted metal decks.

Quantity calculations include:

- Both sides of the wall assembly
- Variable flute heights (see chart)
- 3/4 in. construction gap
- 1 in. overlap (1 in. sprayed on deck and 1 in. on the wall assembly)
- 1/16 in. thickness of spray material
- 10% wastage factor

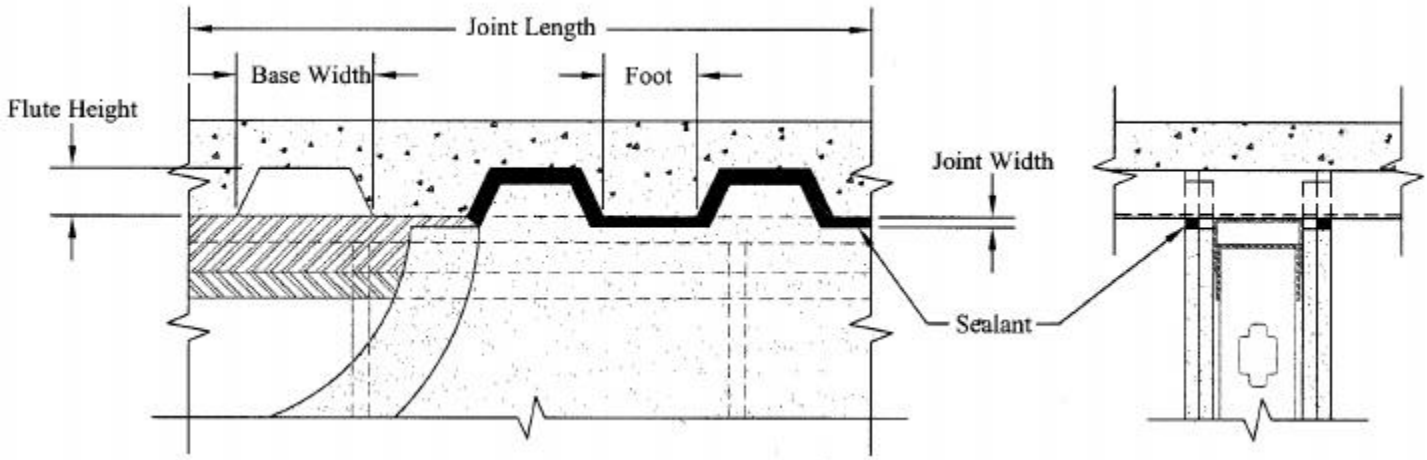
100 LINEAL FEET OF DECKING FLUTE SIZE (inches)			GrabberGard EFS QUANTITY REQUIRED	
Height	**Base Width**	**Foot**	**US gallons**	**Liters**
1.5	4.3	1.7	3.09	11.69
3	3.9	2.2	4.04	15.28
3	5.9	2.2	4.05	15.35

Available sizes:

Container Size:	Volume:
5 gallon pail (18.9L)	1155 cu. in.

GRABBER CONSTRUCTION PRODUCTS
"The Professional's Choice"™

Calculation Guide Caulking Fluted Metal Deck Joints



GrabberGard EFC or IFC sealant top of gypsum wallboard wall assemblies cut to the profile of metal decking. Quantity calculations are for both sides of the wall assembly.

100 LINEAL FEET OF DECKING FLUTE SIZE (inches)			GAP SIZE	SEALANT DEPTH	CAULK QUANTITY REQUIRED	
Height	Base Width	Foot	Inches	Inches	US gallons	Liters
1.5	4.3	1.7	0.50	0.625	4.87	18.43
1.5	4.3	1.7	0.75	0.625	7.31	27.65
1.5	4.3	1.7	1.00	0.625	9.74	36.87
1.5	4.3	1.7	0.50	1.250	9.74	36.87
1.5	4.3	1.7	0.75	1.250	14.61	55.31
1.5	4.3	1.7	1.00	1.250	19.48	73.74
3.0	3.9	2.2	0.50	0.625	6.44	24.38
3.0	3.9	2.2	0.75	0.625	9.66	36.57
3.0	3.9	2.2	1.00	0.625	12.88	48.76
3.0	3.9	2.2	0.50	1.250	12.88	48.76
3.0	3.9	2.2	0.75	1.250	19.32	73.14
3.0	3.9	2.2	1.00	1.250	25.76	97.52
3.0	5.9	2.2	0.50	0.625	5.65	21.39
3.0	5.9	2.2	0.75	0.625	8.48	32.09
3.0	5.9	2.2	1.00	0.625	11.30	42.79
3.0	5.9	2.2	0.50	1.250	11.30	42.79
3.0	5.9	2.2	0.75	1.250	16.96	64.18
3.0	5.9	2.2	1.00	1.250	22.61	85.58

Available sizes:

Container Size:	Volume:
10.1fl.oz tube (300ml)	18 cu. in.
20 fl.oz foil pack (600ml)	36 cu. in.
29 fl.oz tube (850ml)	51 cu. in.
5 gallon pail (18.9L)	1155 cu. in.

GRABBER CONSTRUCTION PRODUCTS
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CAULKING INSTRUCTIONS GRABBERGARD EFC & IFC

Equipment and Caulking Installations Instructions Using Caulking Applicator Guns

There are different types of caulking applicator guns available. The recommended procedure when using the different styles will be described in Sections A and B. Section C will then describe the recommended procedures to follow to install the caulk and finish the job.

Section A – Applying Caulk in Plastic and Cardboard Fiber Foil Wrapped Cartridges

There are variety of applicator caulking guns available to do firestopping. We recommend using a smooth rod style rather than the less expensive ratchet rod type. When dispensing caulk from a 29 ounce-size cartridge, we recommend a rod type gun with at least a 12:1 thrust ratio. The higher thrust ratio means less hand fatigue since firestopping caulks are usually high viscous caulkings. The higher thrust ratio will also help when the product becomes stiffer in the colder temperatures. (12:1 ration generates approximately 300 pound thrust)

For manual single component cartridge applicator guns.

Select the correct size manual drive frame-style cartridge gun for either the 10-ounce (300ml) or the larger 29-ounce (850ml) plastic or cardboard fiber foil wrapped tube type

Using a utility knife cut off the end of the plastic tip/nozzle to the desired opening size. The cut can be either straight across (90°) or angled (45°). Cutting too small of an opening will restrict the flow of material and a smaller bead size will result. The smaller the opening the higher the trigger action (pressure) required to move the material out of the tube.

On the 29 fl. oz. tubes, insert either a screwdriver or other pointed utensil into the plastic nozzle to puncture the membrane; which will allow the caulk material to flow.

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Pull back the push rod of the frame-style caulking gun to its full extension.

Drop the cartridge into the frame insuring that the plastic nozzle of the cartridge is place through the opening in the end plate.

Repeatedly pull the trigger of the applicator guns until the push rod is advanced to the end of the cartridge. The caulk will begin to flow when some resistance is felt.

When the desired amount of material has been advanced, stop triggering; release the pressure by pressing the lever (tab) located at the back of the handle with your thumb. This causes the push rod to slip back stopping the flow of material.

REFER TO SECTION C TO COMPLETE THE INSTALLATION PROCEDURE.

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Section B - Applying Caulk with Refillable Bulk Loading Applicator Gun

The caulking to be used is shipped in 5-gallon (18.9 liter) plastic tapered pails.

Advance the plunger and push the rod down to the end of the barrel.

To begin the loading process, remove the front cap containing the nozzle.

With a utility knife, cut an opening in the plastic nozzle (cut can be straight across (90°) or angled (45°)).

Coat the threads at the end of the barrel with a solvent (oil) or water to prevent the accumulation of material.

Immerse the open end of the barrel into the material to a depth of approximately 1-inch.

Move the immersed gun slightly around so the material will adhere and form an air seal.

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Hold the barrel steady, grip the T-pull and slowly pull the push rod back drawing the material into the barrel. Pulling the rod back to quickly may result in air pockets and an incomplete fill.

Remove the gun from the pail of material and scrape off the excess amount that has accumulated on the barrel.

Replace the front cap and nozzle.

To stop the flow or product, stop triggering and depress the pressure and release tab on the handle.

Now you are ready to install the material into the openings and joints.

REFER TO SECTION C TO COMPLETE THE INSTALLATION PROCEDURE.

Section C – Installing Firestop Caulk

General Information

All firestopping installations must be performed in compliance with a tested and listed firestop system design. The testing laboratories like Underwriters Laboratories (UL) or Intertek (Warnock Hersey) publish these listings.

For the appropriate listing, consult the manufacturer's literature or the testing laboratories Fire Protection Directories and/or their web sites.

The manufacturer recommends an individual who has been properly trained in the correct procedures should perform all firestop installations. The individual must be able to read and understand a tested firestop listing design.

The applicator should have the following materials and equipment to **correctly and safely** install firestop caulking.

- Safety Glasses
- Gloves
- Utility (box) knife
- Stainless Steel Spatula
- Cleaning rags
- Plastic spray water bottle (quart/liter) with finger pump trigger/nozzle

Areas to be firestopped should be clean, free from: water, excessive dirt, dust, debris and grease. For the best results, the ideal atmospheric temperatures and environment would be:

- Dry, 60°-75°F (15°C -24°C) & R.H. 50 %.

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When the damming or fire insulation material is required, the following information should be considered before commencing.

- Backer rod used as a damming or support material should be installed into the opening in a thickness and compressed sufficiently as to not dislodge and fall out under normal building movement. Wrap the backer rod completely around the penetration(s) and recess it to accommodate the required amount of firestop caulk.
- Mineral wool when required, as an insulation material, it should be installed into the opening compressed to a thickness as to not dislodge nor fall out under normal building movement. The mineral wool, usually 4 pcf, should be installed to the compression required by the firestop listing. The orientation of the mineral wool is also very important and maybe the difference of the system being in compliance or not. For construction joints or through penetration in floor (horizontal) rated assemblies, the mineral wool or similar fibrous material should be installed with the lamination in a vertical orientation assemblies. The opposite is the rule of joints and through penetrations in wall (vertical) assemblies. Here the laminations should be placed in a horizontal orientation. Installing the mineral wool in these different lamination directions allows the material to be compressed to the density required for the fire rating and building movement.
- **Do not install mineral wool that is or has become wet i.e. exposure to water, rain, or snow.**

Water base caulks adhere to some construction materials better than others. Applying a light mist of water to these surfaces can in some instances, help the bonding process. Mineral wool, is one of these materials, especially when it is in a vertical orientatation.

Tooling the installed material can be done in several ways:

- **Dry tooling:** After the material is put in place, using a spatula or other tool that has not been wetted with water, smooth it out.
- **Wet tooling:** After the material has been put in place, using a spatula or other tool that has been wetted with water, smooth it out.
- **Wet tooling:** After the material has been installed, lightly mist the material with water. Use a plastic water spray bottle, turn the nozzle to a mist spray orifice, hold the bottle approximately 10-12 inches (255-305mm) from the area. **DO NOT APPLY WATER TO THE MATERIAL IN A CONCENTRATED JET SPRAY.** This will apply too much water, causing the material to dilute and run out.

Caulking Penetrations

Install the correct amount of caulk material into the opening (annular space) around the service penetration to the depth/thickness required. Make sure that caulking is in intimate contact with the substrate and the penetrating item. Once the caulk is in place, tool the material with a tooling utensil (spatula) to a smooth finish. This will push the installed material into areas not covered in the initial caulking procedure. It will also help to ensure a better bond with mating construction materials.

Caulking Construction Joints

Some construction joints do not require damming material or mineral wool to be used to affect a firestop system. When filler caulk material is the only component required, the installation must be installed in accordance with the listing being used. This usually requires the filler material to be installed into the gap/joint. Once the caulking has been trowelled or gunned in place, the installed material should be tooled into a smooth finish. Work the material to ensure no voids and air holes are left. This is particularly important when caulking to fireproofing materials. Cured fireproofing is very porous and the caulking must be tooled to it to ensure a tight seal and a secure mating surface system, refer to the procedures described above for the proper installation before applying the filler caulking material.

Note: *All installation procedures of firestop caulk materials outlined in the proceeding information are* ***water-based compounds.***

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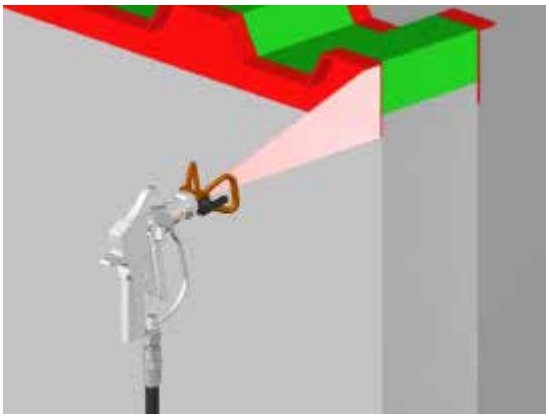
SPRAYING INSTRUCTIONS GRABBERGARD EFS

Firestopping Construction Joints Grabbergard EFS



Determine the installation requirements. Select the appropriate firestop listing for the application

The installation of the safing material is crucial to the joint firestop system. If the mineral wool safing material is poorly installed several undesirable consequences could happen: (1) normal building movement may cause the firestop materials to fall out; (2) if loosely packed and safing is hit with the pressure from the spray gun, the material may blow out of the joint; (3) loosely packed mineral wool will require more firestop spray material to be applied (the wool fiber will open up and create more voids to be filled with the coating).

Surface preparation: To ensure an effective firestop system, remove excessive dust, dirt, debris, frost, water and oils. Remove any rust from supporting members.

Safing Insulation: Use minimum 4pcf mineral wool fiber (some systems may require 6 or 8 pcf)

- **For horizontal joints in wall assemblies:** Select the appropriate nominal thickness for the joint; cut the mineral wool safing material to fit tightly into the joint and compress it to the density (usually 25% compression) required by the listing. The mineral wool should be installed with the laminations (layers) being in a horizontal orientation (this will allow the wool to compress easier and not break apart).
- **Vertical joints in wall assemblies:** Install as outlined above, except for floor joints the safing laminations (layers) should be installed in a vertical orientation. This allows for maximum compression of the safing material.
- **Floor to floor and floor to wall joints:** Install as outlined above, except for the floor joints the safing material should be installed with the laminations (layers) in a vertical orientation. Larger floor joints may require impaling clips or pins, which help support the mineral wool (manufacturer recommends using clips or pins in joints 4 inches and larger).

Operating Electrical Spray Equipment

For optimum equipment operating and cleaning information, consult the spray pump manufacturer's **Owner's Manual** or their local distributor/representative.

Spraying Elastomeric Firestop Techniques

- An important factor when spray-applying Grabbergard EFS is to achieve an even coating over the entire surface being covered.
- Use even strokes to get the best results.
- As much as possible, keep you arm moving at a constant speed.
- Keep the spray gun at a constant distance from the surface. A good distance is 10-12 inches (25-30cm) between the spray tip and the surface.
- Grabbergard EFS can be applied in a single pass up to 80 mil (5/64") wet thickness.
- Overlap the interfacing surfaces with the correct amount of material [usually 1 inch (25cm)]
- If the coating starts to run when applied to vertical assemblies, more than one thin coat may be necessary. Begin the process by first applying a thin tack coating. After a short time apply the desired coating thickness.

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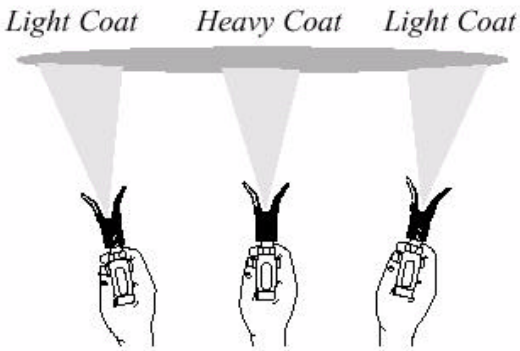
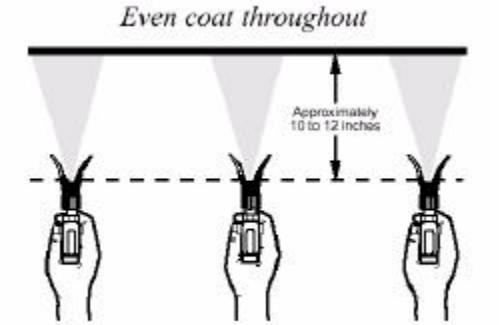
SPRAYING INSTRUCTIONS
GRABBERGARD EFS



Do not flex wrist while spraying.

Keep the gun at right angles on the surface. This means moving your entire arm back and forth rather than flexing the wrist.

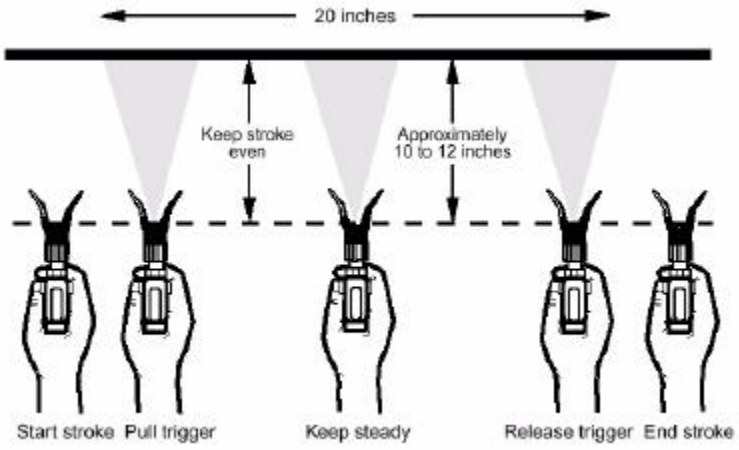


Keep stroke smooth and at an even speed.

Keep the spray gun perpendicular to the surface.

The spray gun should be triggered by turning it on and off with an even stroke.

Proper way to trigger the spray gun



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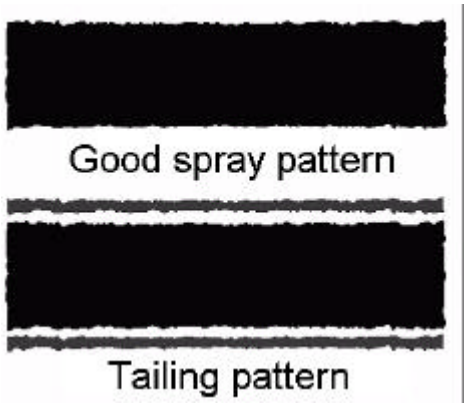
Overlap each stroke by approximately 30%. This will ensure an even coating.



Not Acceptable Spray Pattern

Spray Equipment

Apply Grabbergard EFS using airless spray equipment. Recommended specifications:

Heavy to Moderate Duty

Electric motor	1.50 hp
Maximum Working Pressure	3000 psi
Flow Output	1.25 gpm
20 Amp Mode Cord	Min. 12 gauge (recommend 10 gauge)
Hose size	3/8" (9.5mm)
Hose length	Max. 100 ft.
Spray Gun	Mastic Gun
Spray Tips	Reversible 0.019 to 0.031 (recommend 0.021)
Fan width	2" – 12" (50mm-300m)


EP2510

***Note Remove the filter element and filter support attempting to spray. The screen in some applications could be removed.**

Moderate to Heavy Duty

Electric Motor	1.50 hp
Maximum Working Pressure	3000 psi
Flow Output	0.67 gpm
20 Amp Mode Cord	12 gauge
Hose Size	¼" or 3/8 " (6 or 9.5mm)
Hose Length	Max. 100ft. (30.5)
Spray Gun	Mastic Gun
Spray Tips	Reversible 0.019 to 0.025 (recommend 0.021)
Fan Width	2" – 12" (50-300mm)


EP2305

***Note Remove the filter element and filter support before spraying. The screen (rock) filter could also be removed.**

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SPRAYING INSTRUCTIONS
GRABBERGARD EFS

Light to Moderate Duty

Electric Motor	1.1 hp
Maximum Working Pressure	3000 psi
Flow Output	0.55 gpm
Amp Mode Cord	12 gauge
Hose Size	¼" (6mm)
Hose Length	Max. 100 ft. (30.5)
Spray Gun	Mastic Gun
Spray Tips	Reversible 0.019 – 0.023
Fan Width	2" – 12" (50-300mm)

***Note Remove the element filter and filter support before spraying.**

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Through-Penetrations

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Joint Systems

Intertek / Omega Point Laboratories
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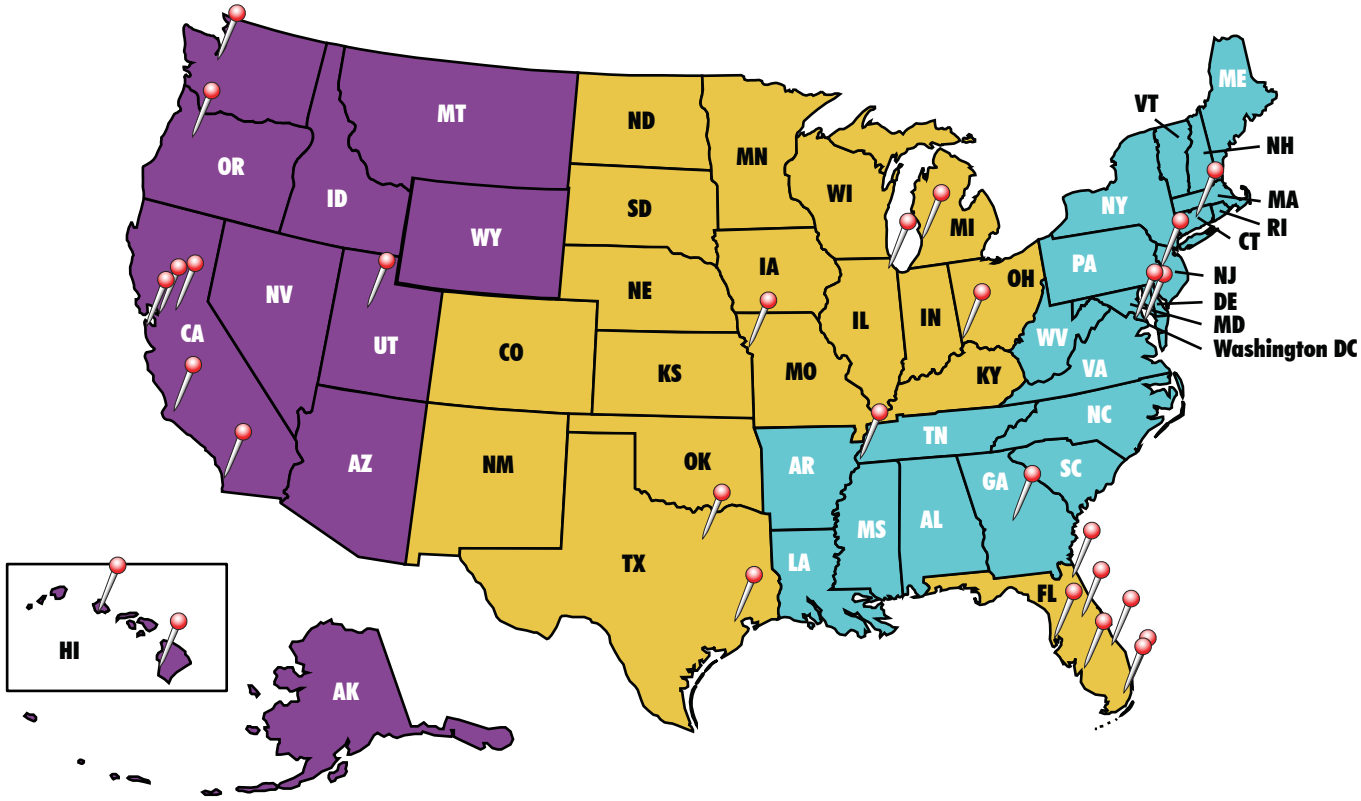

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