FCIA Webinar Series

Gettin' Greasy with Grease Duct *Enclosures*

Bill McHugh, Executive Director of FCIA
Mike Kerrison, Global Application Engineering Manager, Alkegen
Rich Walke, CTI, Consultant to FCIA

FCIA
Firestop Contractors International Association

October 18, 2023

FCIA – Firestop Contractors International Association

- **Fire Exits??**

- **Thanks to FCIA Members**
  - Firestop Contractors
  - Manufacturers, Consultants
  - Firestop Distributors, Reps, Friends

Welcome, Thanks, From FCIA…..

Firestop Contractors International Association

FREE PDF MOP, SPECIFICATION for Code Officials, Fire Marshals,

& Specifiers with Design Firms

Life Safety Digest FREE for ALL

Info@FCIA.org

www.FCIA.org

FCIA – Firestop Contractors International Association

- **Info@FCIA.org for FREE Webinars**
- **Info@FCIA.org FREE Life Safety Digest**
- **INFO@FCIA.org FREE FCIA MOP PDF**
- **UL/ULC, FM 4991 Contractor Programs**
- **IAS AC 291 Inspection Agency Accreditation Program**
- **Firestop Certificate &** Individual Knowledge
- **ASTM Inspection Standards**
- **Resources - VISIT FCIA.org**

FCIA
FIRESTOP
MANUAL
OF
PRACTICE
'THE STANDARD'
FCIA

FCIA – Firestop Contractors International Association

- Canada – Symposiums, National Prescence, NBCC, NFC
- Qatar - Doha FCIA Symposium; Members
- India - Mumbai/Ahmadabad – Fire Safe Build India – IIT-G
- UAE - Dubai – FCIA Symposium; Civil Defence
- Saudi Arabia - Riyadh – BIG5 Show; UL, ICC, TBWIC
- Mexico/LATAM - CONAPCI/AMRACI
- Australia/New Zealand – FPA, Etc.

FCIA Actions –

- ***NEW Education for Careers in Firestopping!!***

- ***FCIA's Firestop Education Program (FEP)***
  - ***3.5 Hours Level 1 – LAUNCHED***
  - ***16.5 Hours Level 2 - LAUNCHED***
  - ***4.0 Hours Level 3 – LAUNCHED***

- ***24 Hours Education…***
- ***30++ Hours = Education & Exams –***
  - ***Members – Unlimited Subscription***
  - ***Non-Members – Visit FCIA.org***
  - ***SPECIFIERS, Code Officials, Fire Marshals – FREE Level 1***

FCIA – Firestop Contractors International Association

- **UL/ULC, FM 4991 Contractor Programs**
  - DRI's
  - Exams for Contractors, Inspection Agencies

  IAS AC 291 Inspection Agency Program
  - Responsible Individuals / Competence

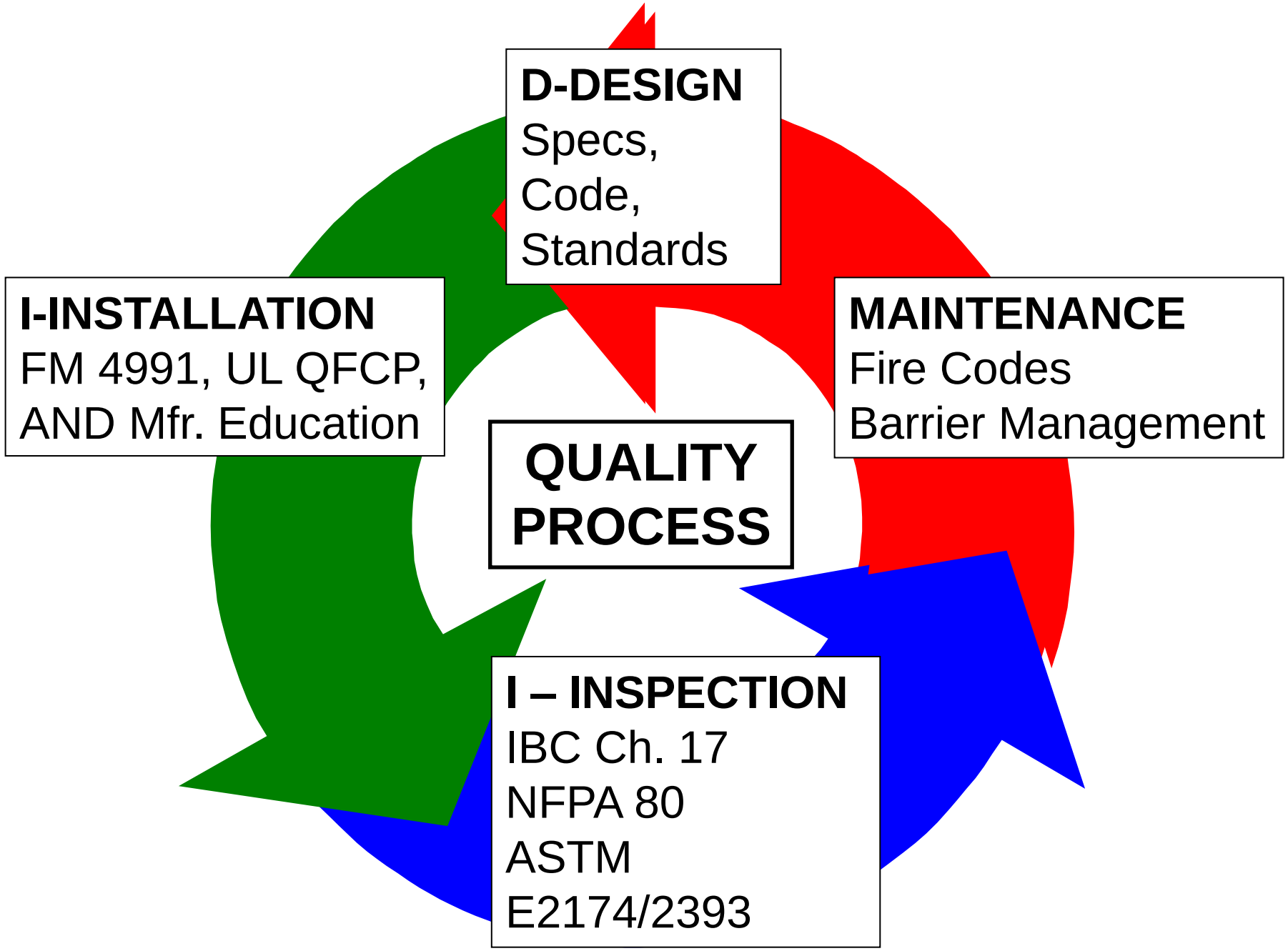
- **ASTM Inspection Standards – ASTM E2174 & ASTM E2393**
  - ***High Rise, Category III & IV, R>250 ('21), NFPA 1, NFPA 101 Appx. & in Specifications Worldwide***

- **Watch FCIA.org for Webinar Announcements!**

Systems & Materials….

“TOTAL FIRE PROTECTION”

- Effective Compartmentation
  - Fire Barriers, Fire Walls, Floors, Smoke Barriers
  - Firestopping, Fire Dampers, Swinging and Rolling Fire Doors, Fire-Rated Glazing
  - Fire-Resistive Protection for Ductwork
- Detection & Alarm Systems
- Sprinkler Suppression Systems
- Education & Egress –
  - Building Owners & Managers, Building Occupants and Firefighters


D-DESIGN
Specs,
Code,
Standards
MAINTENANCE
Fire Codes
Barrier Management
I – INSPECTION
IBC Ch. 17
NFPA 80
ASTM
E2174/2393
I-INSTALLATION
FM 4991, UL QFCP,
AND Mfr. Education
QUALITY
PROCESS

Ch. 17 Special Inspection

1705.1.1 Special cases. *Special inspections* and tests shall be required for proposed work that is, in the opinion of the building official, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

[IBC 2021, 1705.1.1]

Means Wraps, even though not referenced…..

FCIA Webinar Series

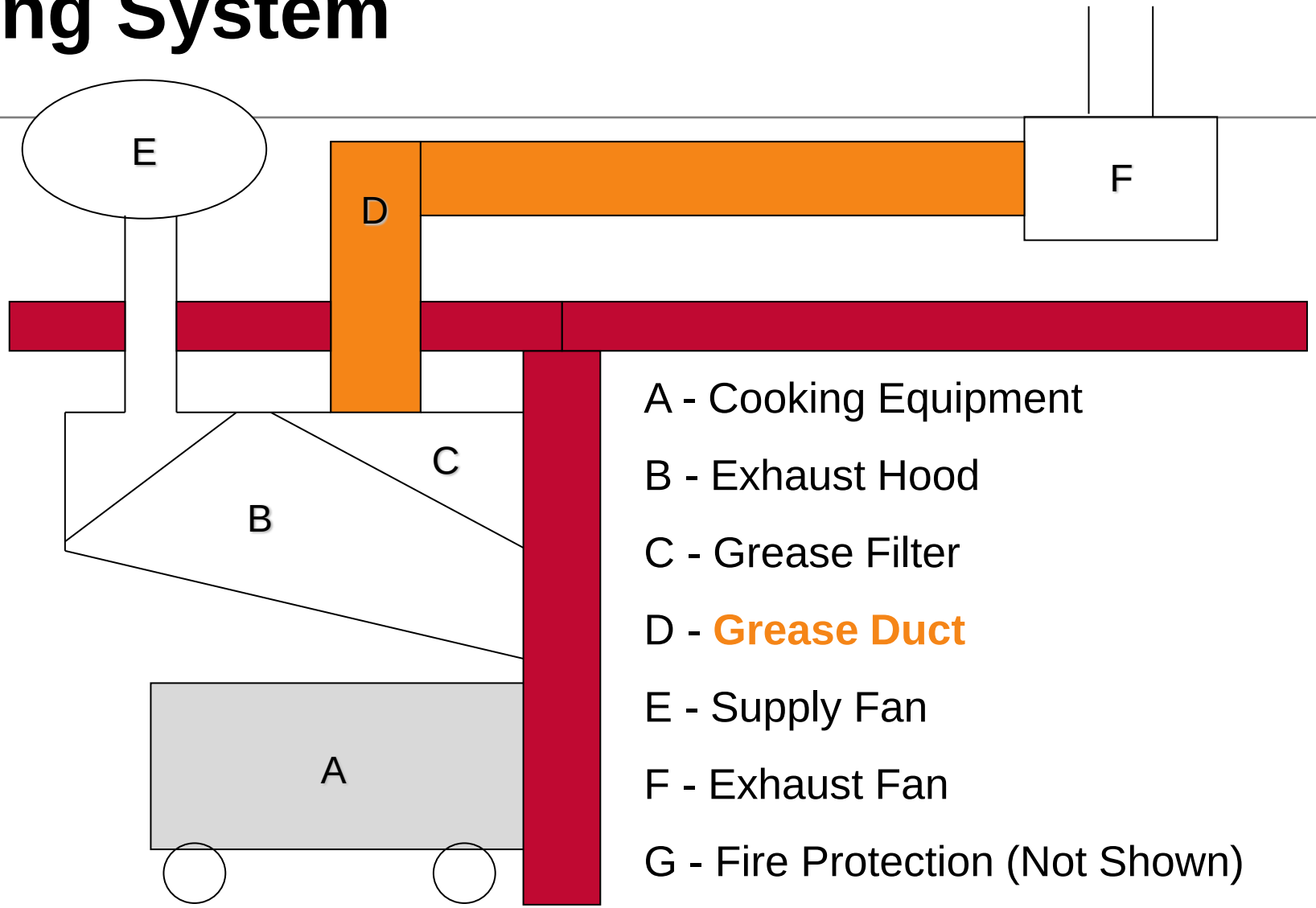
Gettin' Greasy with Grease Duct *Enclosures*

Bill McHugh, Executive Director of FCIA
Mike Kerrison, Global Application Engineering Manager, Alkegen
Rich Walke, CTI, Consultant to FCIA

FCIA
Firestop Contractors International Association

October 18, 2023

Cooking System



A - Cooking Equipment

B - Exhaust Hood

C - Grease Filter

D - **Grease Duct**

E - Supply Fan

F - Exhaust Fan

G - Fire Protection (Not Shown)

The Early Years

- Where a grease duct penetrated a ceiling, wall, floor or any concealed space, the legacy codes and NFPA 96 required the duct be enclosed in a fire-rated enclosure
  - Traditionally that meant a gypsum board shaft enclosure. Issues with shaft enclosures included:
    - Constructability
    - Temperature within enclosure resulted in gypsum board exceeding it's maximum working temperate
    - Clearance requirements resulted in large enclosures

The Early Years Cont.

- When field applied grease duct wrap systems were introduced:
  - No code requirements existed
  - No test standard existed
- Industry requested each of the Legacy Code Evaluation Services develop an Acceptance Criteria for duct wrap systems

The Early Years Cont.

- Each Evaluation Service developed their own criteria based on what they judged to be the hazard. The three criteria were conceptually similar, but different.
- Criteria addressed the following hazards:
  - Flammability of wrap
  - Durability of wrap
  - Internal Grease Duct Fire Test (i.e. grease fire inside duct)
  - Engulfment Fire Test (i.e. external fire exposure)
  - Fire-Resistance Test

The Early Years Cont.

- Criteria Developed:
  - **SBCCI-ES** – Evaluation Guide on Fire Resistance Construction (Flexible Duct Wrap Enclosure Systems)
  - **BOCA-ES** – Outline of Code Requirements & Evaluation Criteria – Flexible Grease Duct Enclosures
  - **ICBO-ES** – AC101 – Acceptance Criteria for Grease Duct Enclosure Assemblies
- Three criteria differed, resulting in different requirements based on adopted code

The Early Years Cont.

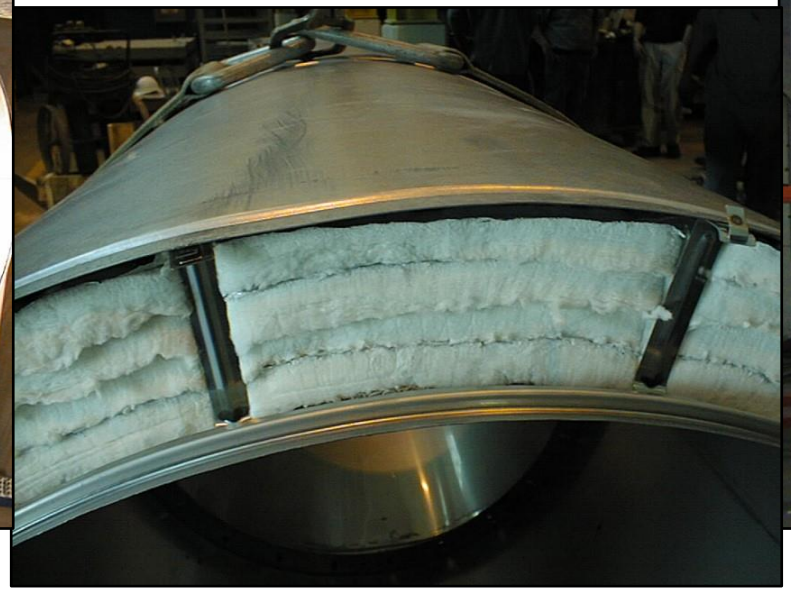
- Differences led Industry, UL, OPL and ASTM to recognize need for a nationally recognized standard
- Two standards ultimately published
  - ASTM E2336 – Standard Test Method for Fire Resistive Grease Duct Enclosure Systems
  - UL 2221 – Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies

The Early Years Cont.

- ASTM E2336 – Published in 2004
  - Covers duct wrap systems
  - Based on the ICBO-ES Acceptance Criteria
  - Requires two layers of 1-1/2 in. wrap

The Early Years Cont.

- UL 2221 – Published in 2001
  - Covers:
    - Duct wrap systems
    - Listed factory-built grease duct assemblies with integral fire protection enclosure



Where Do We Find the Current Code Requirements?

- ICC Codes
  - International Mechanical Code
  - International Fire Code
- NFPA Codes
  - NFPA 96 – Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
  - NFPA 1 – Fire Code

Types of Grease Ducts

- Field constructed grease ducts
- Factory produced grease ducts listed to UL 1978

Grease Duct Requirements for Both Types

- Corrosion Protection
- Construction
- Support
- Air Velocity within duct
- Separate duct for each Type I hood
- Clearances
- Grease accumulation
- Cleanouts
- Enclosures

Duct Enclosure Requirements (IMC)

IMC 506.3.11 Grease duct enclosures.

- Duct serving Type I hood which penetrates a ceiling, wall, floor or any concealed space shall be enclosed with fire-rated enclosure
- Each enclosure shall serve only single grease exhaust duct system

Duct Enclosure Requirements Cont. (IMC)

- No enclosure required where grease duct penetrates only a non-fire-resistance-rated roof/ceiling assembly
- Duct enclosure shall have a fire-resistance rating of not less than the assembly penetrated, and not less than 1 hr

Types of Duct Enclosures (IMC)

- Fire-rated shaft enclosure
  - Shaft to comply with IBC 713
  - 18 in. clearance to combustible construction
  - 6 in. clearance to noncombustible construction and gypsum board on noncombustible structures
- Field-applied grease duct enclosure – Duct Wrap (ASTM E2336)
- Listed factory-built grease duct assemblies with integral fire protection (UL 2221)

Duct Enclosure Requirements (NFPA 96 – 7.7.1)

- Duct which penetrates a vertical fire barrier shall be enclosed with fire-rated enclosure
- In buildings of more than one story and in one story buildings where the roof-ceiling is required to be fire-resistance-rated, duct shall be enclosed with fire-rated enclosure
  - Buildings less than 4 stories – 1 hr
  - Buildings 4 stories or more – 2 hr

Duct Enclosure Requirements Cont. (NFPA 96 – 7.7.1)

- Duct shall be sealed at entrance into enclosure
- No enclosure required where grease duct penetrates only a non-fire-resistance-rated roof/ceiling assembly

Types of Duct Enclosures (NFPA 96 – 4.3 & 7.7.2.2)

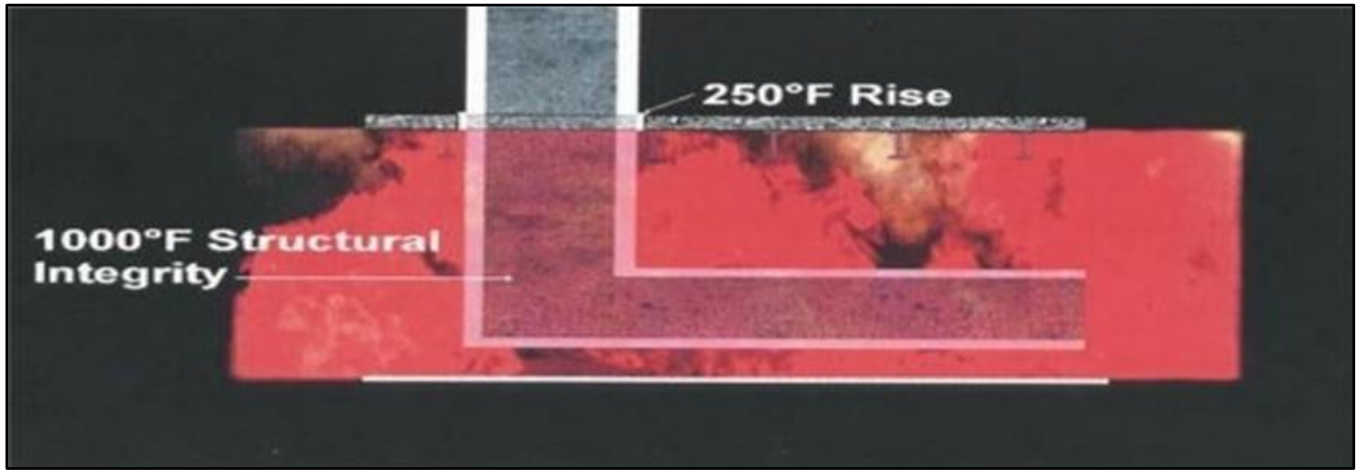
- Fire-rated shaft enclosure
  - 18 in. clearance to combustible construction
  - 6 in. clearance to noncombustible or limited combustible construction
- Field-applied grease duct enclosure (ASTM E2336)
- Listed factory-built grease duct assemblies with integral fire protection (UL 2221)

Field-applied Grease Duct Enclosure (Duct Wrap)

- Consists of wrapping field constructed grease duct
- Listed and labeled to ASTM E2336
- Through-penetration firestop system utilized at locations where duct penetrates fire-rated construction

Listed Factory-built Grease Duct Assemblies

- Consists of complete unit complying with grease duct and fire-rated enclosure requirements
- Listed and labeled to both UL 1978 and UL 2221
- Through-penetration firestop system utilized at locations where duct penetrates fire-rated construction



Where Can I Find The Most Current Listing?

- Directories of the Nationally Recognized Testing Laboratories
  - Intertek Directory of Building Products
  - UL/ULC Product iQ Online Directory

Products become assemblies based on testing!!!

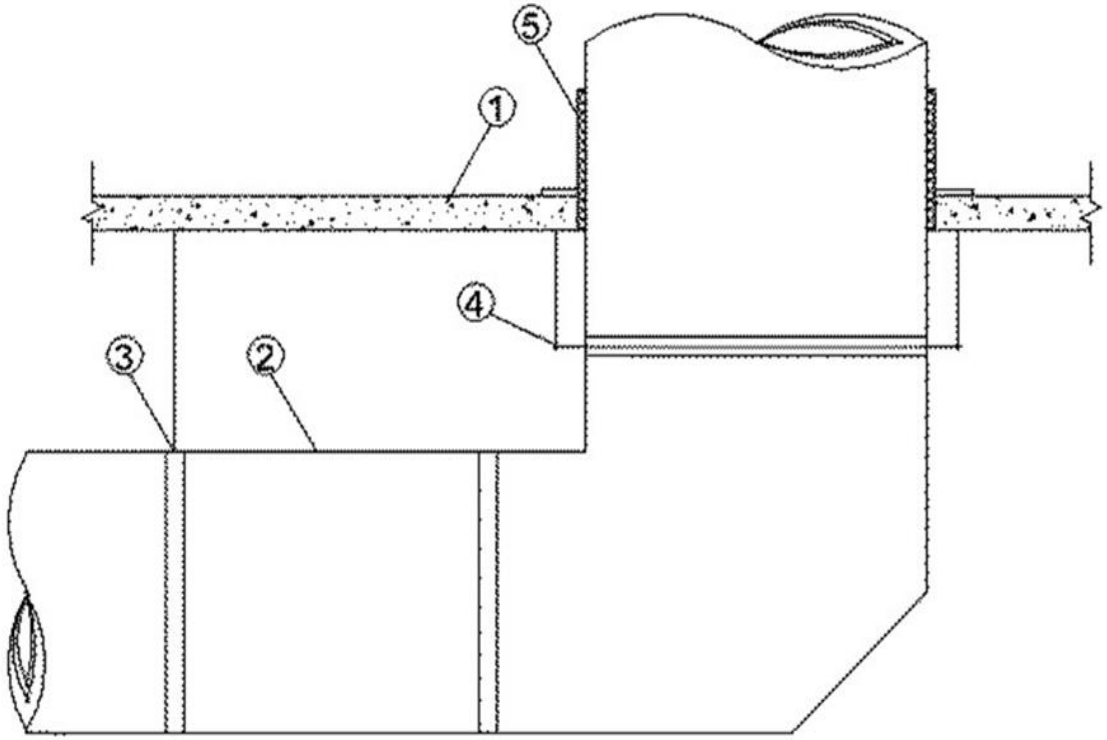
Products installed in assemblies based on mfr's Installation Instructions

Factory-built Grease Duct Assembly Cont.

Assembly No. G-XX

Assembly Ratings – 1 and 2 Hr (See Item 2)

1. Concrete Floor or Wall
2. Listed Factory Built Grease Duct (UL 1978 and UL 2221)
3. Closure Band
4. Hanger System
5. Listed Firestop System



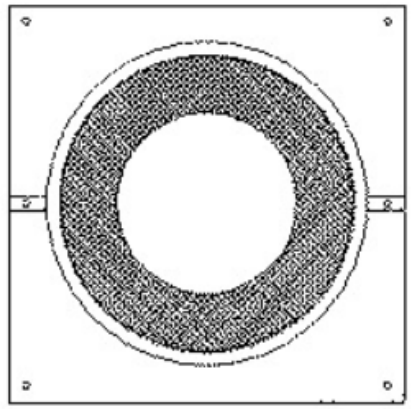
Through-penetration Firestop System at Floor Penetration

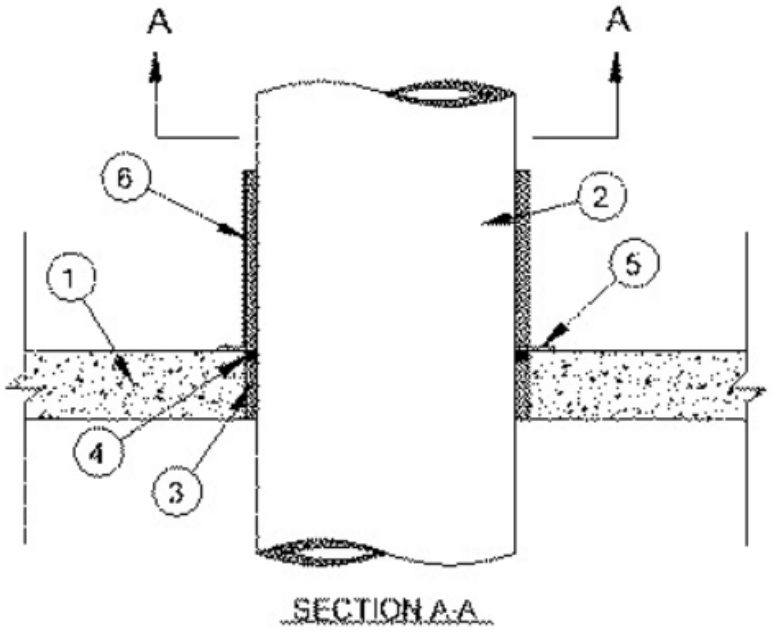
System No. C-AJ-7XXX

F Rating – 2 Hr

T Rating – 2 Hr

1. Concrete Floor or Wall
2. Listed Factory Built Grease Duct (UL 1978 and UL 2221)
3. Packing Material
4. Listed Caulk/Sealant
5. Cover Plate
6. Closure Band





SECTION A-A

Field Applied Grease Duct Listings

Design Number 3MU/FRD 120-18
FIRE RESISTANT GREASE DUCT
3M Company
3M Fire Barrier™ Duct Wrap 615+
ASTM E 2336-04 (2009) and
ICC-ES Acceptance Criteria for Grease Duct Enclosure Systems (AC101)[1]
Noncombustibility Test (ASTM E 136) – Pass
Fire Resistance Test (ASTM E 119) – 2 hr
Durability Test (ASTM C 518 modified) – Pass
Internal Fire Test – 4 hr @ 500°F and 30 minutes @ 2000°F – Pass
Fire-Engulfment Test (ASTM E 119 Exposure) – 2 hr

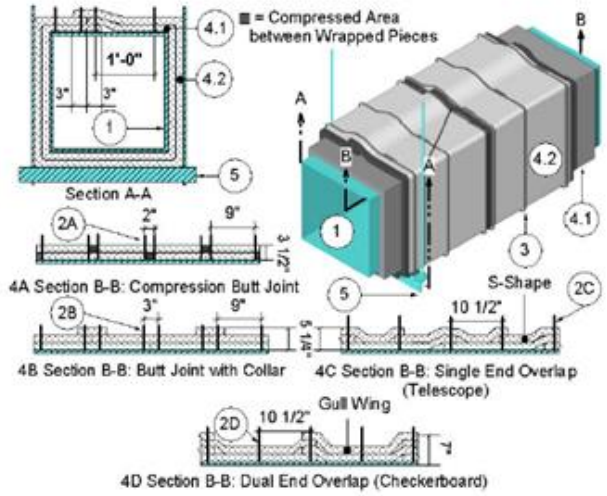


Figure 1

[1]ACCEPTANCE CRITERIA FOR GREASE DUCT ENCLOSURE ASSEMBLIES, AC101, Approved April 2001 (Editorially revised October 2004) states, "The system may be installed with zero clearance from the insulating materials to combustibles".

Date Modified: October 29, 2012
Project No: 100922132SAT-002A

Intertek

Unifrax I LLC
Design No. UNI/BI 120-14
FIRE RESISTANT GREASE DUCT
FyreWrap® Elite® 1.5 Duct Insulation
ASTM E 2336-16 and
ICC-ES Acceptance Criteria for Grease Duct Enclosure Systems (AC101)[1]
Non-combustibility Test (ASTM E 136) – Pass
Fire Resistance Test (ASTM E 119) – 2 Hour
Durability Test (ASTM C 518 modified) – Pass
Internal Fire Test – 4 Hour @ 500 °F and 30 minutes @ 2000 °F – Pass
Fire-Engulfment Test (ASTM E 119 Exposure) – 2 Hour

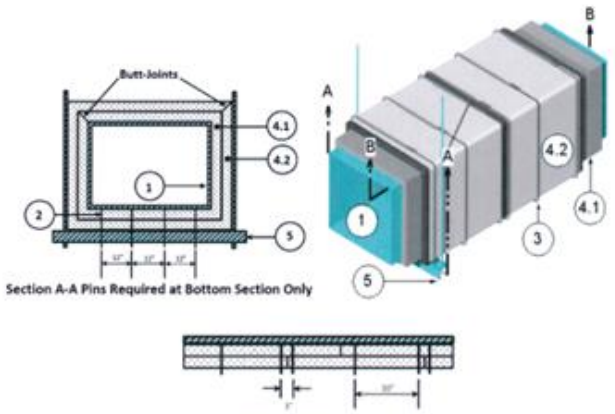


Figure 1

[1] ACCEPTANCE CRITERIA FOR GREASE DUCT ENCLOSURE ASSEMBLIES, AC101, Approved April 2001 (Editorially revised October 2004) states, "The system may be installed with zero clearance from the insulating materials to combustibles.

Date Issued: November 30, 2016
Project No. G102720223

Intertek

HNKT.G-18
Grease Duct Assemblies

Page Bottom

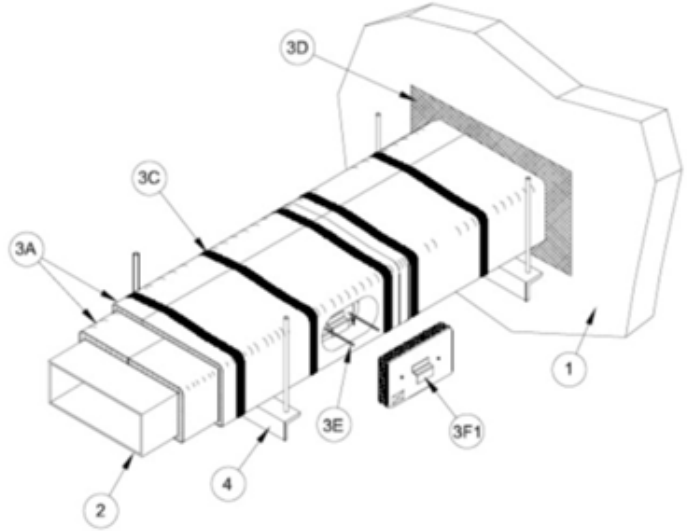
Grease Duct Assemblies

See General Information for Grease Duct Assemblies

Assembly No. G-18

February 24, 2014

Assembly Rating – 2 Hr



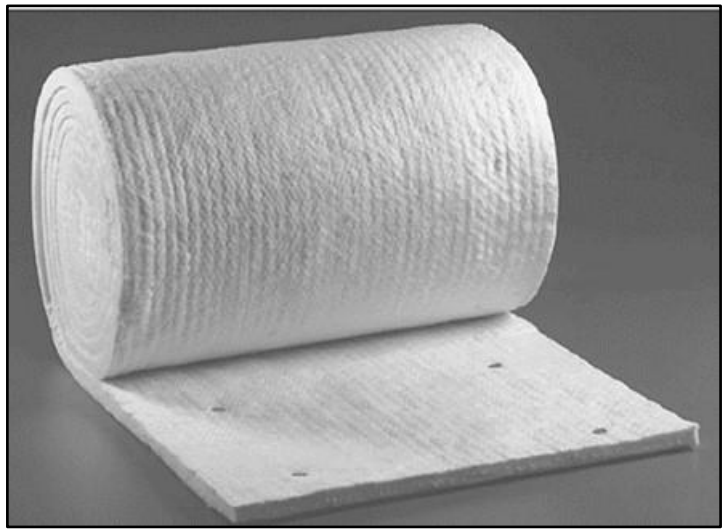
Classified in accordance with the SBCCI Public Safety Testing and Evaluation Services Inc. Evaluation Guide on Fire Resistance Construction (Flexible Duct Wrap Enclosure Systems), dated January 1, 1998 as an alternate to 2 Hr fire resistance rated shaft enclosures with a minimum zero clearance to combustibles.

Classified in accordance with ICBO Evaluation Services, Inc. Acceptance Criteria for Grease Duct Enclosure Systems, dated April 2001 as an alternate to 2 Hr fire resistance rated shaft enclosures with a minimum zero clearance to combustibles. Also Classified in accordance with the requirements of ASTM E 2336-04, "Standard Test Methods For Fire Resistive Grease Duct Enclosures".

1. **Floor or Wall Assembly** – Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf, 1600-2400 kg/m^3) concrete floor or min 4-3/4 in. (121mm) thick reinforced lightweight or normal weight concrete wall. Wall may also be constructed of any UL Classified Concrete Blocks.

Flexible Field Applied Wrap Products

- High temperature insulation (2300°F)
- AES wool (LBP) blankets
- Scrim encapsulated
- Non-combustible (ASTM E136)
- Low surface burning <25/50 (ASTM E84/UL 723)



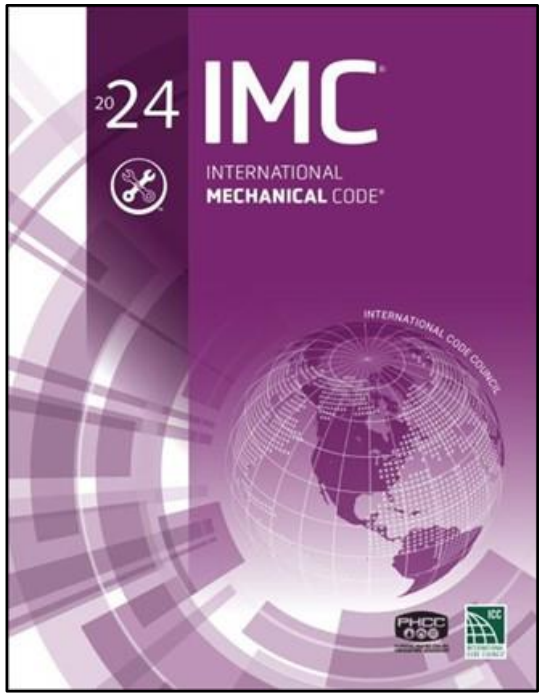
Flexible Field Applied Wrap Systems

Field constructed grease duct + flexible wrap = Fire Resistive Duct SYSTEM

Code Highlights

506.3.11.2 Field-applied grease duct enclosure

- Each duct requires it's own enclosure (506.3.11)
- Listed & labeled per ASTM E2336
- Equal F&T per ASTM E814/UL1479
- Wrapped from point of origin to outlet terminal
- Partial application not permitted for reduction of clearance
- No change for the 2024 edition of the IMC



Through-penetration Firestop - Floor

Embedded in E2336 System

F Rating – 2 Hr

T Rating – 2 Hr

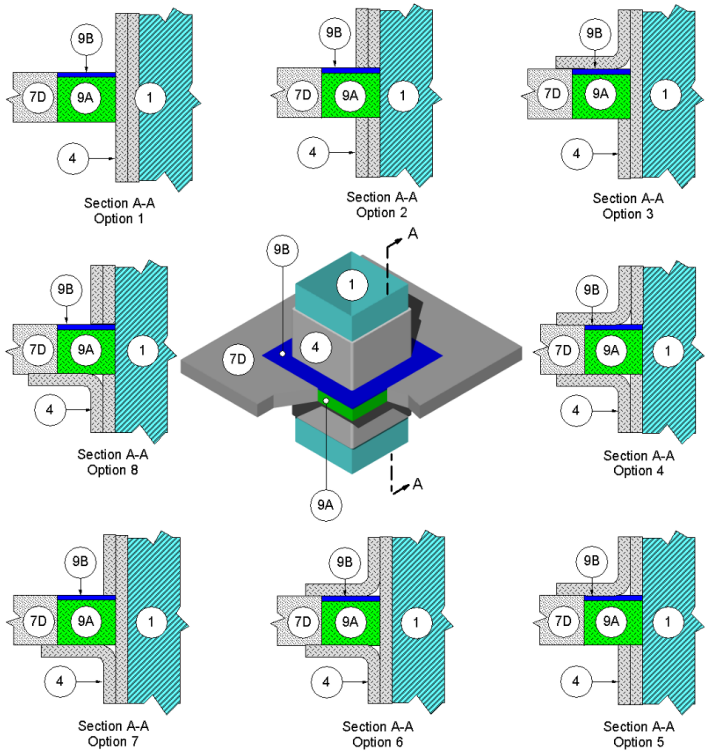
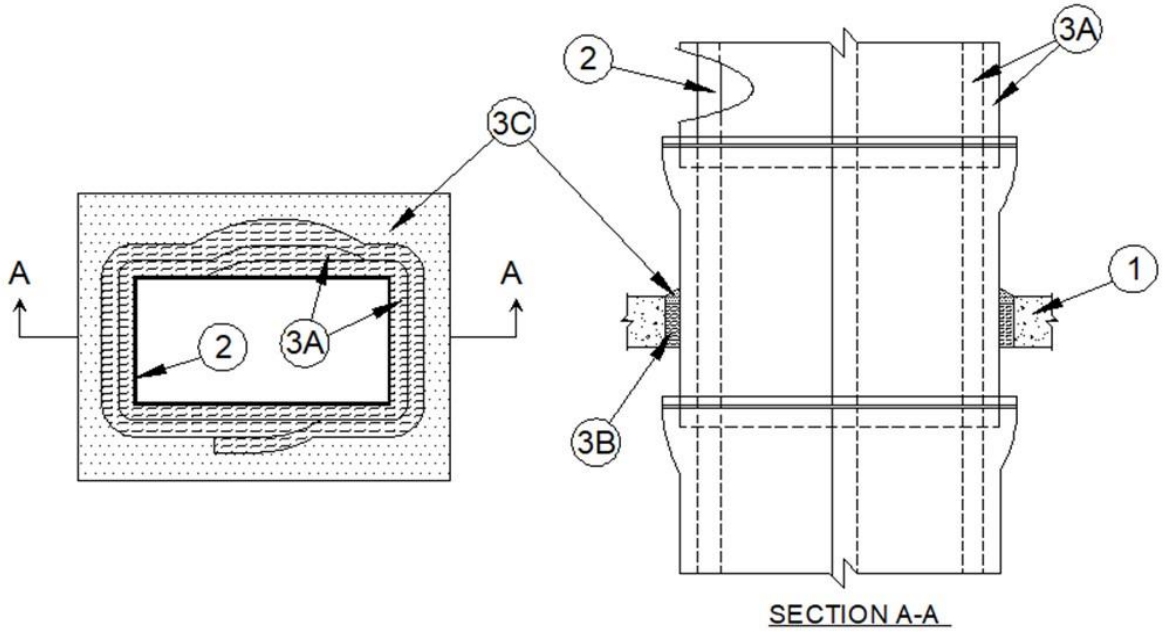


Figure 7 – Penetration Firestops for Floor Supporting Construction

Referenced in E2336 System

F Rating – 2 Hr

T Rating – 2 Hr



Through-penetration Firestop - Wall

Embedded in E2336 System

F Rating – 2 Hr

T Rating – 2 Hr

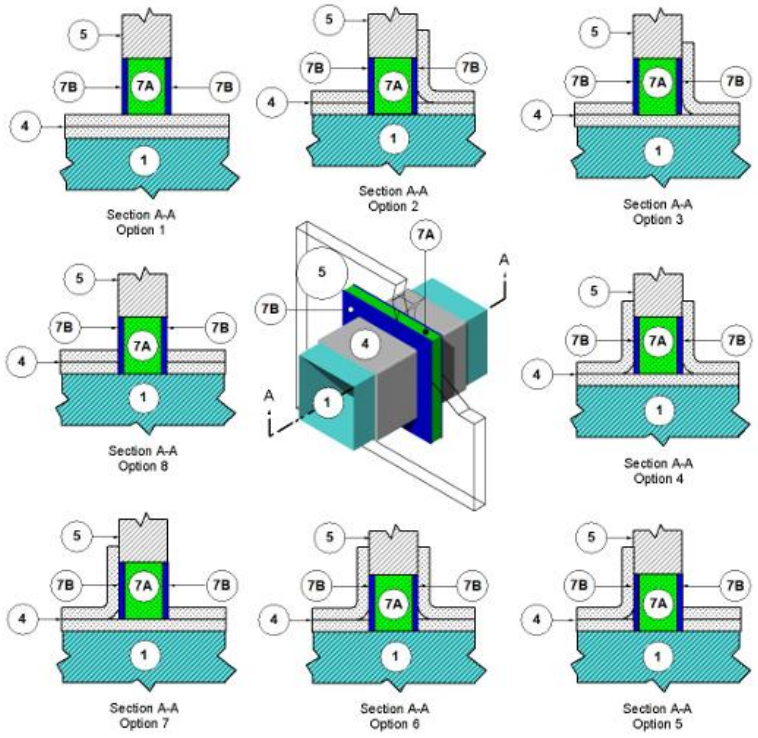
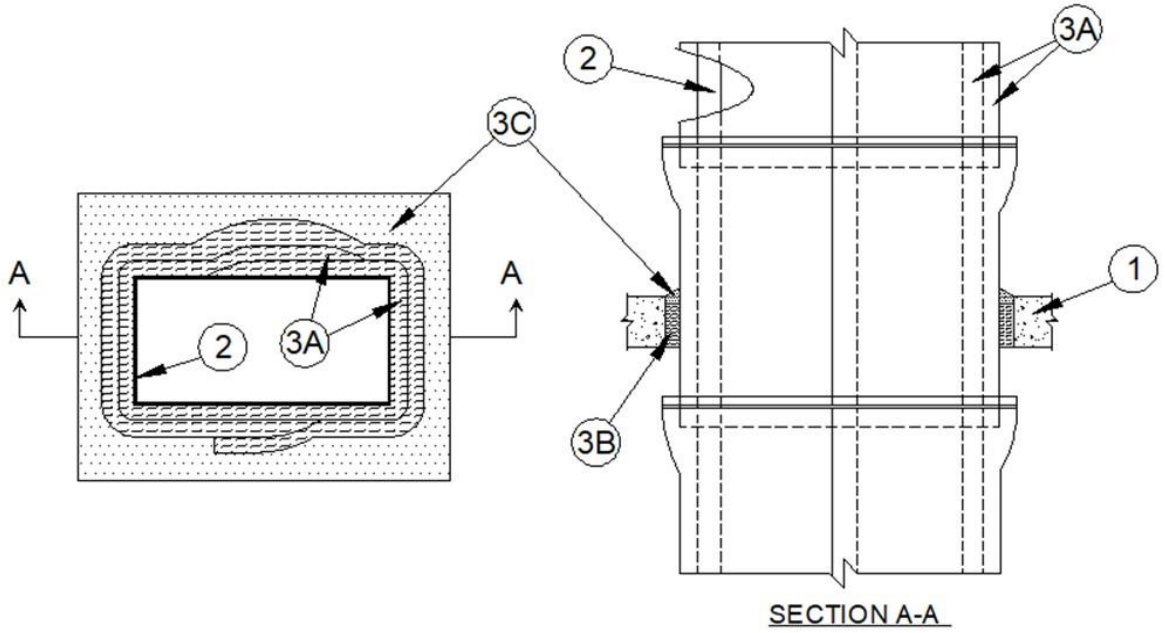


Figure 2. Penetration Firestop Systems – Wall Penetrations

Referenced in E2336 System

F Rating – 2 Hr

T Rating – 2 Hr



Installation Materials

Typical Installation Materials

- Insulation knife
- Filament tape - optional
- Aluminum foil tape
- ½” wide steel banding and clips
- Banding tools
- CD pin welder
- Insulation weld pins & washers (speed clips)
- Cuphead pins

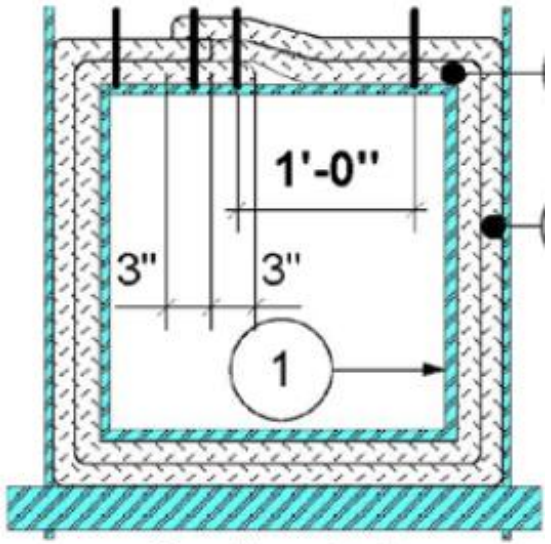
Installation Guidelines - General

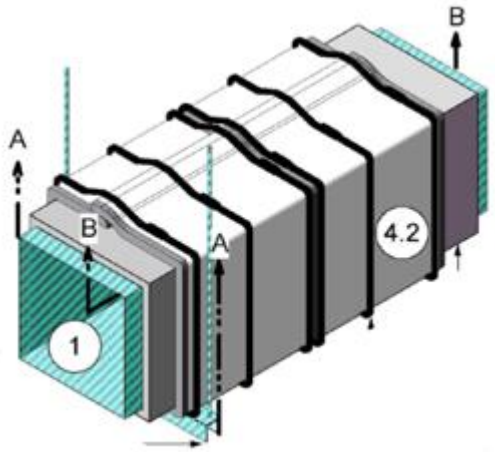
Roll out material and pull tautly before measuring or making any material cuts

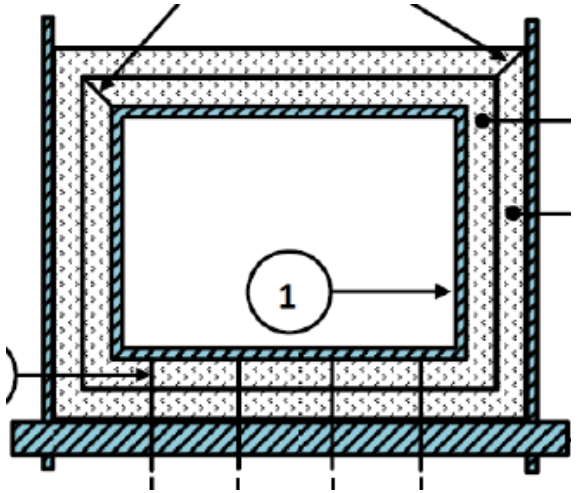
Tape cut edges of wrap with aluminum foil tape

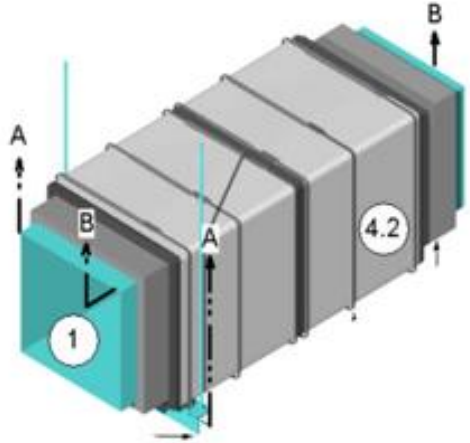
Installation Guidelines - General

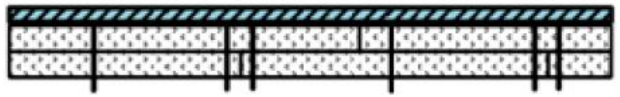
- Overlap or butt per listing/manufacturer's installation guidelines
- Two layers - offset/stagger between 1st and 2nd layer







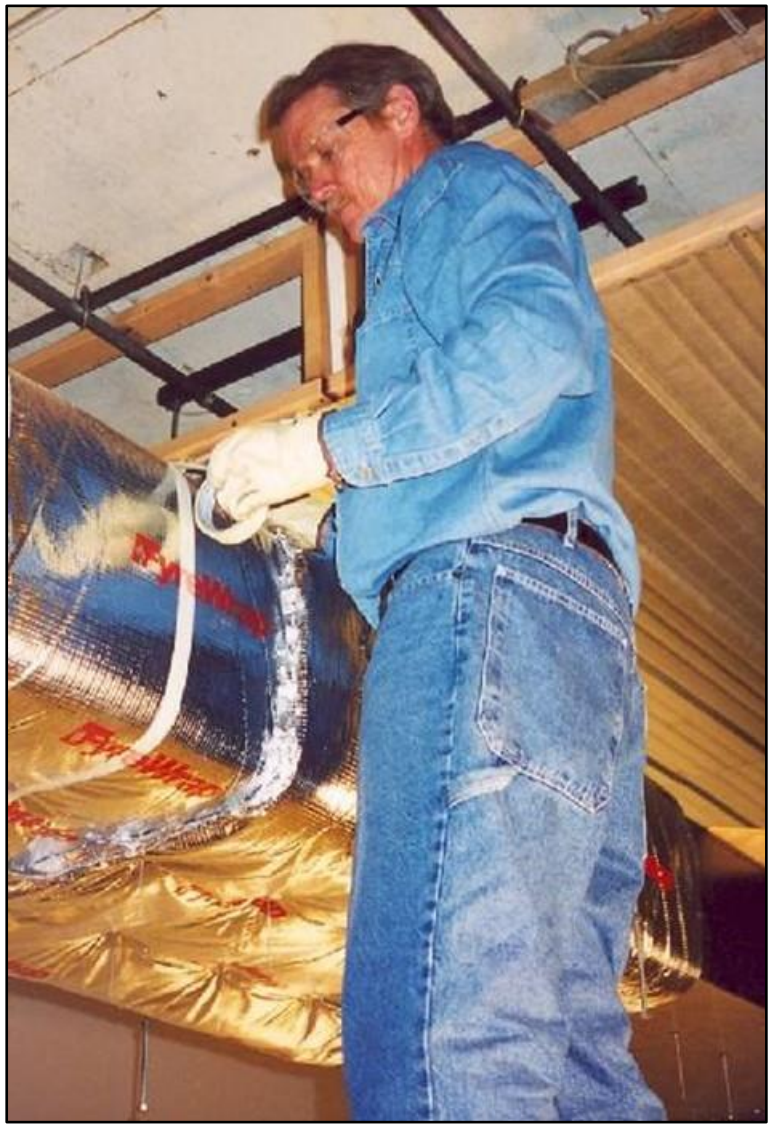




Installation Guidelines - General

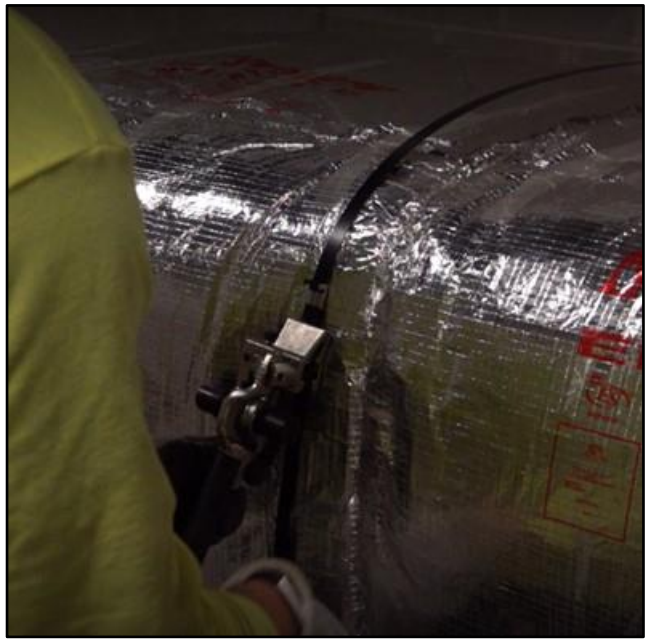
Filament Tape

- Optional installation aid to temporarily hold the duct wrap in place until a permanent attachment is installed
- Does not need to be removed



Installation Guidelines - Mechanical Fastening

Steel banding and/or weld pins – driven by duct size



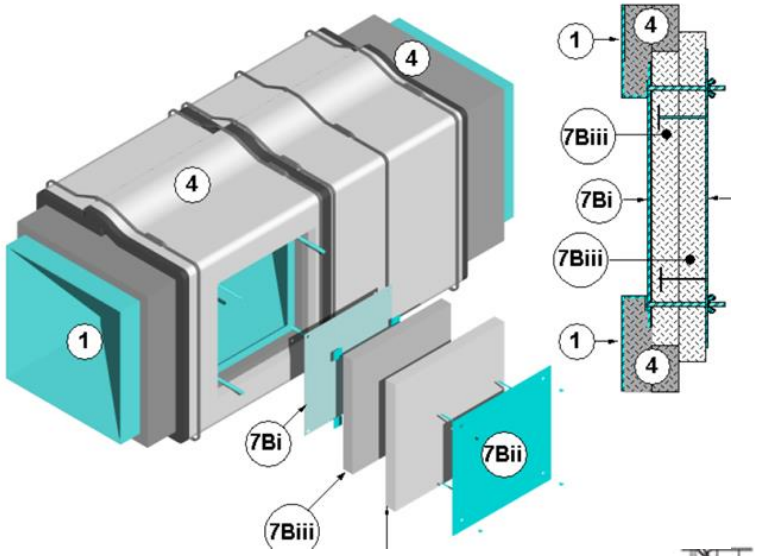
Banding

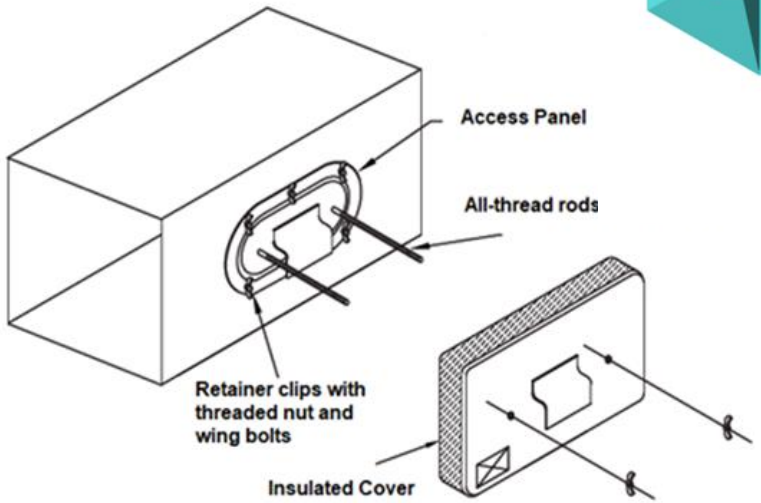
Pre-welded pins & speed clips

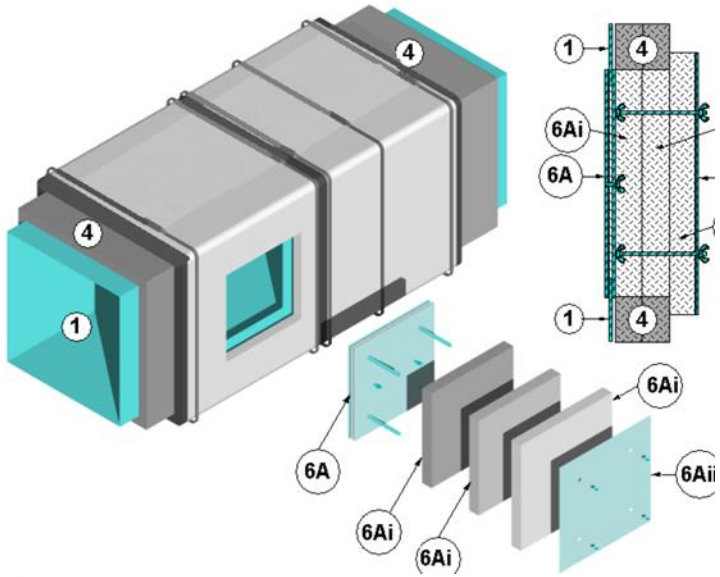
Cuphead pins

Access Doors/Cleanouts

Required per ASTM E2336 as part of assembly







Through-penetration Firestop

Field conditions - flexibility

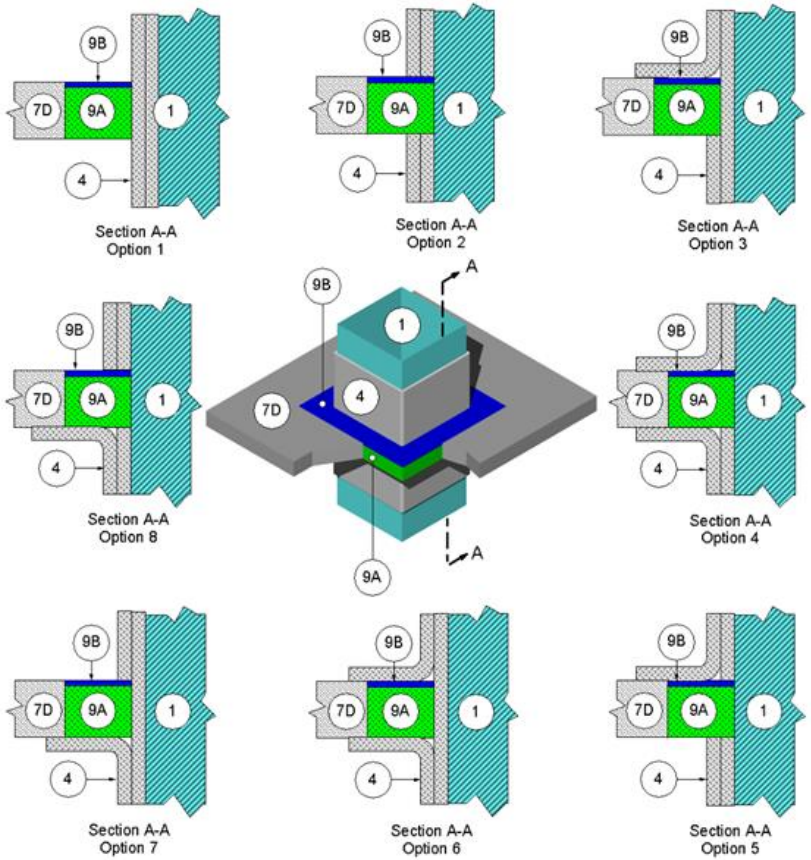
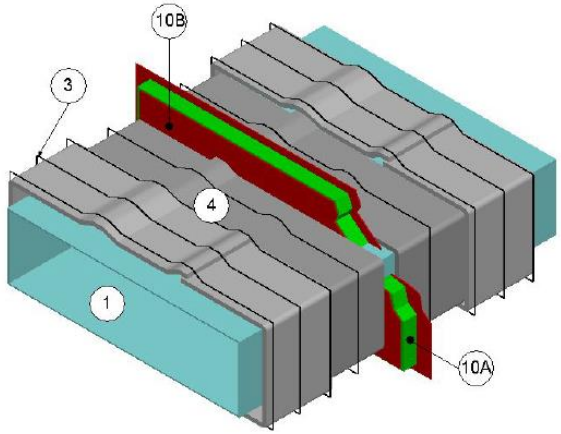
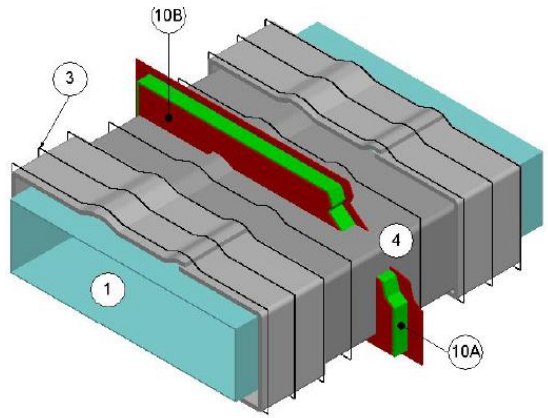


Figure 7 – Penetration Firestops for Floor Supporting Construction



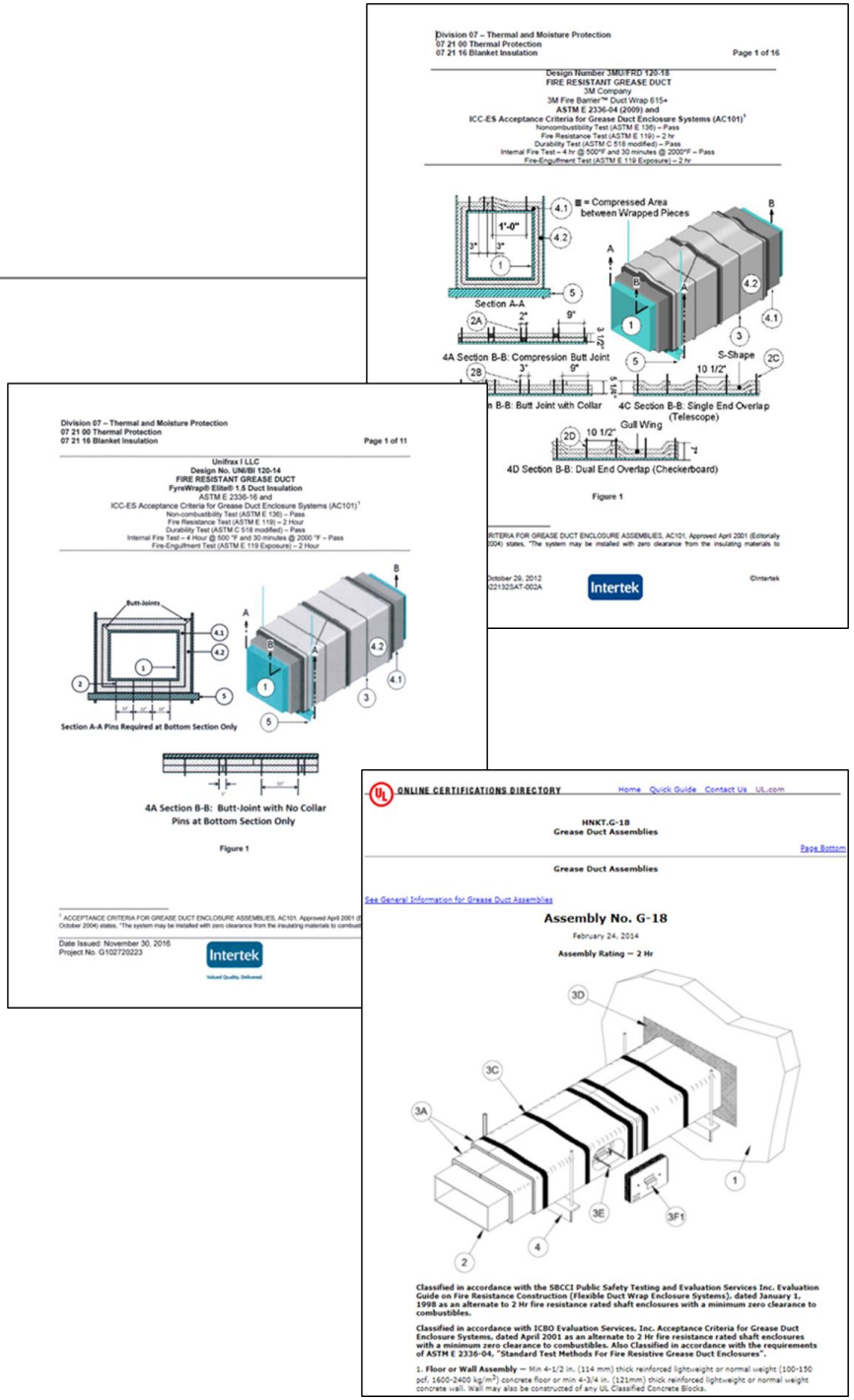
Symmetrical Firestops for Horizontal Grease Ducts
without Insulation Through Noncombustible Wall Assemblies



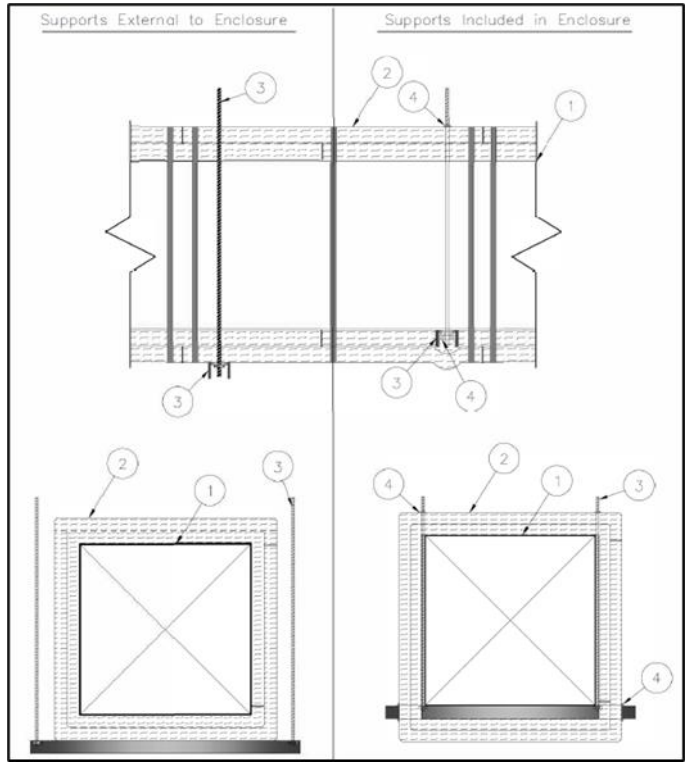
Symmetrical Firestops for Horizontal Grease Ducts
with Insulation Through Noncombustible Wall Assemblies

Listing Details

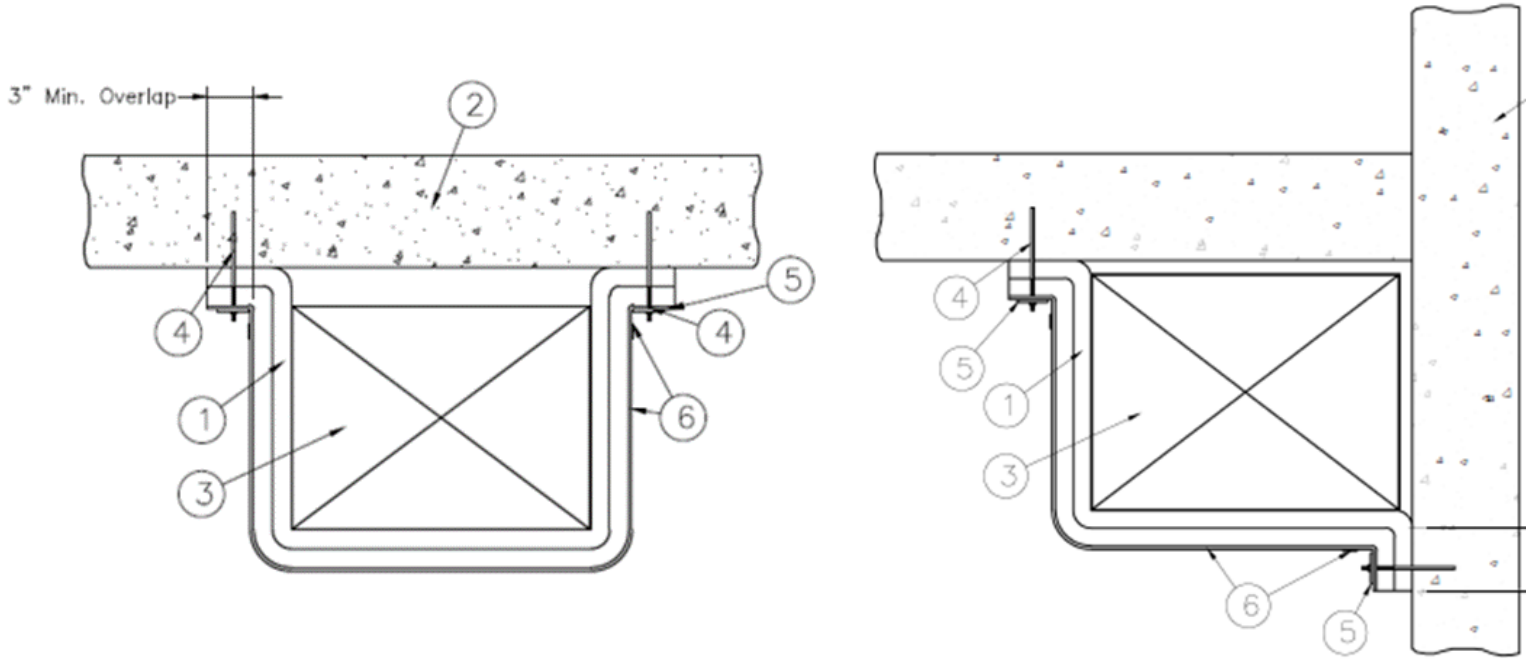
- Tested duct size and construction
- Wrap material
  - Properties – thickness, density, etc.
  - # of layers
  - Overlaps/butt joints, layer offset requirements
- Mechanical attachment
- Support hangers and spacing
- Access doors
- Through-penetration firestop



Non-Standard Field Conditions



Supports wrapped within

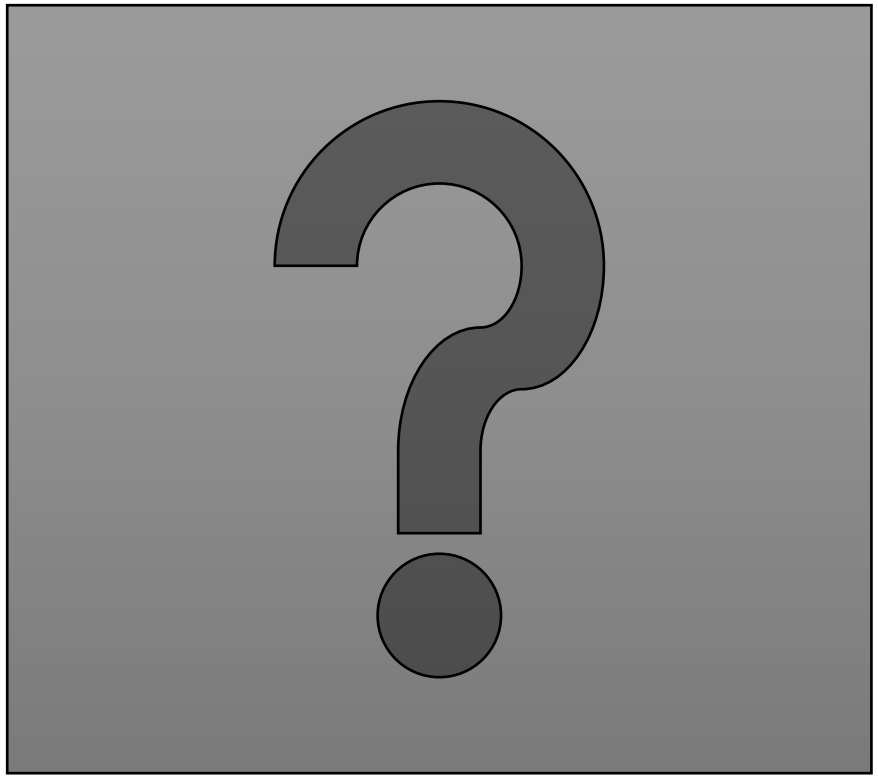


Duct close to rated assemblies

Worth Mention…

- One layer ≠ One hour rating
- NO peel and stick insulation pins
- NO aluminum banding
- Patch/repair procedure
- Overlaps/butt joints won’t hold themselves closed in a fire
- Flexible wrap products are not fire resistance rated, systems/assemblies are
- When in doubt, it’s life safety, Please Ask

Questions??



Bill McHugh, FCIA Executive Director
Mike Kerrison, Alkegen
Rich Walke, Consultant to FCIA
Firestop Contractors International Association
800 Roosevelt Road
Building C, Suite 312
Glen Ellyn, IL 60137
+1-708-202-1108

FCIA
Firestop Contractors International Association