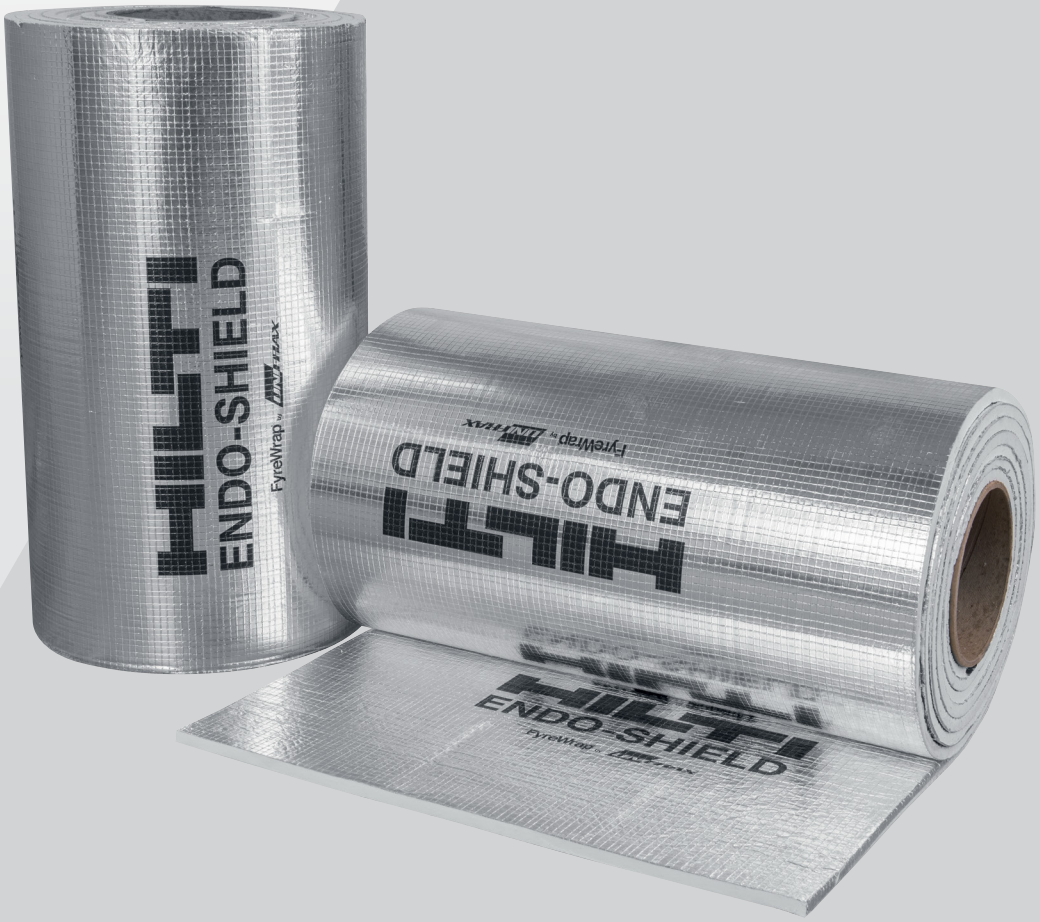
HILTI ENDO-SHIELD

Application Guideline



GENERAL INFORMATION

HILTI ENDO-SHIELD OVERVIEW

The new Hilti Endo-Shield is the 1st Low Bio Persistent (LBP) Endothermic mat for passive fire protection of critical cable circuits, fuel lines, communication systems and many other MEP applications.

Hilti Endo-Shield is the only endothermic mat in the market made using non-carcinogenic LBP fibers, removing a common safety hazard for installers. Our LBP mat provides health and safety benefits over competitive products that contain ceramic fibers making it ideal to meet higher safety requirements in projects such as healthcare.

With its unique lightweight and highly flexible design, Hilti Endo-Shield is a more efficient solution, especially for small diameter pipes.

Hilti Endo-Shield's double-sided foil scrim feature makes it the only endothermic solution, that can be installed from either side, reducing installation errors.

Furthermore, this unique feature makes the product more robust, and less susceptible to damage. With extensive 3rd party testing according to ASTM E 1725 and UL1489, Hilti Endo-Shield offers multiple installations (telescoping, individual layers, and continuous wrapping with and without sealant) and fastening methods (18-gauge tie wire & steel banding), thereby helping reduce the need for engineering judgements.

Additionally, we are introducing "Endo-Shield estimation tool," that will help assist in calculating your application material needs quicker and easier for single and multiple pipe applications.

Hilti Endo-Shield meets stringent sustainability requirements for Leed V4 projects

HILTI ENDO-SHIELD IS THE THE 1ST LOW BIO PERSISTENT ENDOTHERMIC MAT FOR PASSIVE FIRE PROTECTION. MAKE THE SWITCH!

Easter to install

- Flexible material - easier to install, even on small diameter conduits complex shapes (elbows, anchors, hangers, etc.)

- Easy to cut due to low density
- Double-sided foil scrim feature makes it the only endothermic solution, that can be installed from either side, reducing installation errors.

27% Lighter weight

- Uniquely lightweight, it is 22 lbs. lighter than E-Mat allowing for easier product handling and installation

Unique health and safety benefits

- Low bio persistent material: Helps fibers to clear from lungs easily compared to ceramic fibers. No carciongenic label needed.
- Only LBP product on the market today

Multiple installation and fastening methods

With extensive 3rd party testing according to ASTM E 1725 and UL1489, Hilti Endo-Shield offers multiple installation and fastening methods reducing the need for engineering judgements.

Robust design to withstand application

- **Double sided scrim** product is less susceptible to damage
- Cleaner installation

Leed V4 complaint and Made in USA

- Hilti Endo-Shield meets stringent sustainability requirements for Leed V4 projects
- Government funded project qualification
- Shorter lead time

GENERAL INFORMATION

CIRCUIT PROTECTION IS KEY TO PROTECT CRITICAL PATHWAYS DURING A FIRE

Circuit protection is needed for different critical systems within a building. Systems such as pressurization fans, fire alarm, fire pump, smoke extraction fans, emergency generator, firefighters elevators and Distributed Antenna System (DAS) – used by first responders to be able to communicate within a building during an emergency, needs to be protected to help ensure its functionality during fire emergencies.

Protecting survivability pathways requirements are well defined in the model code. In the 2015 IBC code the requirement was to use rated cables or to build a rated construction such as building a rated gypsum enclosure or encasing with concrete.

Even though endothermic systems for circuit protection have been used for years, IBC 2018 formally allows the use of an "electrical circuit protective system" installed in accordance with the listing requirements. This allowed the endothermic solution to be officially included in the IBC code. Additionally, NFPA 72 mentions the need to protect emergency communication systems. These model code requirements show a growing relevance of this application in the market.

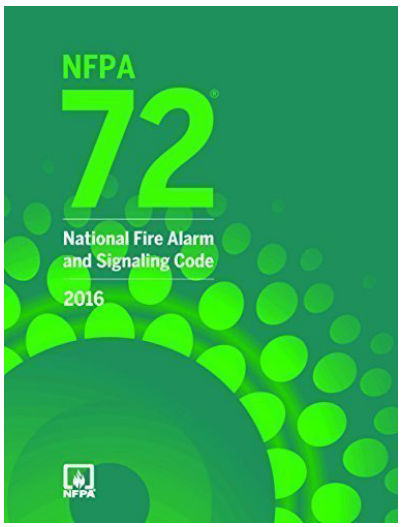
IBC 2018 now says:

In addition to IBC 2015 requirements: Electrical circuit protective systems shall have a fire resistance rating of not less than 1 hour. Electrical circuit protective systems shall be installed in accordance with their listing requirements.

2018 IBC Section	System
412.3.7	Airport Traffic control towers
909.20.6.1	Smoke control system
913.2.2	Fire pumps
2702.3	Emergency and standby power systems

NFPA 72 '16

Two-way in building wired emergency communications systems shall have a pathway survivability of level 2 or level 3 (2hr system or 2hr system+ sprinklers)



GENERAL INFORMATION

SAMPLE PROJECT ESTIMATION

Circuit Protection

Use Hilti's Endo-Shield estimation tool, which allows you to calculate your application material needs quicker and easier for single and multiple pipe applications. This is an example of how to use the calculator. Numbers are not from an actual quote or job. Please reach out to your Hilti Fire Protection Specialist to get the Endo-Shield estimation tool. Contact your Fire Protection Specialist to get the estimation tool.

Endo-Shield Estimation Tool
Single circular pipe

Buy Systems **www.hilti.com**

Project Title	Project Example
Date	Tuesday, July 6, 2022

1. Metric data

Pipe actual outside diam.:	3.5 in.	Note: Bends should not be taken in account for the endo-shield bill of material. See systems.
Length of run:	500 ft.	
Number of layers:	5 layers	
Overage of waste:	5%	This is an example. The waste percentage is the customer preference.

2. System data

Type of joints:	◎ Telescoping	◉ Butted	
Joint sealing method:	◉ Sealant + Alu. tape	◎ Collar	◎ Alu. tape
Final wrapping method:	◉ Tie wire	◎ Steel banding	
Layers install. method:	◉ Ind. wrapping layers	◎ Continuously wrapped layer	

3. Price data and build of material

Cost of Hilti Endo-Shield:	$ 700.00	20 ft Roll	125.7	Rolls	$	87,961.88
Cost of Hilti sealant:	$ 4.00	20 oz Foil	40.8	Foils	$	163.20
Cost of aluminum foil tape:	$ 15.00	250 yd Roll	6.9	Rolls	$	103.21
Cost of tie wire:	$ 15.00	200 ft Roll	18.6	Rolls	$	278.93
Cost of steel banding:	$ -	200 ft Roll	0.0	Rolls	$	-
				Total cost	$	88,507.22
				per foot	$	177.01

4. Endo-Shield cut

Layer	Cut length (in)	Cumulative weight (lbs/ft)
1	16.6	1.9
2	19.8	4.1
3	22.9	6.7
4	26.1	9.6
5	29.2	12.9

5. Joints and final wrapping cut

Joint sections			Wrapping
Sealant qty (oz)	**Alu. tape (in)**	**Collar (in)**	**Tie wire (in)**
3.3	31.7	X	35.7
Every section	Every section	Every section	5 per section

GENERAL INFORMATION

TECHNICAL SUPPORT

Hilti's Fire Protection Design Team is ready to support your Endo-Shield application. When there is a situation where a listing does not meet your application requirements, our fire protection engineers can provide an Engineering Judgment (EJ).

We look forward to expanding our EJ selections on the Hilti Construction Platform (HCP) to include Endo-Shield options. Until that time, we ask that you submit a Question request when you need an EJ or have a technical question. Please include the following information when submitting for an Endo-Shield EJ.

- Application – Fuel Line Protection or Circuit Protection
- Type and Size of Service Item (conduit, tube, etc.)
- Hourly Rating Required
- Special Conditions, e.g. multiple service items in close proximity

If you have not yet visited the HCP, please visit hilti.com/ej (US) or hilti.ca/ej (CA) for more information on how to register and use this digital platform to submit firestop engineering requests.

You can also speak with a fire protection engineer between 7 AM and 5 PM CST, Monday through Friday by calling customer service at 1-800-879-8000.

ELECTRICAL CIRCUIT PROTECTION

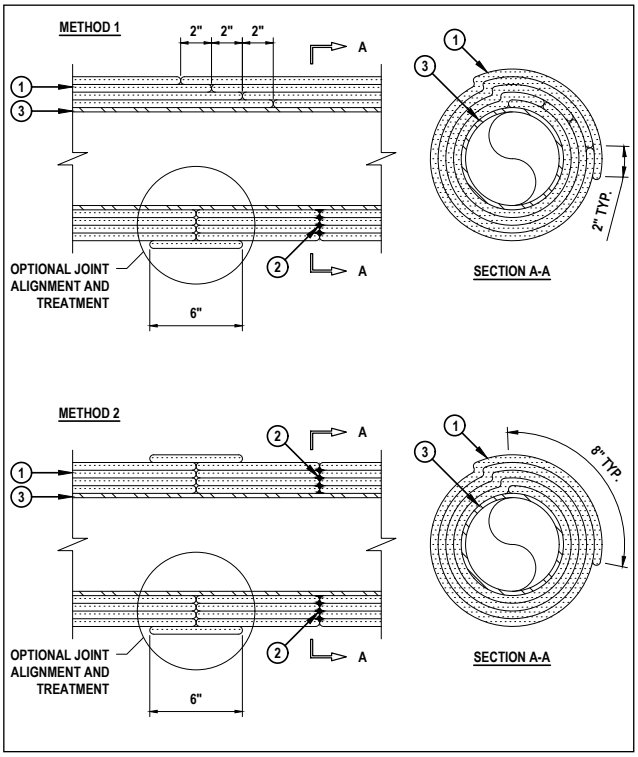
This application guide does not cover all configurations (limitations in material, sizes, etc.). Before handling and for specific application details, refer to Hilti product literature, 3rd party published listings and national approvals. For professional use only.

1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.1 Aligned Seams with Sealant

Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.



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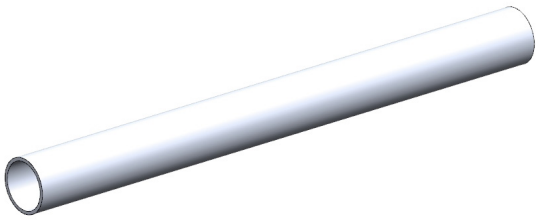

Layer 1: Tape Hilti Endo-Shield to the conduit with min. 1/2 in. wide filament tape, FSK tape or aluminum tape.

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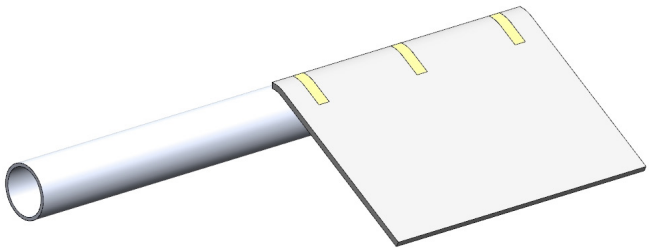

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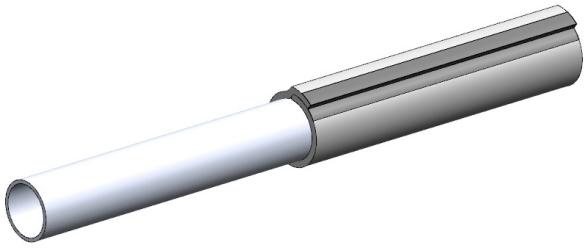

Wrap Hilti Endo-Shield tightly around the conduit overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

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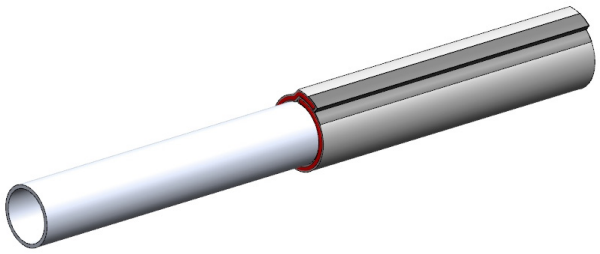

Add 1/8 in. depth of Hilti CP 606 or FS-ONE MAX at the edge of first layer. Ensure compatibility with piping material.

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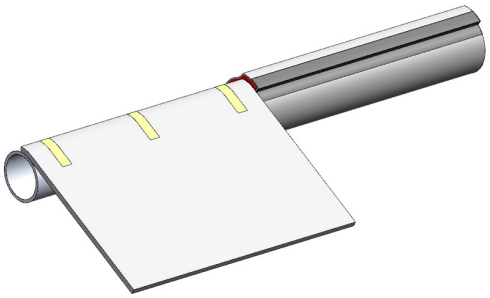

Wrap adjacent section per previous instructions. Additional wrap sections are added to insulate all straight runs of tubing.

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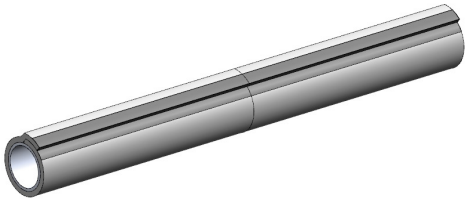

Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

ELECTRICAL CIRCUIT PROTECTION

1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.1 Aligned Seams with Sealant

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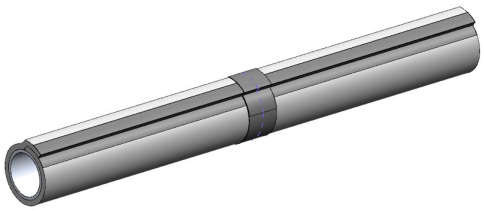

The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

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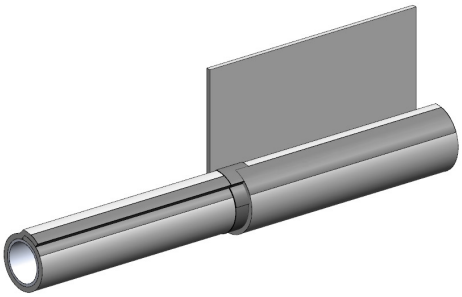

Layer 2: Wrap second layer of Hilti Endo-Shield in the same manner as Layer 1. The start of Layer 2 begins at the longitudinal seam of Layer 1, secured with 3 in aluminum foil tape or FSK tape covering the full length of the seam.

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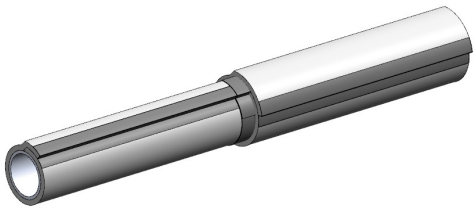

Tightly wrap Layer 2 over Layer 1 and overlap the longitudinal seam by 2 in. Cover the full length of the longitudinal seam with 3 in. wide aluminum foil tape or FSK tape.

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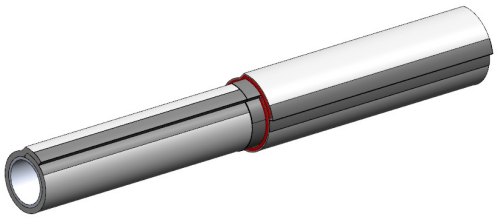

Add 1/8 depth thickness of Hilti CP 606 or FS-ONE MAX at the edge of second layer.

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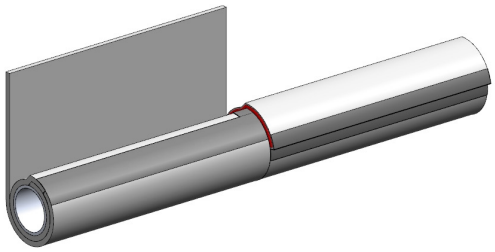

Additional wrap sections are added to insulate all straight runs of tubing.

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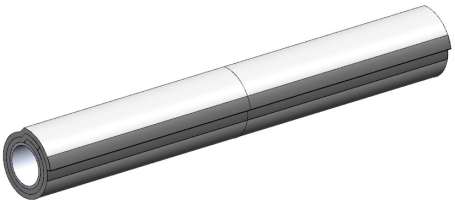

Secure Layer 2 with 3 in wide aluminum foil tape or FSK tape covering the full length of the longitudinal seam.

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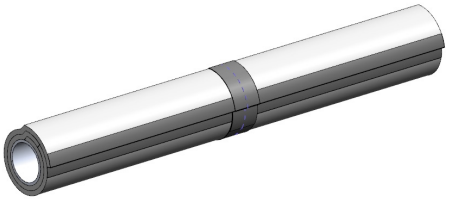
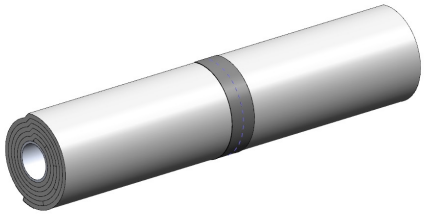


The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

⑭



Layer 3, 4, 5: As required wrap third, fourth or fifth layer of Hilti Endo-Shield in the same manner as Layer 2 to obtain desired rating.

ELECTRICAL CIRCUIT PROTECTION

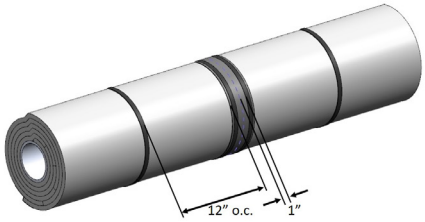
1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.1 Aligned Seams with Sealant

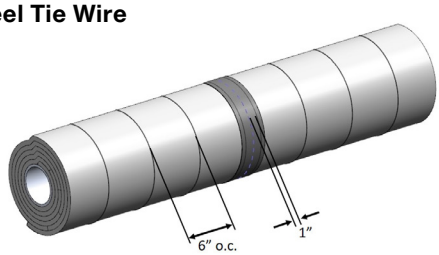
Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

⑮ a. Steel Banding



The outer layer is secured with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center.

⑮ b. Steel Tie Wire



The outer layer is secured with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

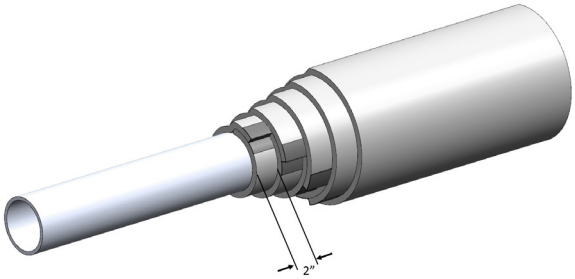
ELECTRICAL CIRCUIT PROTECTION

1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.2 Telescoping Seams

Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.



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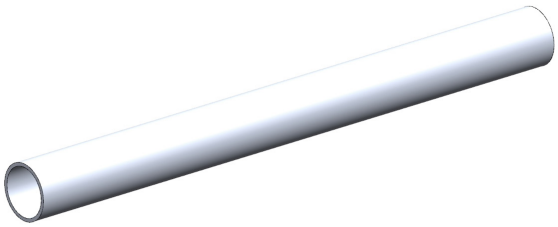

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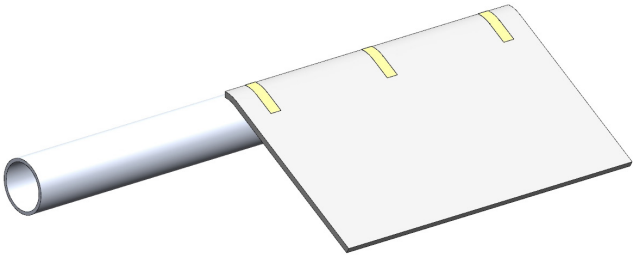
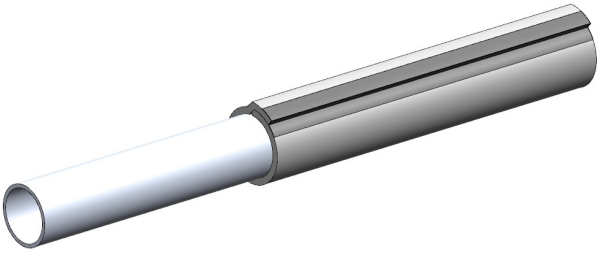


Layer 1: Tape Hilti Endo-Shield to the pipe with min 1/2 in. wide filament tape, FSK tape or aluminum tape.

③



Wrap Hilti Endo-Shield tightly around the tubing overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

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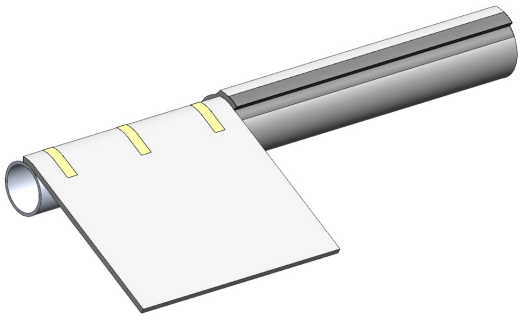

Wrap adjacent section continuously per previous instructions. Additional wrap sections are added to insulate all straight runs of tubing.

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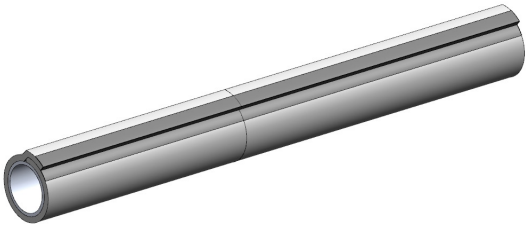

Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

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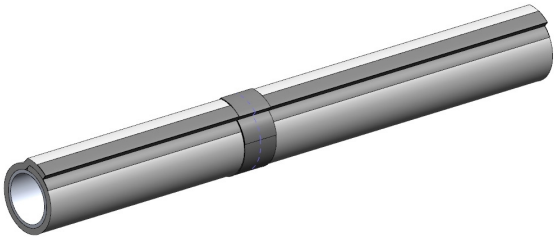

The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

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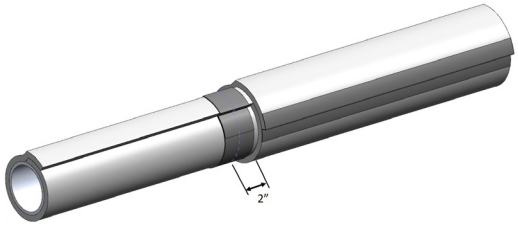

Wrap second layer of Hilti Endo-Shield in the same manner as Layer 1. Offset the Layer 2 radial seam 2 in. from the radial seam Layer 1. Tightly wrap Layer 2 over Layer 1 and overlap the longitudinal seam by 2 in. Cover the full length of the longitudinal and radial seam with 3 in. wide aluminum foil tape or FSK tape.

ELECTRICAL CIRCUIT PROTECTION

1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.2 Telescoping Seams

Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

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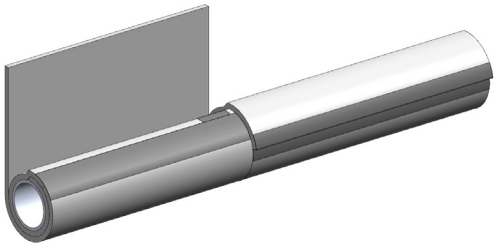

Additional wrap sections are added to insulate all straight runs of tubing.

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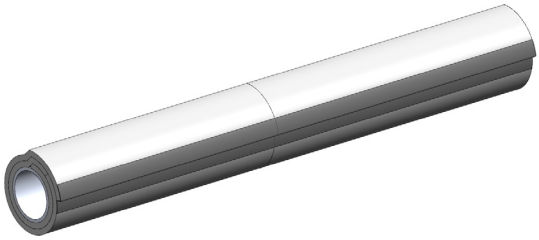
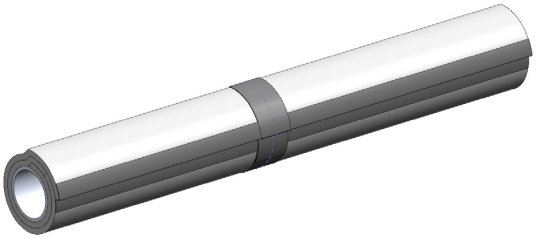


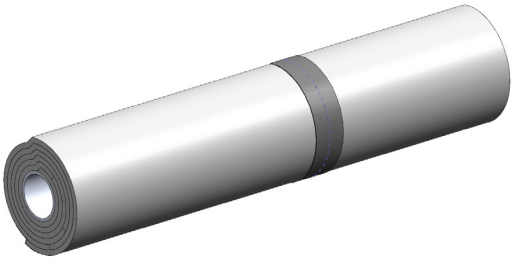
Secure Layer 2 with 3 in wide aluminum foil tape or FSK tape covering the full length of the longitudinal seam.

⑩



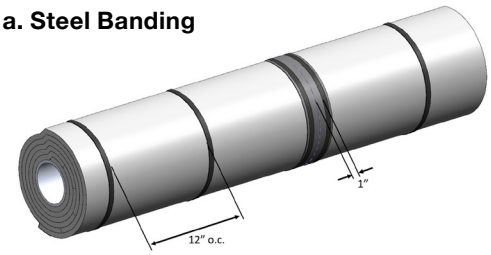
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

⑪



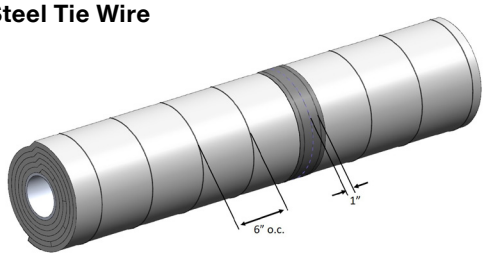
Layer 3, 4, 5: As required wrap third, fourth or fifth layer of Hilti Endo-Shield in the same manner as Layer 2 maintaining min 2 in. overlap of radial seams at each layer, to obtain desired rating.

⑫ **a. Steel Banding**



The outer layer is secured with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center.

⑫ **b. Steel Tie Wire**



The outer layer is secured with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

ELECTRICAL CIRCUIT PROTECTION

1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.3 Continuous Wrapping Method with Sealant

Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

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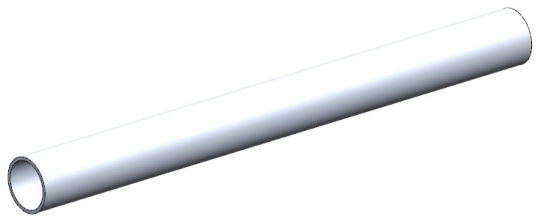
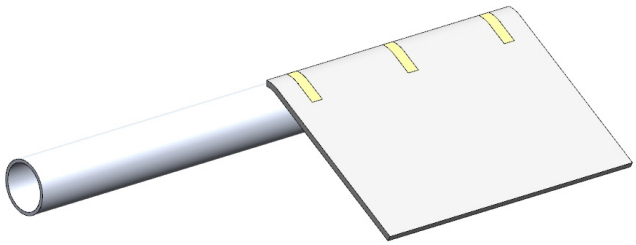
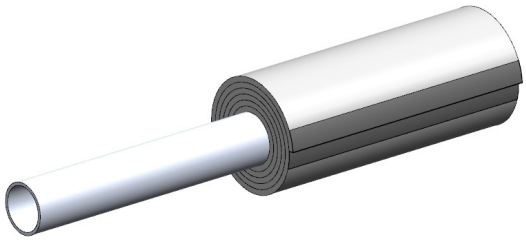


②



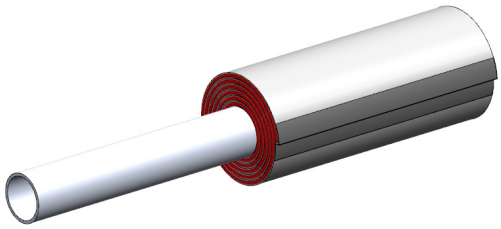
Hilti Endo-Shield may be continuously wrapped around the conduit. Using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape, attach leading edge of Hilti Endo-Shield onto the conduit and wrap continuously.

③



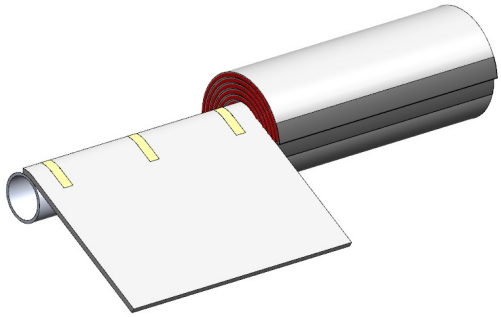
Wrap Hilti Endo-Shield continuously with the number of layers required by the 3rd party tested firestop system. A. 2 in. overlap shall be included for each layer required. For example, 4-layer system requires an 8 in. overlap on a final layer. Apply 3 in. wide aluminum foil tape or FSK tape over the full length of the longitudinal seam.

④



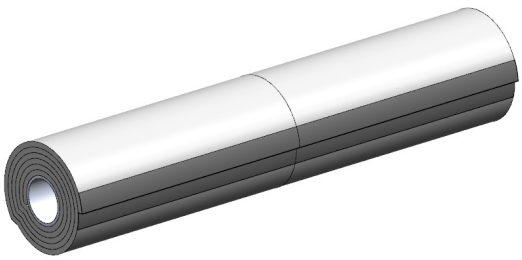
Prior to installing the adjacent continuously wrapped section, apply 1/8 in. wet thickness of Hilti CP 606 or FS-ONE MAX over the entire edge of Hilti Endo-Shield.

⑤



Wrap adjacent section continuously per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑥



Apply 3 in. wide aluminum foil tape or FSK tape over the full length of the longitudinal seam.

ELECTRICAL CIRCUIT PROTECTION

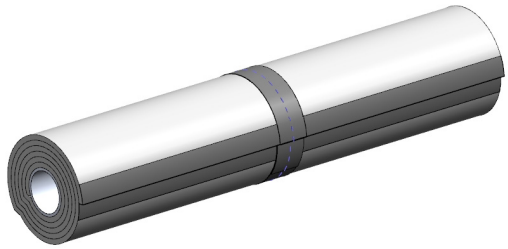
1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.3 Continuous Wrapping Method with Sealant*

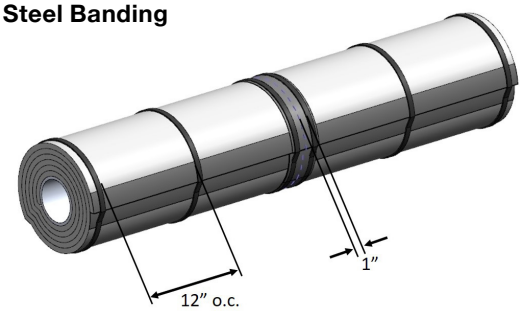
Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

⑦



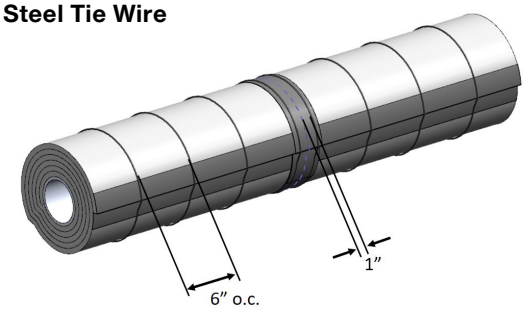
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

⑧ **a. Steel Banding**



The outer layer is secured with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center.

⑧ **b. Steel Tie Wire**



The outer layer is secured with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

*For elbow segment instructions refer to “Elbow section on the Application Guide”

ELECTRICAL CIRCUIT PROTECTION

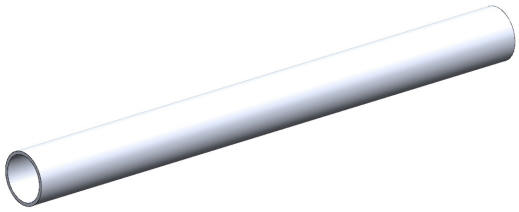
1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

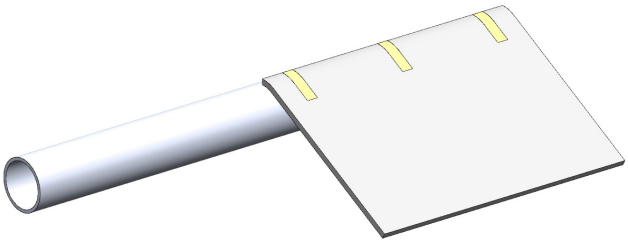
1.4 Continuous Wrapping Method with a Collar (no sealant required)

Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

①

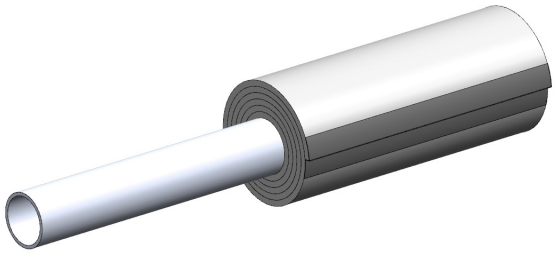


②



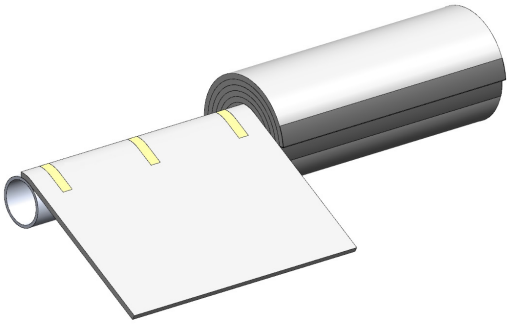
Hilti Endo-Shield may be continuously wrapped around the conduit. Using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape, attach leading edge of Hilti Endo-Shield onto the conduit and wrap continuously.

③



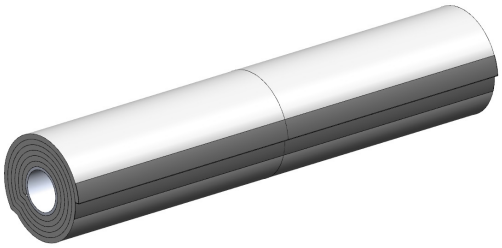
Wrap Hilti Endo-Shield continuously adding the number of layers required by the 3rd party tested firestop system. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam. A. 2 in. overlap of longitudinal seam shall be included for each layer required. For example, 4-layer system requires an 8 in. overlap on a final layer.

④



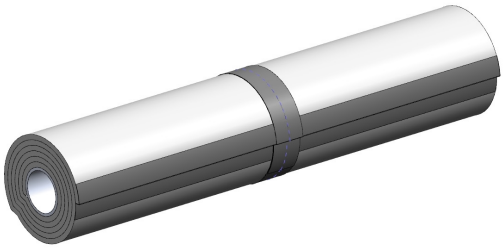
Wrap adjacent section continuously per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑤



Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑥



The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

ELECTRICAL CIRCUIT PROTECTION

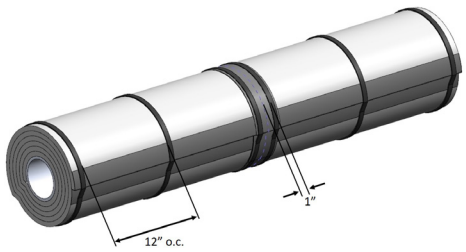
1.0 SINGLE CONDUIT

Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

1.4 Continuous Wrapping Method with a Collar (no sealant required)

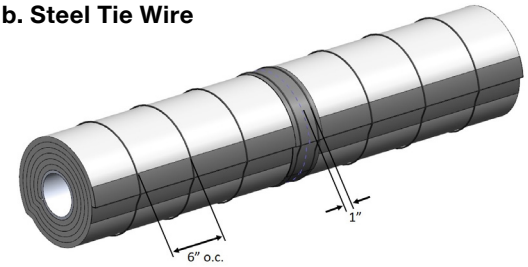
Refer to approved listing HI-AF/AF 120-01 for pipe, sealant and specific installation details.

⑦ **a. Steel Banding**



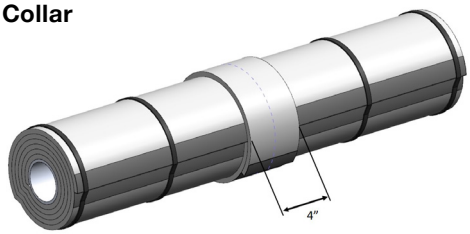
The outer layer is secured with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center.

⑦ **b. Steel Tie Wire**



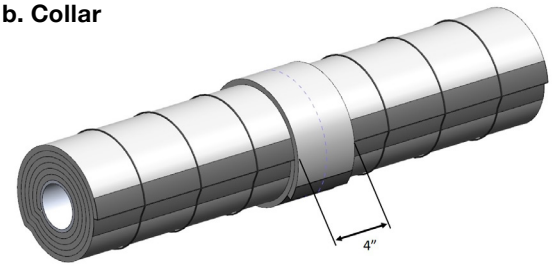
The outer layer is secured with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

⑧ **a. Collar**



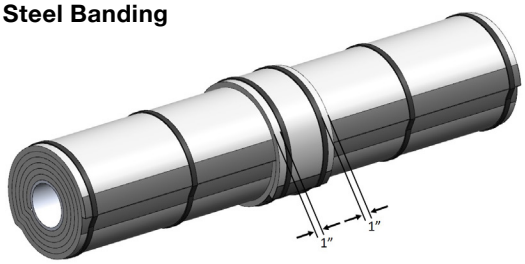
At radial seams and seams between the gore end segment and adjoining straight section, add an additional 4 in. wide section of Hilti Endo-Shield. Center collar over the radial seam of the final layer overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam of the 4 in. wide section of Hilti Endo-Shield. Secure with steel banding per 9a.

⑧ **b. Collar**



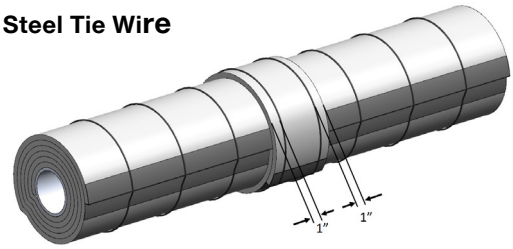
At radial seams and seams between the gore end segment and adjoining straight section, add an additional 4 in. wide section of Hilti Endo-Shield. It may be centered over the radial seam of the final layer overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam of the 4 in. wide section of Hilti Endo-Shield. Secure with Steel tie wire.

⑨ **a. Steel Banding**



Secure section with 1/2 in wide stainless-steel banding located 1 in. from each edge of collar.

⑨ **a. Steel Tie Wire**



Secure final wrap with min 18 GA steel tie wire located 1in from each collar edge of collar.

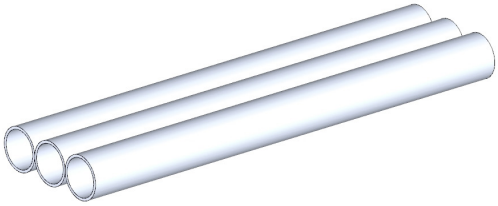
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

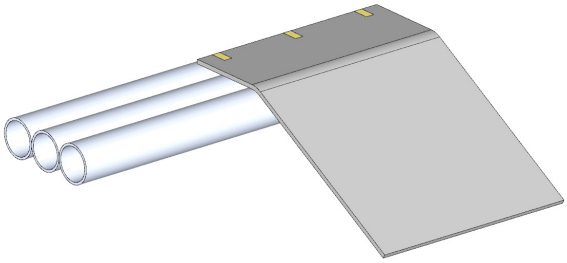
For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

2.1 Continuous Wrapping Method with Collar

①

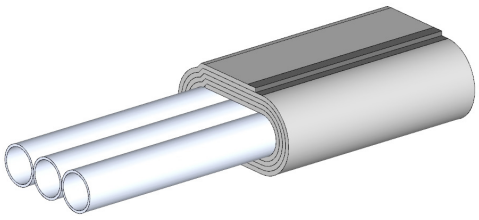


②



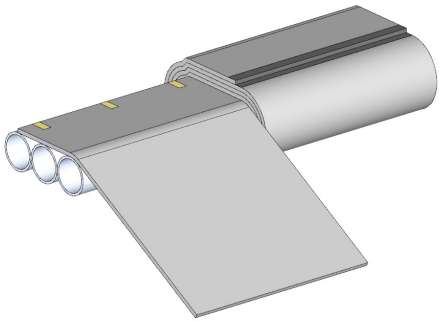
Hilti Endo-Shield may be continuously wrapped around the conduit bank. Using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape, attach leading edge of Hilti Endo-Shield onto the conduit and wrap continuously.

③



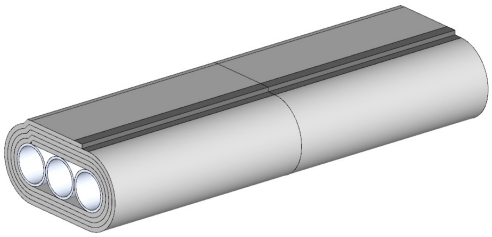
Wrap Hilti Endo-Shield continuously adding the number of layers required by manufacturer. A 2 in. overlap of longitudinal seam shall be included for each layer required. For example, a 4-layer system requires an 8 in. overlap on a final layer. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

④



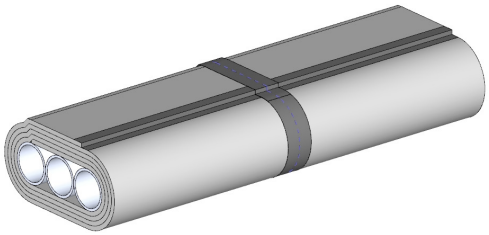
Wrap adjacent section continuously per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑤



Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑥



The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. back onto itself.

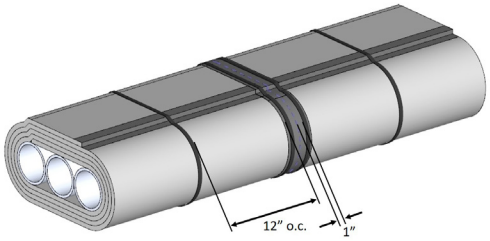
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

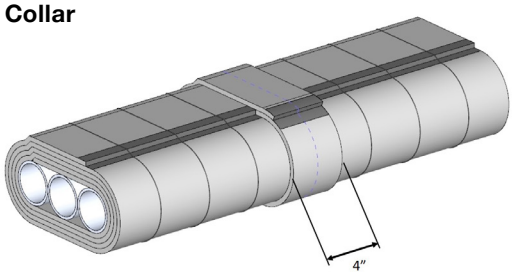
2.1 Continuous Wrapping Method with Collar

⑦ **a. Steel Banding**



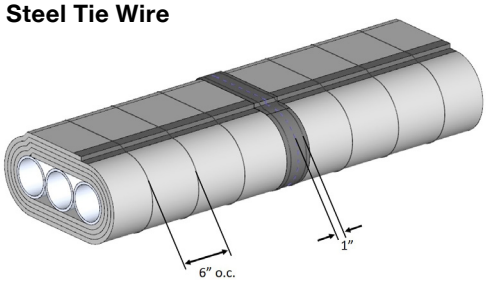
Secure outer layer with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center.

⑧ **b. Collar**



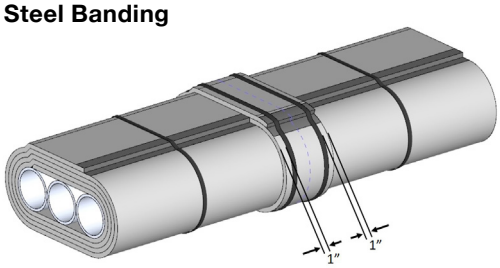
At radial seams and seams between the gore end segment and adjoining straight section, add an additional 4 in. wide section of Hilti Endo-Shield. Center over the radial seam of the final layer overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam of the 4 in. wide section of Hilti Endo-Shield. Secure with Steel tie wire per 9b.

⑦ **b. Steel Tie Wire**



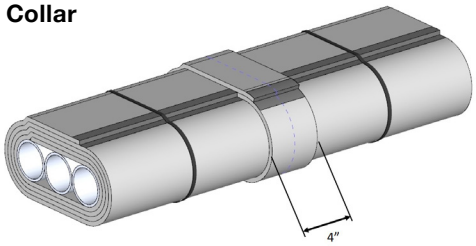
Secure outer layer with min 18 GA steel tie wire located 1in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

⑨ **a. Steel Banding**



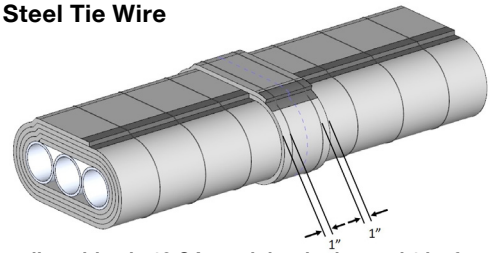
Secure collar with 1/2 in wide stainless-steel banding located 1 in. from each edge of collar as shown on the picture.

⑧ **a. Collar**



At radial seams and seams between the elbow end segment and adjoining straight section, add an additional 4 in. wide section of Hilti Endo-Shield. Center over the radial seam of the final layer overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam of the 4 in. wide section of Hilti Endo-Shield. Secure with Steel banding per 9a.

⑨ **a. Steel Tie Wire**



Secure collar with min 18 GA steel tie wire located 1 in. from each edge of collar.

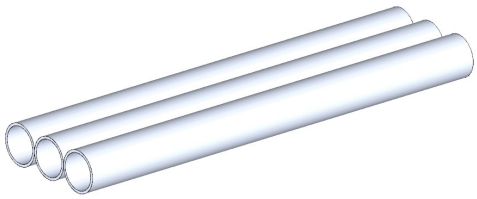
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

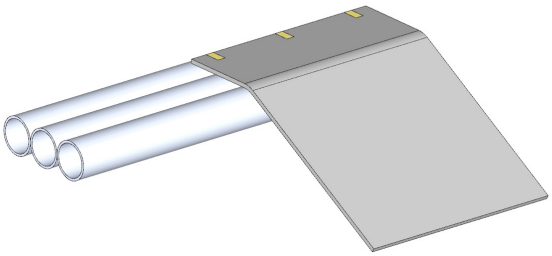
For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

2.2 Continuous Wrapping Method with Sealant

①

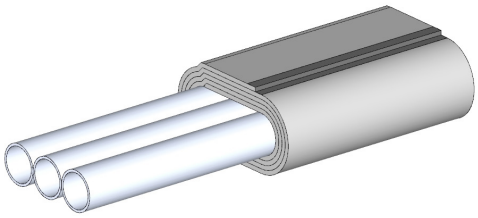


②



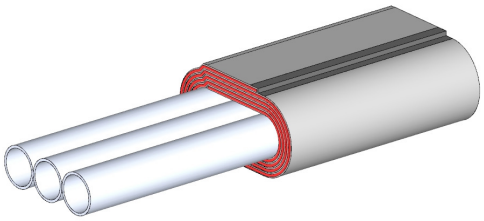
Hilti Endo-Shield may be continuously wrapped around the conduit bank. Using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape, attach leading edge of Hilti Endo-Shield onto the conduit and wrap continuously.

③



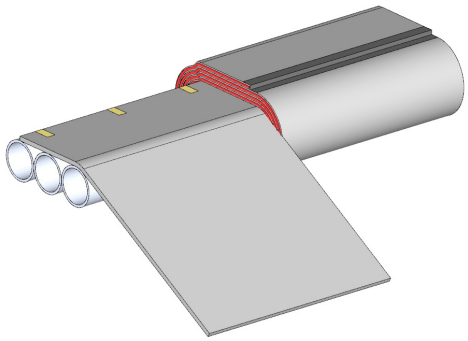
Wrap Hilti Endo-Shield continuously adding the number of layers required by manufacturer. A 2 in. overlap of longitudinal seam shall be included for each layer required. For example, a 4-layer system requires an 8 in. overlap on a final layer. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

④



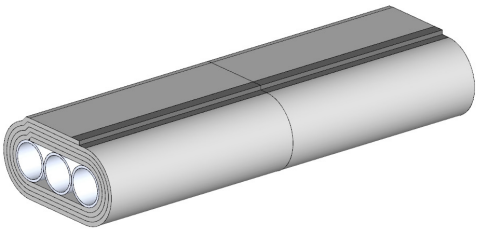
Prior to installing the adjacent continuously wrapped section, apply 1/8 in. wet thickness of Hilti CP 606 or FS ONE MAX over the entire edge of Hilti Endo-Shield.

⑤



Wrap adjacent section continuously per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑥



Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

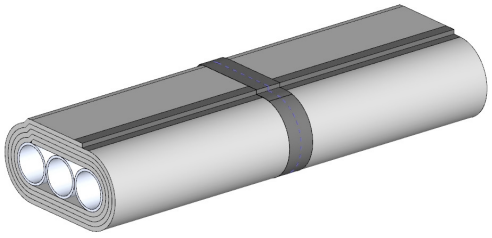
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

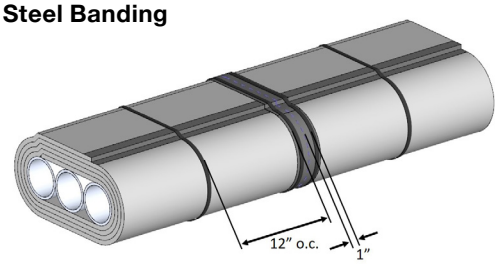
2.2 Continuous Wrapping Method with Sealant

⑦



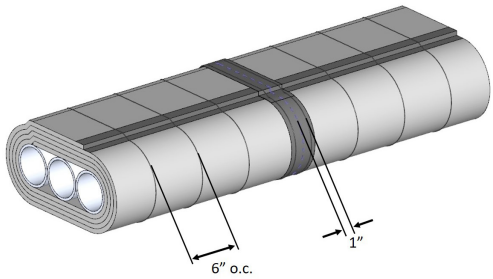
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. onto itself.

⑧ **a. Steel Banding**



Secure final wrap with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center between seams.

⑧ **b. Steel Tie Wire**



Secure final wrap with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

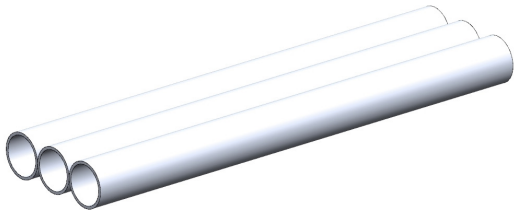
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

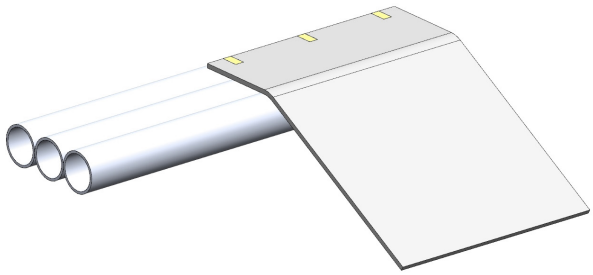
For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

2.3 Aligned with Sealant

①

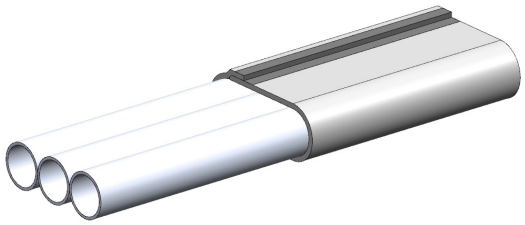


②



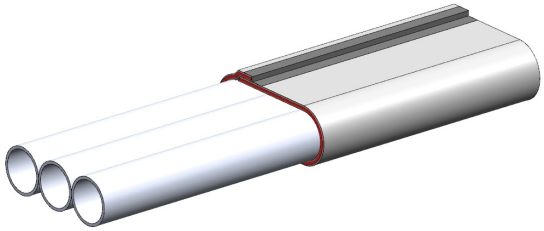
Layer 1: Tape Endo-Shield to the conduit with min 1/2 in. wide filament tape, FSK tape or aluminum foil tape.

③



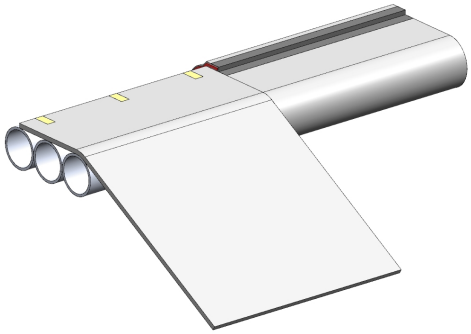
Wrap Hilti Endo-Shield tightly around the tubing overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

④



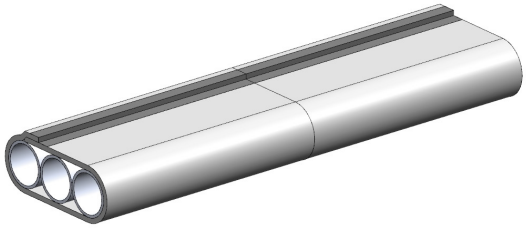
Prior to installing the adjacent section, apply 1/8 in. wet thickness of Hilti CP 606 or FS-ONE MAX over the entire edge of Hilti Endo-Shield Layer 1.

⑤



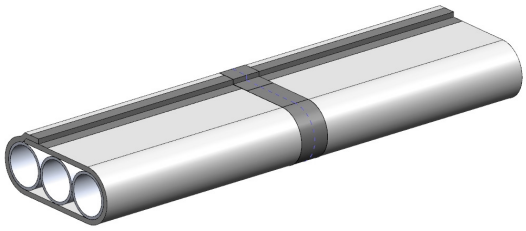
Wrap adjacent section continuously per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑥



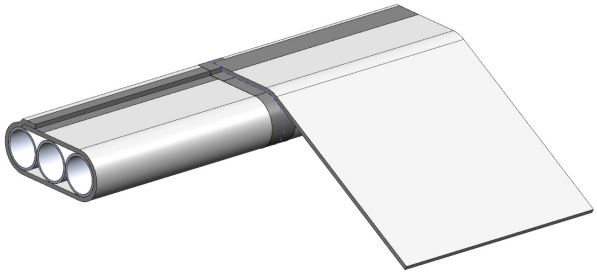
Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑦



The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. onto itself.

⑧



Layer 2: Wrap second layer of Hilti Endo-Shield in the same manner as Layer 1. The start of Layer 2 begins at the longitudinal seam of Layer 1, secured with 3 in. wide aluminum foil tape or FSK tape covering the full length of the seam.

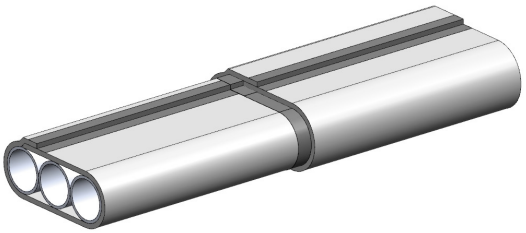
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

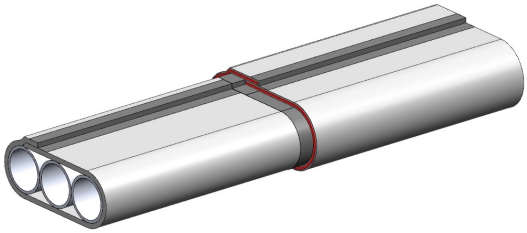
2.3 Aligned with Sealant

⑨



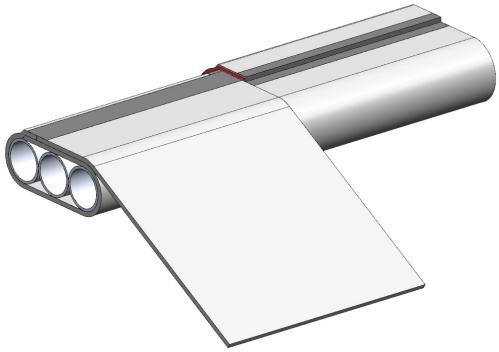
Tightly wrap Layer 2 over Layer 1 and overlap the longitudinal seam by 2 in. Cover the full length of the longitudinal with 3 in. wide aluminum foil tape or FSK tape.

⑩



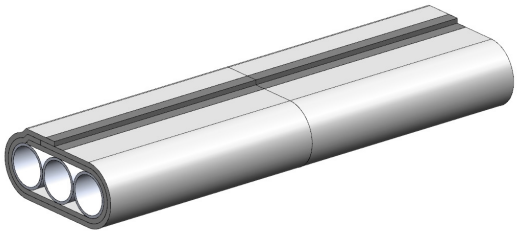
Prior to installing the adjacent wrapped section, apply 1/8 in. wet thickness of Hilti CP 606 or FS ONE MAX over the entire edge of Hilti Endo-Shield Layer 2.

⑪



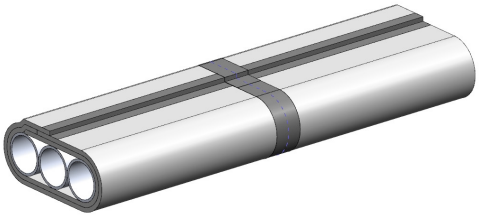
Install adjacent wrapped section as per previous instructions.

⑫



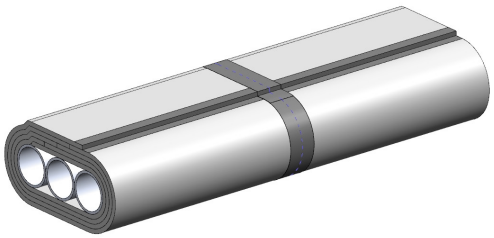
Secure Layer 2 with 3 in. wide aluminum foil tape or FSK tape covering the full length of the longitudinal seam

⑬



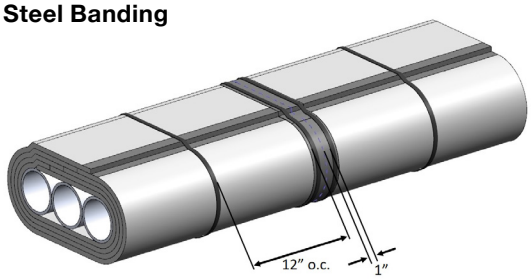
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam and overlap 2 in. back onto itself.

⑭



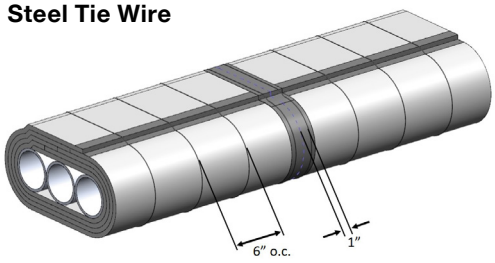
Layer 3, 4, 5: As required wrap third, fourth or fifth layer of Hilti Endo-Shield in the same manner as Layer 2 to obtain desired rating.

⑮ **a. Steel Banding**



Secure outer layer with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center between seams.

⑮ **b. Steel Tie Wire**



Secure outer layer with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

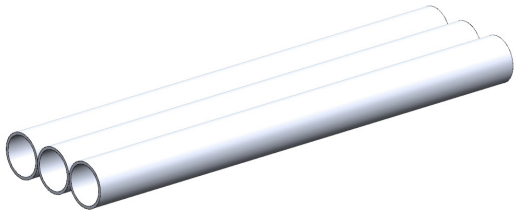
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

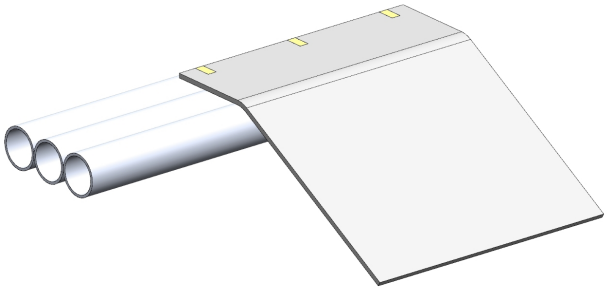
For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

2.4 Telescoping Method

①

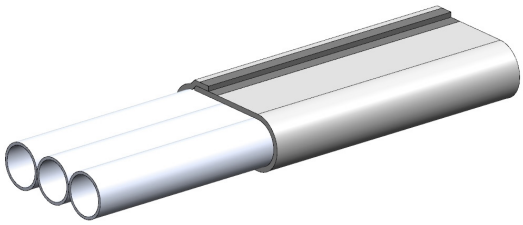


②



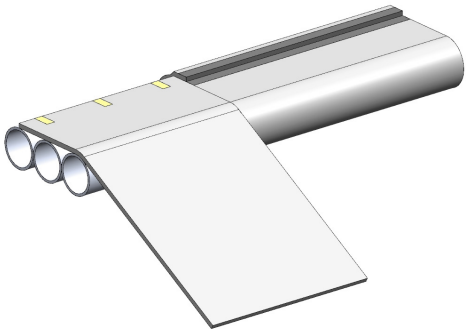
Layer 1: Tape Endo-Shield to the pipe with min 1/2 in. wide filament tape, FSK tape or aluminum foil tape.

③



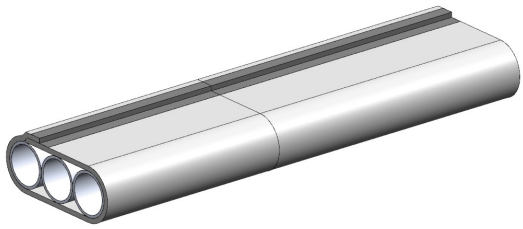
Wrap Hilti Endo-Shield tightly around the conduit bank overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape centered for the full length of the longitudinal seam.

④



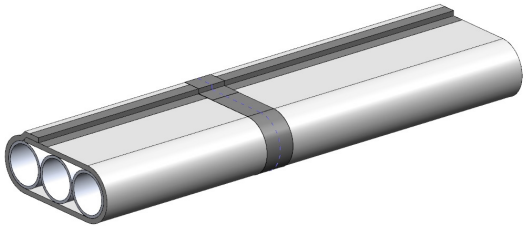
Install adjacent wrapped section as per previous instructions. Additional wrapped sections are added to insulate all straight runs of tubing.

⑤



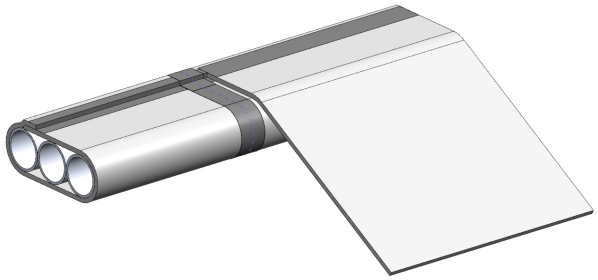
Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑥



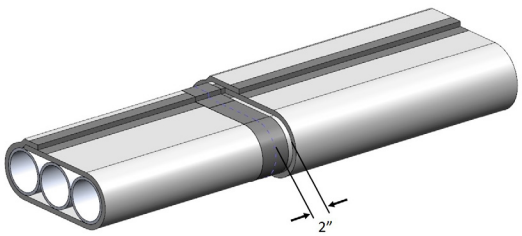
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap 2 in. onto itself.

⑦



Layer 2: Wrap second layer of Hilti Endo-Shield in the same manner as Layer 1. The start of Layer 2 begins at the longitudinal seam of Layer 1, secured with 3 in. wide aluminum foil tape or FSK tape covering the full length of the seam.

⑧



Offset the Layer 2 radial seam 2 in. from the radial seam of Layer 1. Tightly wrap Layer 2 over Layer 1 and overlap the longitudinal seam by 2 in. Cover the full length of the longitudinal and radial seam with 3 in. aluminum foil tape or FSK tape.

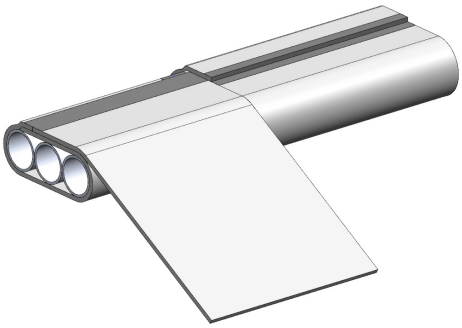
ELECTRICAL CIRCUIT PROTECTION

2.0 BANK OF CONDUITS

For this application, please request an EJ from our Fire Protection Engineering team through the HCP. Use Hilti Endo-Shield Estimation Tool to calculate layers sizes for multiple pipes and estimate your project materials cost.

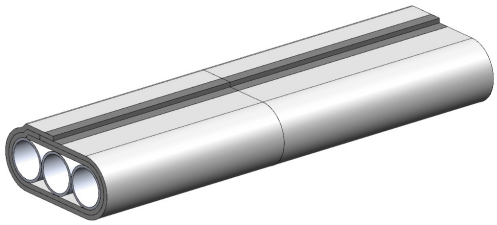
2.4 Telescoping Method

⑨



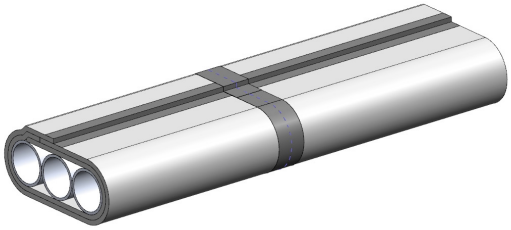
Additional wrap sections are added to insulate all straight runs of conduit.

⑩



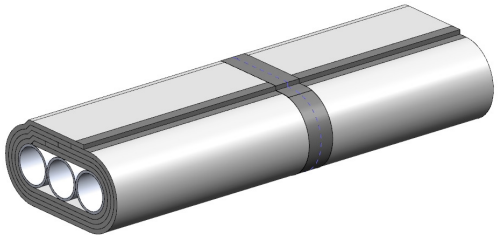
Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑪



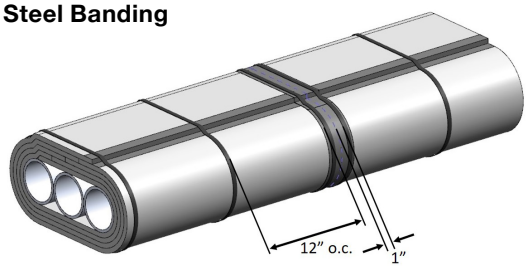
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam and overlap 2 in. onto itself.

⑫



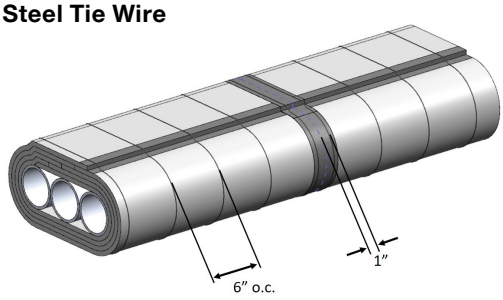
Layer 3, 4 and 5: As required wrap third, fourth or fifth layer of Hilti Endo-Shield in the same manner as Layer 2 to obtain desired rating.

⑬ **a. Steel Banding**



Secure final wrap with 1/2 in. wide stainless-steel banding located 1 in. from each radial seam. Space the steel banding 12 in. on center between seams the seam.

⑬ **b. Steel Tie Wire**



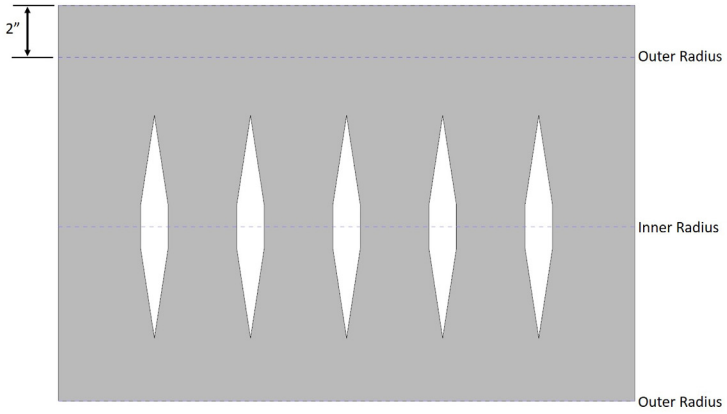
Secure final wrap with min 18 GA steel tie wire located 1 in. from each radial seam. Space the steel tie wire 6 in. on center between the seam.

ELECTRICAL CIRCUIT PROTECTION

3.0 ELBOWS

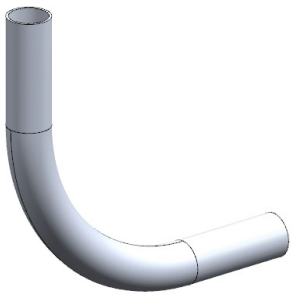
3.1 Gore Segments

Gore segment is for illustrative purposes only. Changes in the diameter, bending radius and number of layers will affect gore segments. Use insulation industry standard to create gore segments.



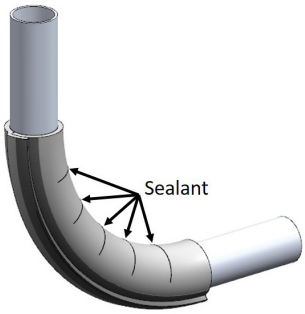
The elbows are each fitted with a gore segment cut to accommodate the elbow radius that occurs as the Hilti Endo-Shield is wrapped radially around the elbow.

①



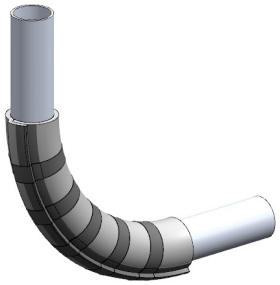
Start Layer 1 at the outermost radius of the elbow

②



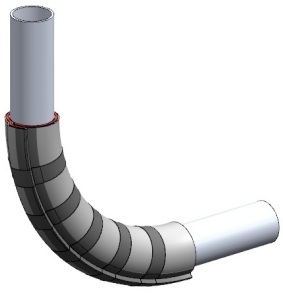
Attach Layer 1 using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape. Fill all gore segment seams with 1/8 in. thick of Hilti CP 606 or FS ONE MAX. Wrap Hilti Endo-Shield tightly around the tubing overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

③



Apply 3 in. wide aluminum foil tape or FSK tape over the radial seams and overlap 2 in. back onto itself.

④



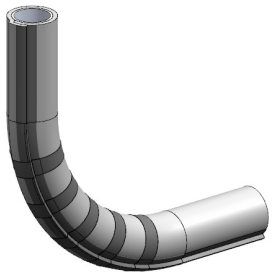
Prior to installing the adjacent straight sections, apply 1/8 in. wet thickness of CP 606 or FS One max over the entire edge of Hilti Endo-Shield Layer 1 (unless using collar protection).

ELECTRICAL CIRCUIT PROTECTION

3.0 ELBOWS

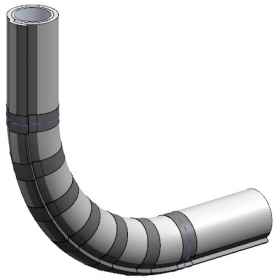
3.1 Gore Segments

⑤



Refer to single conduit instructions for installation of the straight sections connecting to the elbow.

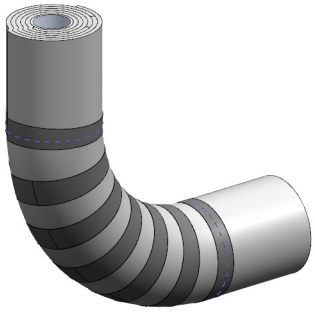
⑥



Apply 3 in. wide aluminum foil tape or FSK tape over the radial seams and overlap 2 in. back onto itself.

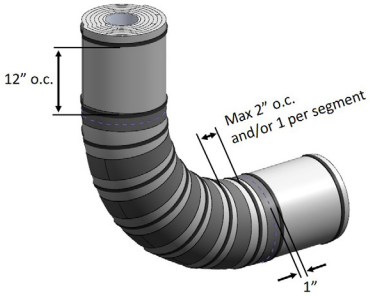
Repeat steps 2-6 for each additional layer required

⑦



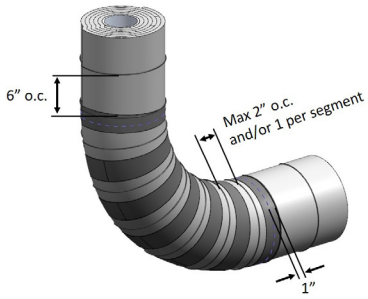
As per listing HI/AF 120-01. The elbow longitudinal seam of Layer 2 is located at the short radius of the elbow. The elbow longitudinal seam of Layer 3 is located at the middle radius of the elbow, rotated 90 degrees from the longitudinal seam of Layer 2. The elbow longitudinal seam for Layer 4 is located at the middle radius of the elbow, rotated 180 degrees from the longitudinal seal of Layer 3. The elbow longitudinal seam for Layer 5 (if necessary) is located at the long radius of the elbow.

⑧ **a. Steel Banding**



At the elbow, space the steel banding 2 in. on center at both at the short interior radius.

⑧ **b. Steel Tie Wire**



At the elbow space steel tie wire at max 2 in. on center and centered on the interior radius of each individual segment.

ELECTRICAL CIRCUIT PROTECTION

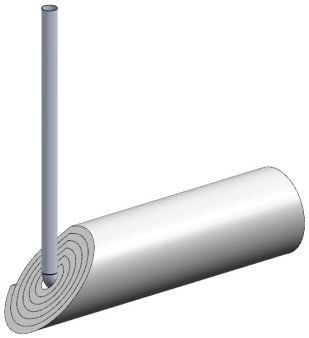
3.0 ELBOWS

3.2 45 Degree Cut

①

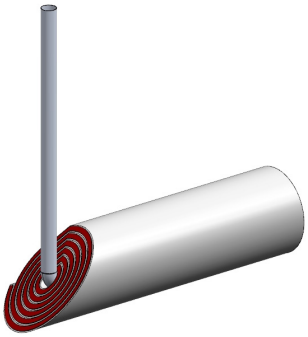
As an alternative to gore segments for 2 in. and smaller, tight bend radius elbows. Hilti Endo-Shield may be wrapped around the straight sections of pipe adjacent to the elbow per individual layers or continuous wrapping methods except material shall not be taped permanently to pipe.

②



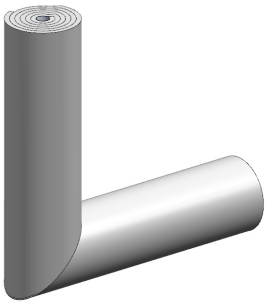
Each section to be cut to provide a 45 degree surface on the side of Hilti Endo-Shield closest to the elbow. Wrap Hilti Endo-Shield continuously adding the number of layers required by the 3rd party tested firestop system.

③



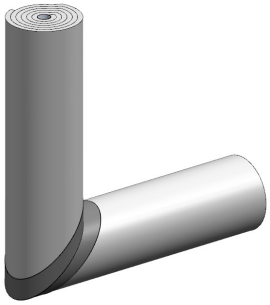
Apply 1/8 in. depth of Hilti CP 606 or FS-ONE MAX to be applied to cover 45 degree cut edge on one section.

④



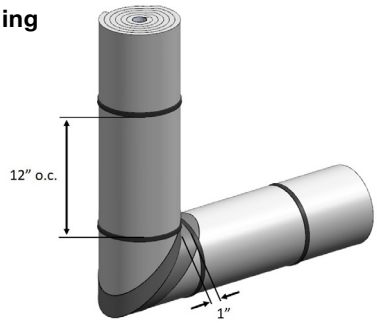
Install the adjacent continuously wrapped section. Both sections of Hilti Endo-Shield shall be slid together while aligning the 45 degree angled cuts.

⑤



Apply 3 in. wide aluminum or FSK tape over the seam of the adjoining pieces of Hilti Endo-Shield.

⑥ a. Steel Banding



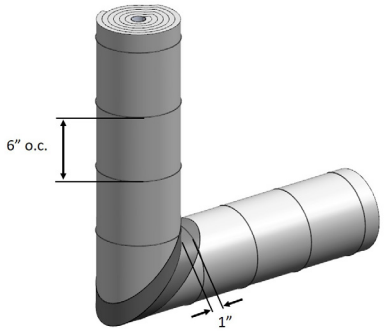
Prior to installing the adjacent straight sections, apply 1/8 in. wet thickness of CP 606 or FS One max over the entire edge of Hilti Endo-Shield Layer 1 (unless using collar protection).

ELECTRICAL CIRCUIT PROTECTION

3.0 ELBOWS

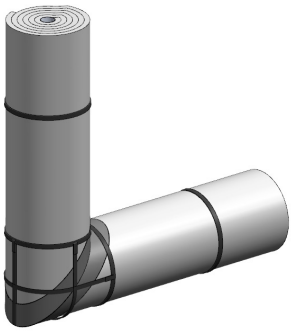
3.2 45 Degree Cut

⑥ **b. Steel Tie Wire**



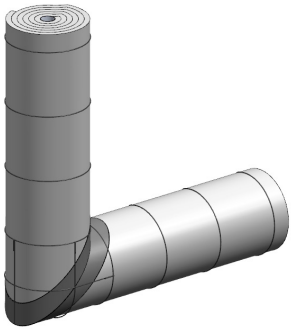
Secure elbow treatment with min. 18 Ga steel tie wire located 1" from interior radius of elbow treatment on both sections of Hilti Endo-Shield. Space the steel tie wire 6 in. on center.

⑦ **a. Steel Banding**



Tie an additional 3 pieces of min 1/2 wide steel banding to existing steel banding, centered horizontally and vertically to form a basket around elbow protection.

⑦ **b. Steel Tie Wire**



Tie an additional 3 pieces of min 18 Ga steel tie wire to existing wires, centered horizontally and vertically to form a basket around elbow protection.

ELECTRICAL CIRCUIT PROTECTION

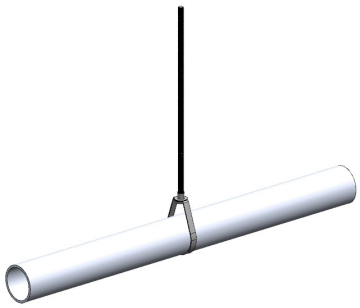
4.0 SUPPORT MEMBERS PROTECTION

The wrapping of the support members is not used to maintain the mechanical structural integrity of the support system. The wrapping of the support members is to maintain the circuit integrity of the conduits (concrete slab is omitted for illustration purposes). For this application please request an Engineering Judgment to our Fire Protection Engineering team through the Hilti Construction Platform (HCP).

4.1 Hanger and Rod

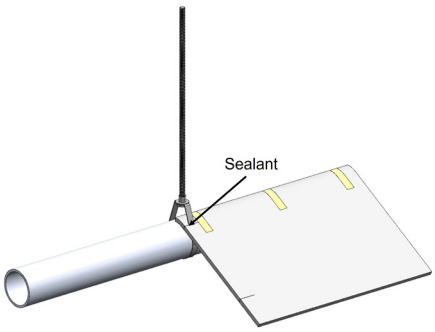
SWIVEL LOOP HANGER - All wrapping methods for the straight sections are applicable.
Telescoping method is illustrated in the figures below.

①



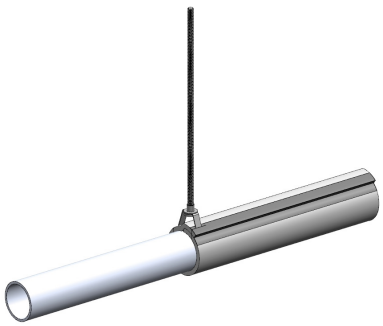
Traditionally critical conduits are supported with swivel loop hangers as shown in the picture above.

②



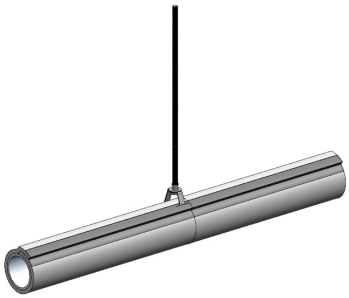
Apply relief cuts positioned to contour around the loop hanger. Attach Layer 1 using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape. Apply 1/8 in. bead wet thickness of Hilti CP 606 or FS-ONE MAX to the relief cuts.

③



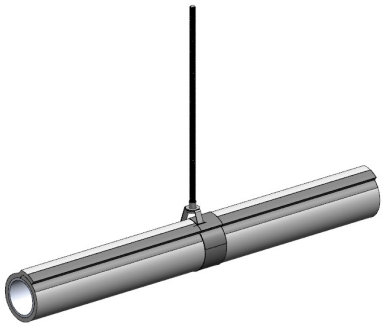
Wrap Hilti Endo-Shield tightly around the tubing overlapping 2 in. at the longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

④



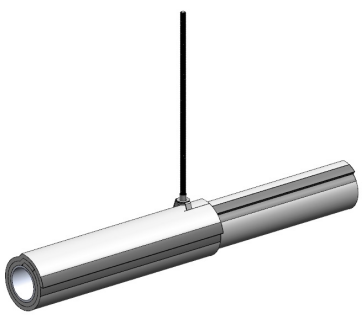
Install adjacent wrapped section as per previous instructions.

⑤



Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam and overlap 2 in. onto itself. Add a piece of aluminum foil tape or FSK tape over relief cut.

⑥



Wrap second layer of Hilti Endo-Shield in the same manner as Layer 1. The start of Layer 2 begins at the longitudinal seam of Layer 1, secured with 3 in. wide aluminum foil tape or FSK tape covering the full length of the seam. Radial seams can be treated in accordance with any of the seam methods outlined on the installation instructions for straight runs.

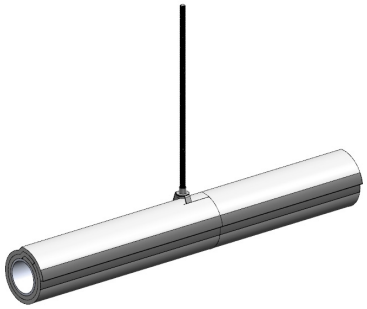
ELECTRICAL CIRCUIT PROTECTION

4.0 SUPPORT MEMBERS PROTECTION

4.1 Hanger and Rod

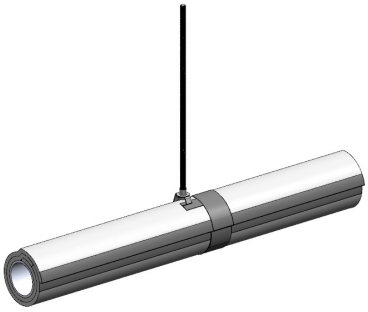
SWIVEL LOOP HANGER - All wrapping methods for the straight sections are applicable.
Telescoping method is illustrated in the figures below.

⑦



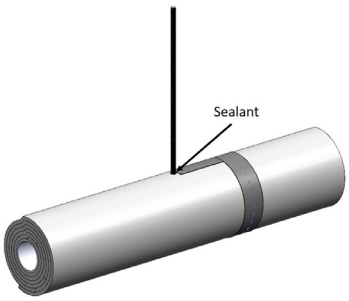
Install adjacent wrapped section as per previous instructions.

⑧



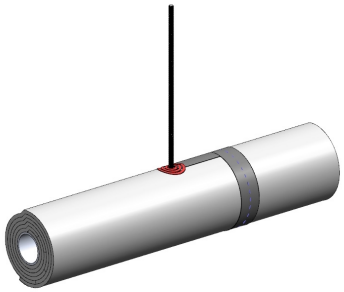
Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam and overlap 2 in. onto itself. Add a piece of aluminum foil tape or FSK tape over relief cut.

⑨



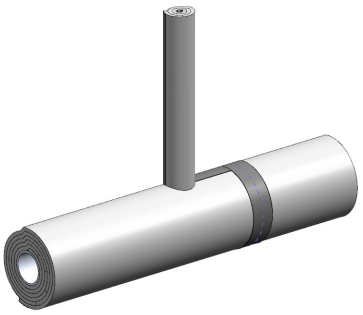
LAYER 3,4,5: As required wrap third, fourth or fifth layer of Hilti Endo-Shield in the same manner as Layer 2 to obtain desired rating. Apply 1/8 in. wet thickness of Hilti CP 606 or FS-ONE MAX to threaded rod penetration and each layer relief cuts.

⑩



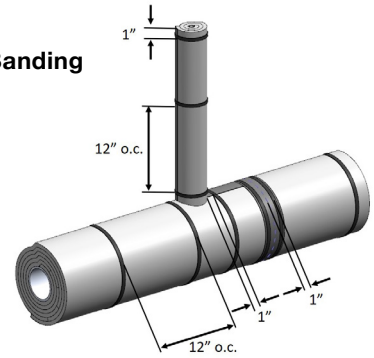
Apply 1/8 in. wet thickness Hilti CP 606 or FS-ONE MAX to outer diameter of the threaded rod penetration.

⑪



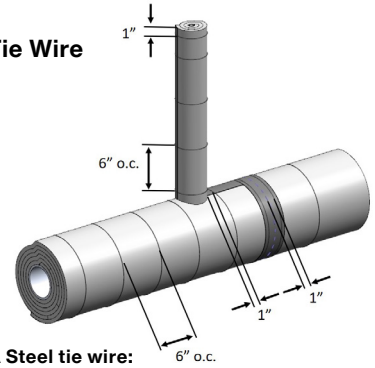
Wrap two layers of Hilti Endo-Shield around the threaded rod continuously adding 4 in. overlap to the final layer or with individual layers each one with a 2 in. overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam. ***The threaded rod needs to be wrapped to the concrete interface.***

⑫ **a. Steel Banding**



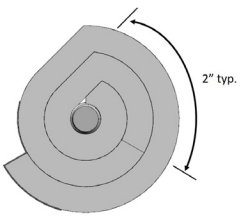
Wrap 1/2 in. Steel banding:
- **1 in. from concrete interface**
- **1 in. from radial seam**
- **1 in. from wrapped threaded rod/ straight section interface**

⑫ **b. Steel Tie Wire**



Wrap min 18 GA Steel tie wire:
- **1 in. from concrete interface**
- **1 in. from radial seam**
- **1 in. from wrapped threaded rod/ straight section interface**

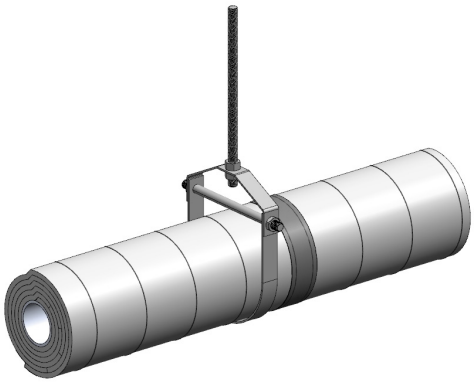
Threaded Rod Cross Section View



ELECTRICAL CIRCUIT PROTECTION

4.0 SUPPORT MEMBERS PROTECTION

4.2 Hanger Rod External Support

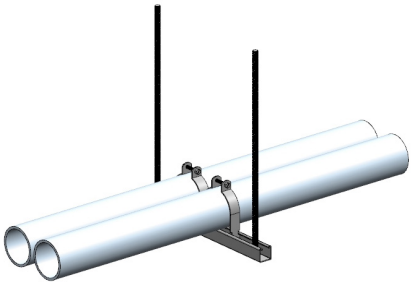


When HILTI Endo-Shield its wrapped prior to hanging with a loop hanger which fits the outer diameter of the HILTI Endo-Shield, there is no need to protect the support member for circuit integrity purposes.

4.3 Strut Assembly

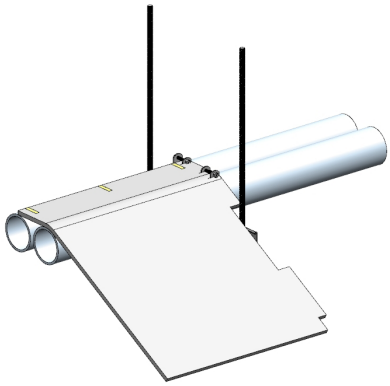
All wrapping methods for the straight sections are applicable. Aligned method is suggested.

①



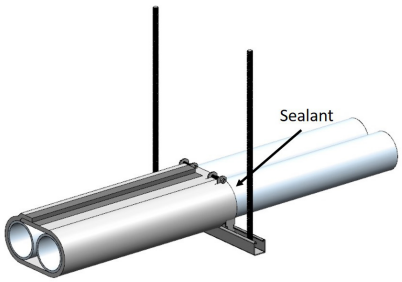
Traditionally a bank of critical conduits is supported by a strut assembly as shown on the drawing.

②



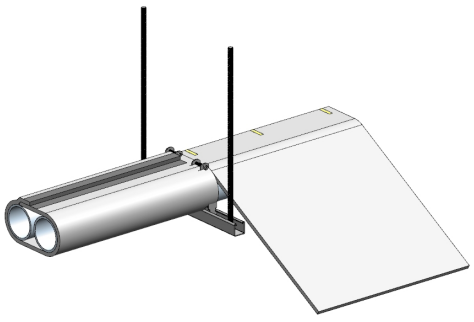
Add relief cuts and notches positioned to contour around the strut assembly. Attach Layer 1 using min 1/2 in. wide filament tape, FSK tape or aluminum foil tape.

③



Apply 1/8 in. wet thickness Hilti CP 606 or FS-ONE MAX to the relief cuts and Layer 1 edge as shown on the picture. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

④



Install adjacent Layer 1 wrapped section as per previous instructions for aligned seam with sealant only.

ELECTRICAL CIRCUIT PROTECTION

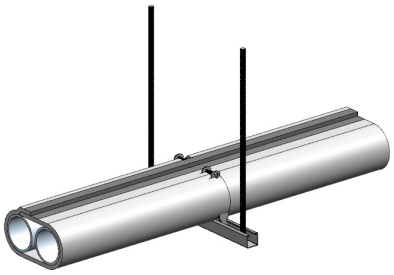
4.0 SUPPORT MEMBERS PROTECTION

For this application please request an Engineering Judgment to our Fire Protection Engineering team through the Hilti Construction Platform (HCP).

4.3 Strut Assembly

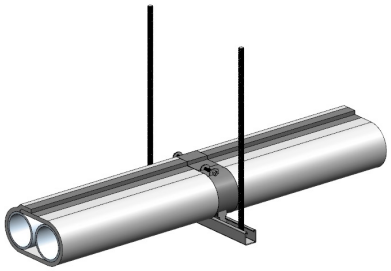
All wrapping methods for the straight sections are applicable. Aligned method is suggested.

⑤



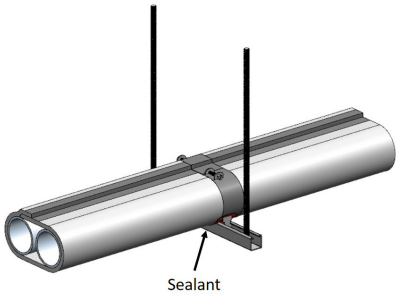
Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑥



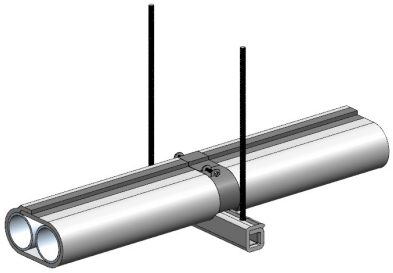
Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam.

⑦



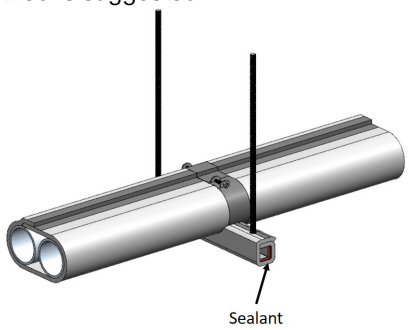
Apply 1/8 in. wet thickness Hilti CP 606 or FS-ONE MAX to where the strut meets Hilti Endo-Shield.

⑧



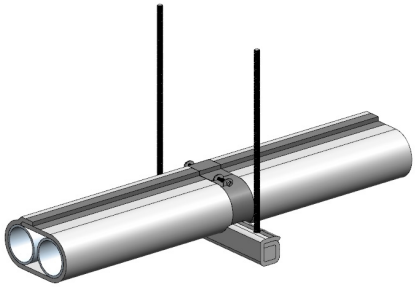
Prior to wrapping strut with Hilti Endo-Shield ensure additional 1/2 in. on both ends (this additional 1/2 in., that comes from the thickness of the product, creates a pocket for the Endo-Shield end plug) and include a 2 in. overlap on longitudinal seam. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

⑨



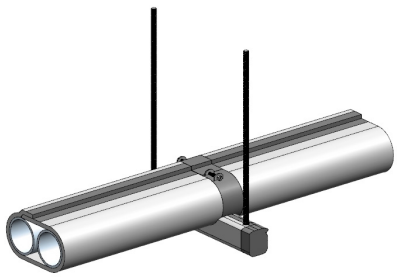
Apply 1/8 in. thick bead of Hilti CP 606 or FS-ONE MAX to the inner surface of the strut ends.

⑩



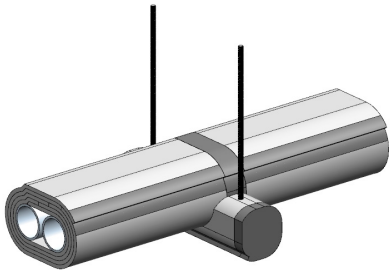
Cut a Hilti Endo-Shield plug to seal strut ends.

⑪



Apply 3 in. wide aluminum foil tape or FSK tape to wrap the strut ends.

⑫



Layer 2, 3, 4 and 5: As required wrap third, fourth or fifth layer of Hilti endo-Shield in the same manner as Layer 1 to obtain desired rating.

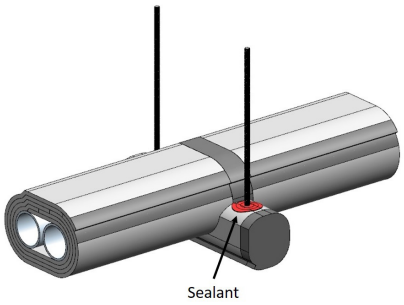
ELECTRICAL CIRCUIT PROTECTION

4.0 SUPPORT MEMBERS PROTECTION

4.3 Strut Assembly

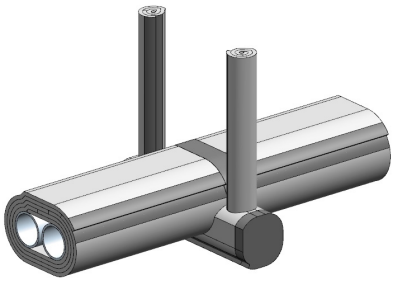
All wrapping methods for the straight sections are applicable. Aligned method is suggested.

⑬



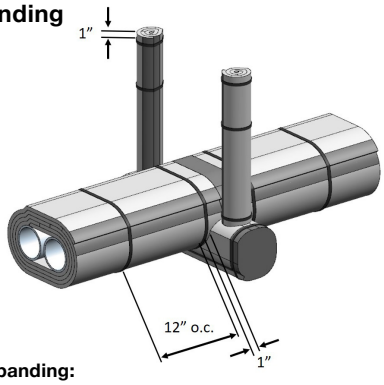
Apply 1/8 in. thick bead of Hilti CP 606 or FS-ONE MAX to outer diameter of the threaded rod penetration.

⑭



Wrap two layers of Hilti Endo-Shield around the threaded rod continuously adding 4 in. overlap to the final layer or with individual layers each one with a 2 in. overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam. ***The threaded rod needs to be wrapped to the concrete interface.***

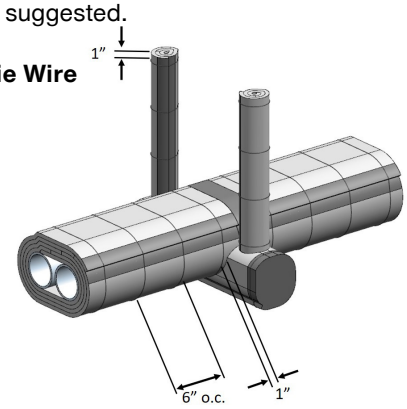
⑮ **a. Steel Banding**



Wrap 1/2 in. Steel banding:

- **1 in. from concrete interface**
- **1 in. from outer strut surface**
- **1 in. from wrapped threaded rod/ straight section interface**
- **12 in. on center steel banding spacing**

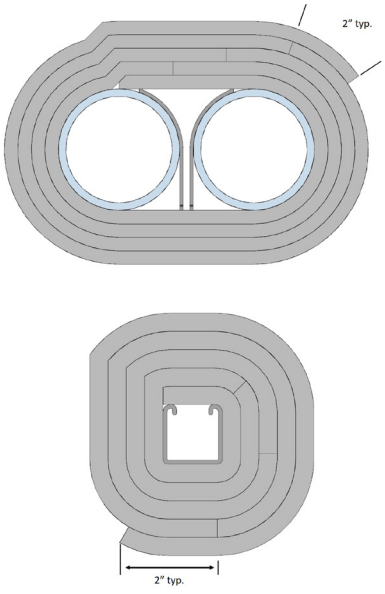
⑮ **b. Steel Tie Wire**



Wrap 1/2 in. Steel tie wire:

- **1 in. from concrete interface**
- **1 in. from outer strut surface**
- **1 in. from wrapped threaded rod/ straight section interface**
- **12 in. on center steel tie wire spacing**

Strut Cross Section View



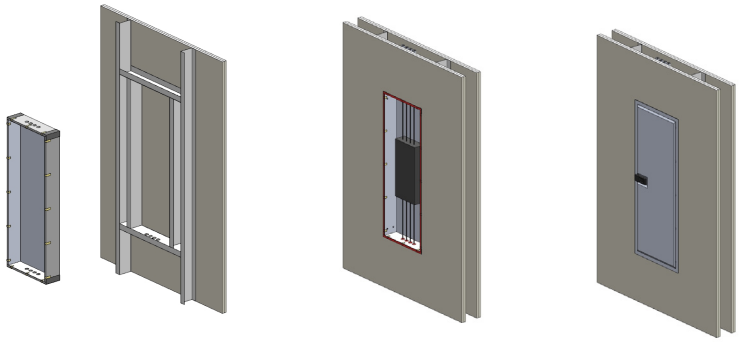
ELECTRICAL CIRCUIT PROTECTION

5.0 LARGE MEMBRANE PENETRATION (see UL/cUL W-L-7324)

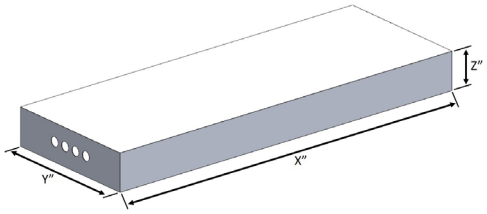
Refer to approved listing WL 7324 for wall design, box sizes, sealant requirements and specific installation details.

5.1 Electrical

Elevator call box and Medical gas box is protected in the same manner.

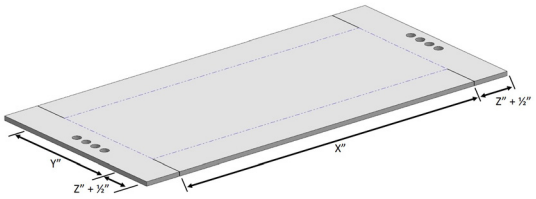


①



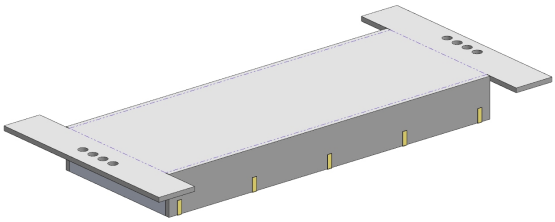
Max 14-3/8 in. (365 mm) wide by 39 in. (991 mm) by max 3-7/8 in. (98 mm) by minimum 20 gauge steel electrical panel box, steel utility box, or steel med-gas valve box with hinged steel door and mounting flange.

②



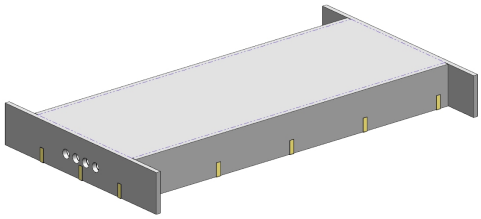
One layer sized to cover back and four sides of steel box. Add relief cuts per box side dimensions. Circular openings made in wrap material to accommodate pipes, tubes or conduits sized max 1/2 in. (13 mm) larger than the outside diameter of the pipe, tube, or conduit.

③



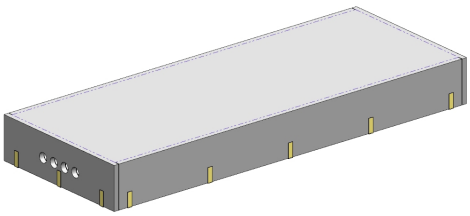
At corners of steel box, wrap cut horizontally or vertically, extending from corner of steel box to edge of wrap material.

④



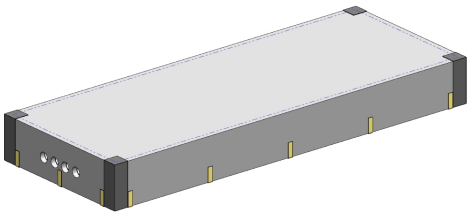
Wrap material folded to maintain contact with back and four sides of steel box.

⑤



At the corners of the box, wrap material is trimmed at top and bottom so that it is flush with the wrap on the sides.

⑥



Seal corners with aluminum foil or FSK tape.

ELECTRICAL CIRCUIT PROTECTION

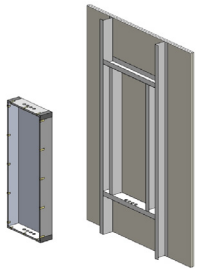
5.0 LARGE MEMBRANE PENETRATION (see UL/cUL W-L-7324)

Refer to approved listing WL 7324 for wall design, box sizes, sealant requirements and specific installation details.

5.1 Electrical

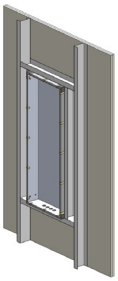
Elevator call box and Medical gas box is protected in the same manner.

⑦



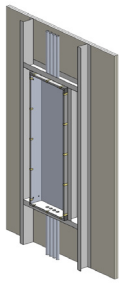
Wall framing may consist of steel channel studs. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC. Additional studs installed horizontally at the top and bottom of the steel box. Additional studs installed vertically as required for steel box attachment.

⑧



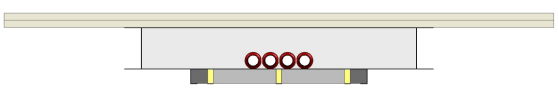
Sides of steel box attached from inside the box to wall framing using steel screws after application of wrap material.

⑨



Top, bottom and/or sides of steel box may be penetrated by maximum twenty (20) total penetrants of nom 1/2 in. (13 mm) to 2 in. (51 mm) diam steel pipe, iron pipe, copper pipe or tube, steel conduit, EMT or flexible steel conduit.

⑩



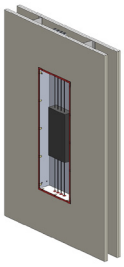
Hilti FS-ONE MAX or CP 618 Firestop Putty to fill circular cutouts made to accommodate pipes, tubes, or conduits.

⑪

⑫

Min 1/2 in. (13 mm) thickness Hilti FS-ONE MAX or CP 618 Firestop Putty applied into ends of pipes, tubes or conduits that terminate inside box.

⑬



Min 1/4 in. (6 mm) bead of Hilti CP606 or FS-ONE MAX applied over exposed edge of CFP-ES Endo Shield prior to installing mounting flange of steel box.

⑭

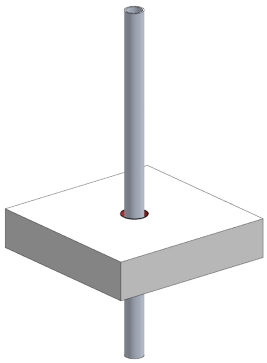
Final look at the application.

6.0 T-RATING

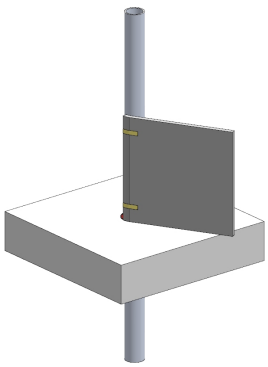
6.1 With CP-680 Cast in Device

Refer to approved listing UL/cUL FA 1207 for base material , pipe type, sealant requirements and specific installation details.

①

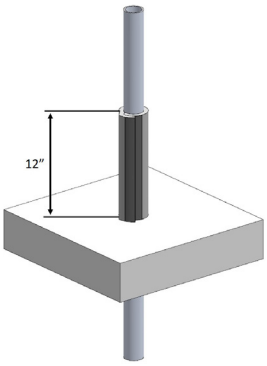


②



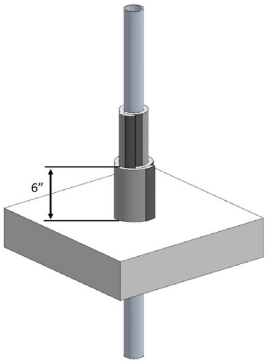
Layer 1: Tape Hilti Endo-Shield to the conduit with min. 1/2 in. wide filament tape, FSK tape or aluminum tape.

③



A 2 in. overlap of longitudinal seam shall be included. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam. For 1 hr. T-rating, one layer of pipe covering shall be continuously wrapped around the penetrant, extending min 12 in. (305 mm) above the floor.

④



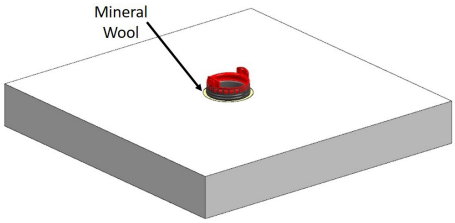
For a 2 hr. T, FT and FTH Rating, an additional layer of pipe covering shall be tightly wrapped around the first layer and extend min 6 in. (152 mm) above floor. All seams to overlap min 2 in. (51 mm) and to be sealed with FSK or foil tape.

6.0 T-RATING

6.2 With CP-653 Speed Sleeve

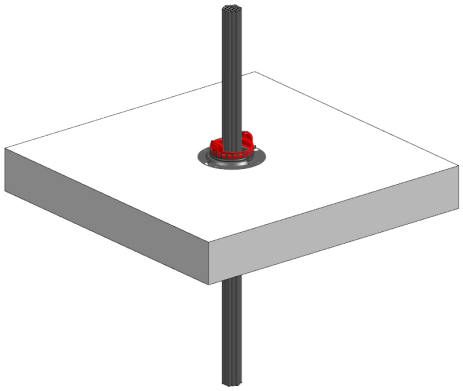
See UL/cUL CAJ3386 for complete details.

①



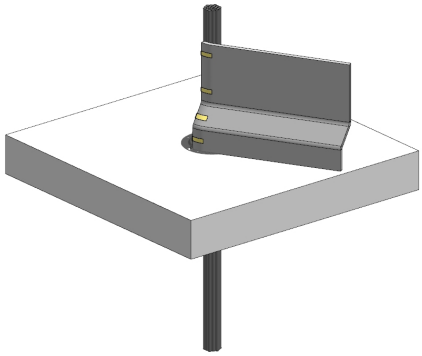
Min 4 in. (102 mm) thickness of min 4 pcf. (64 kg/m3) mineral wool batt insulation firmly packed into annular space between firestop device and opening as a permanent form. Packing material to be installed flush with bottom of floor and recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material.

②



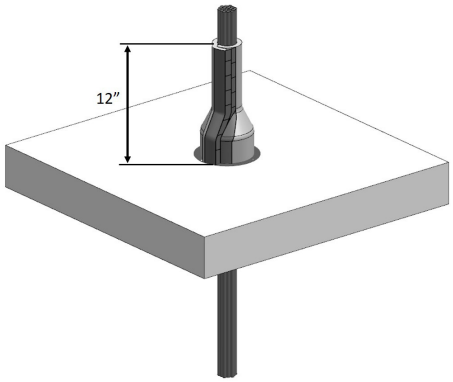
Cables to be tightly bundled within the device and rigidly supported on both sides of floor or wall assembly.

③



One layer of pipe covering shall be continuously wrapped around the device sleeve and penetrant.

④



Extend layer min 12 in. (305 mm) above the floor, with a min 2 in. (51 mm) overlap at the seam. All seams to be sealed with FSK or foil tape. In walls, pipe covering to be installed on both sides of wall.

ELECTRICAL CIRCUIT PROTECTION

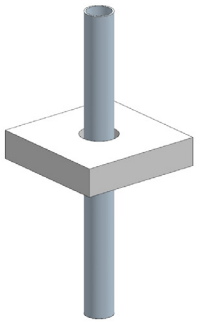
7.0 THROUGH PENETRATION

7.1 Concrete / Block Wall

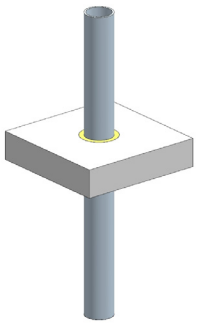
7.1.1 Flush with Surface

For this application please request an Engineering Judgment to our Fire Protection Engineering team through the Hilti Construction Platform (HCP).

①

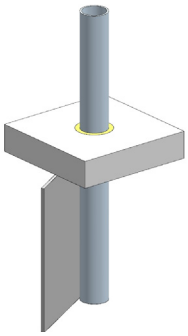


②



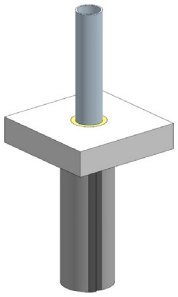
Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m3) mineral wool batt insulation firmly packed into annular space between pipe and opening as a permanent form. Packing material to be installed flush with bottom of floor and recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material.

③



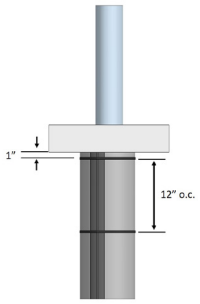
Wrap Hilti Endo-Shield continuously adding the number of layers required by the requested engineering judgement.

④



Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

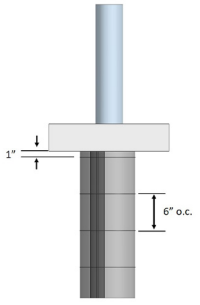
⑤ **a. Steel Banding**



Wrap 1/2 in. Steel banding:

- **1 in. from concrete interface**
- **12 in. on center steel banding spacing**

⑤ **b. Steel Tie Wire**



Wrap min 18 GA Steel tie wire, 1 in. from concrete interface and 6 in. on center steel tie wire spacing.

ELECTRICAL CIRCUIT PROTECTION

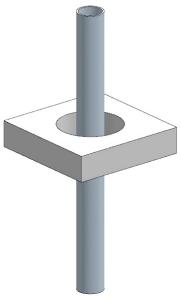
7.0 THROUGH PENETRATION

7.1 Concrete / Block Wall

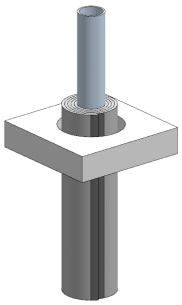
7.1.2 Wrapped Through Concrete Opening

See UL/c/UL C-AJ-5450)

①

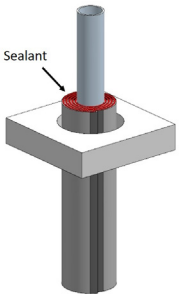


②



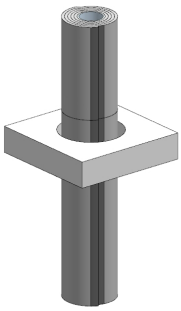
Wrap conduit per methods previously described to achieve desired rating. The annular space between pipe covering material and opening shall be min 1/2 in. (13 mm) to max 1-1/4 in. (32 mm).

③



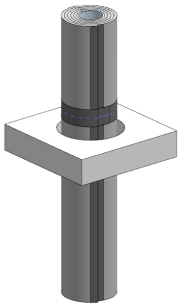
Apply 1/8 in. thick depth of Hilti CP 606 or FS-ONE MAX to be applied to cover edge section.

④



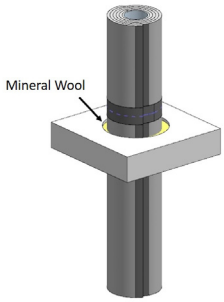
Install the adjacent continuously wrapped section. A 2 in. overlap of longitudinal seam shall be included for each layer required.

⑤



The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the seam and overlap.

⑥



Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m3) mineral wool batt insulation compressed and firmly packed within annular space. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material.

ELECTRICAL CIRCUIT PROTECTION

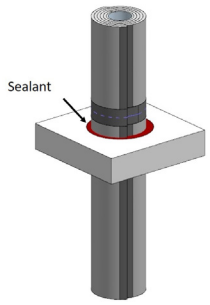
7.0 THROUGH PENETRATION

7.1 Concrete / Block Wall

7.1.2 Wrapped Through Concrete Opening

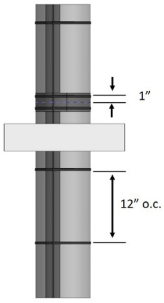
See UL/c/UL C-AJ-5450)

⑦



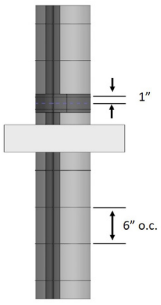
Min 1/2 in. (13 mm) thickness of Hilti FS-ONE MAX applied within the annulus, flush with top surface of floor or with both surfaces of wall.

⑧ **a. Steel Banding**



Wrap 1/2 in. Steel banding:
- **1 in. from radial seam**
- **12 in. on center steel banding spacing.**

⑧ **b. Steel Tie Wire**



Wrap min. 18 GA Steel tie wire:
- **1 in. from radial seam**
- **6 in. on center steel tie wire spacing.**

ELECTRICAL CIRCUIT PROTECTION

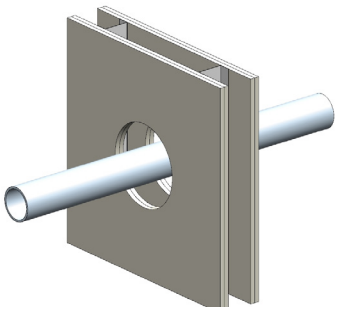
7.0 THROUGH PENETRATION

7.2 Drywall

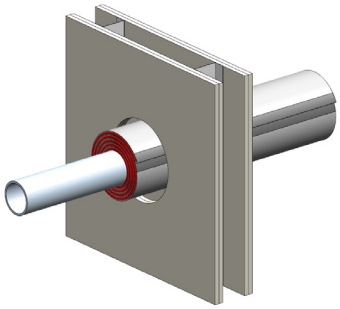
7.2.1 Wrapped Through Drywall Opening

See UL/c/UL C-AJ-5450)

①

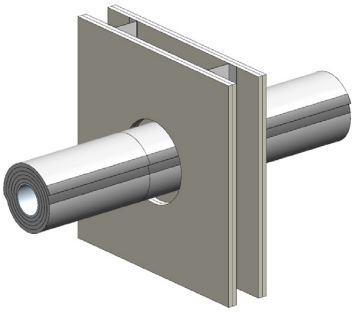


②



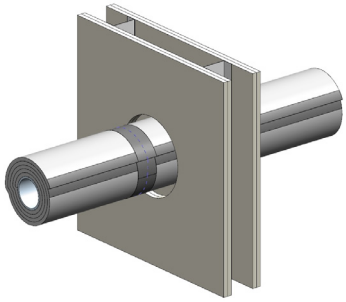
Wrap conduit per methods previously described to achieve desired rating.

③



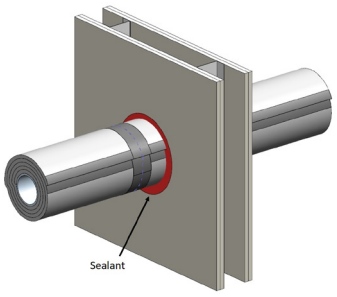
Install the adjacent continuously wrapped section. A 2 in. overlap of longitudinal seam shall be included for each layer required. Apply 3 in. wide aluminum foil tape or FSK tape over the longitudinal seam.

④



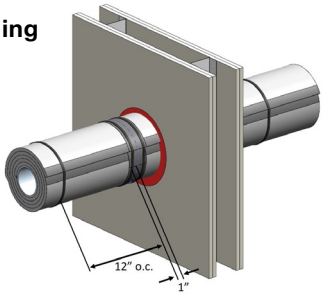
The radial seams are butted end to end without overlap. Apply 3 in. wide aluminum foil tape or FSK tape over the radial seam and overlap 2 in. onto it.

⑤



Min 5/8 in. (16 mm) thickness Hilti FS-ONE MAX 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. (13 mm) diam bead of fill material shall be applied at the pipe covering/gypsum board interface on both surfaces of wall.

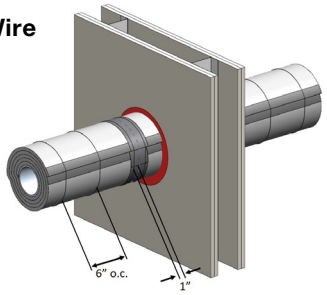
⑥ **a. Steel Banding**



Wrap 1/2 in. Steel banding:

- **1 in. from radial seam**
- **12 in. on center steel banding spacing**

⑥ **b. Steel Tie Wire**

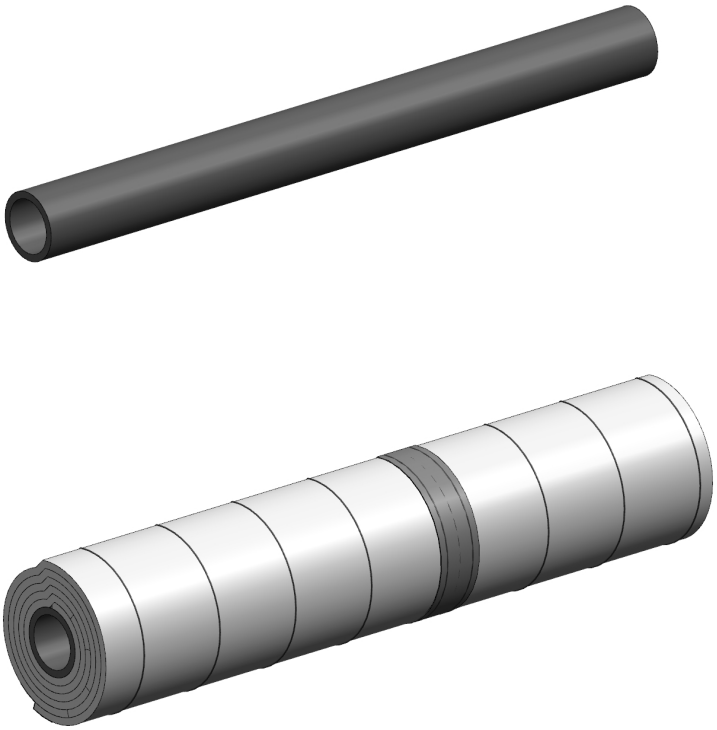


Wrap min. 18 GA Steel tie wire:

- **1 in. from radial seam**
- **6 in. on center steel tie wire spacing**

8.0 FUEL LINE PROTECTION

The installation instructions for fuel lines are the same as “single conduit” section on this guide. Fuel Line protection tested in accordance to UL1489.



In the US:
Hilti, Inc.
7250 Dallas Parkway, Suite 1000, Plano, TX 75024
Customer Service: 1-800-879-8000
en español: 1-800-879-5000
Fax: 1-800-879-7000

www.hilti.com

In Canada:
Hilti (Canada) Corporation
2201 Bristol Circle, Oakville ON | L6H 0J8
Canada
Customer Service: 1-800-363-4458
Fax: 1-800-363-4459

www.hilti.ca

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The data contained in this literature was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1-800-879-8000. All published load values contained in this literature represent the results of testing by Hilti or test organizations. Local base materials were used. Because of variations in materials, on-site testing is necessary to determine performance at any specific site. Laser beams represented by red lines in this publication. Printed in the United States.

WHD • 05/22