METALLIC CHIMNEY LINER SYSTEM

Single Wall Construction Rigid Chimney Liner

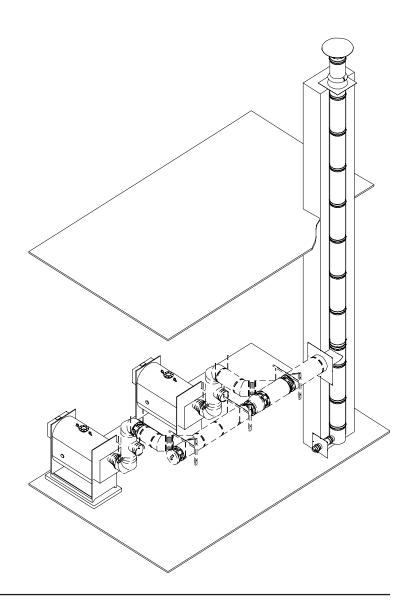
Installation Instructions

Models

IPP Cat. I: Part 1
HEP Cat I, II, III, IV: Part 2



This symbol shows that venting systems
Models IPP and HEP are Listed in the US
and certified for Canada under Underwriters
Laboratories Inc. file no. MH46608. Tests are
made in accordance with UL 1777 standard for
Chimney Liners and the Canadian standard for
Lining Systems CAN/ULC-S635



IT IS OF UTMOST IMPORTANCE THAT THIS CHIMNEY BE INSTALLED ONLY IN ACCORDANCE WITH THESE INSTRUCTIONS.



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Masonry Chimney Liner System

General Notes:

Use only factory-supplied components. Failure to do so will void the certification and the warranty of this chimney.

Maintenance Notes:

Chimney Cleaning: Other than for standard natural gas chimney applications where minimal maintenance is necessary. Keep your chimney clean. Access should be provided for the inspection and cleaning of all sections of the chimney. Have your chimney cleaned by a qualified chimney sweep. If you want to clean the chimney yourself, clean with a nylon or metal chimney brush of the correct size. Do not use a brush that will scratch the stainless steel interior of the chimney.

WARNING

Failure to follow these installation instructions could cause FIRE, CARBON MONOXIDE POISONING, and OR DEATH. If you are unsure of installation requirements, call the phone number listed on the front page of this manual.

CHIMNEY SYSTEM MODEL IPP IS SUITABLE FOR POSITIVE PRESSURE APPLICATIONS USE AT MAXIMUM 60 INCH WATER COLUMN AND MODEL HEP AT MAXIMUM 15 INCH WATER COLUMN INTERNAL STATIC PRESSURE AT 570°F.



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General Notes:

Use only factory-supplied components. Failure to do so will void the certification and the warranty of this chimney.

Maintenance Notes:

Chimney Cleaning: Other than for standard natural gas chimney applications where minimal maintenance is necessary. Keep your chimney clean. Access should be provided for the inspection and cleaning of all sections of the chimney. Have your chimney cleaned by a qualified chimney sweep. If you want to clean the chimney yourself, clean with a nylon or metal chimney brush of the correct size. Do not use a brush that will scratch the stainless steel interior of the chimney.

WARNING

Failure to follow these installation instructions could cause FIRE, CARBON MONOXIDE POISONING, and OR DEATH. If you are unsure of installation requirements, call the phone number listed on the front page of this manual.

CHIMNEY SYSTEM MODEL IPP IS SUITABLE FOR POSITIVE PRESSURE APPLICATIONS USE AT MAXIMUM 60 INCH WATER COLUMN AND MODEL HEP AT MAXIMUM 15 INCH WATER COLUMN INTERNAL STATIC PRESSURE AT 570°F.



PART 1: IPP Category I

UNDERWRITERS LABORATORIES LISTINGS:

Cheminee Lining venting systems Models IPP and HEP are Listed by Underwriters Laboratories, Inc. (UL) under File MH46608 and Tested in accordance with UL 1777 Chimney Liners and the Canadian Standard for Lining Systems CAN/ ULCS635-M91. Listings include the following chimney product categories and diameters.

UL 1777

Model	Classification	Diameters
IPP	Chimney Liners	6" to 48" I.D.

CAN / ULC-S635-M91

Model	Classification	Diameters
HEP	Lining systems for existing masonry	6" to 48" I.D.

FEATURES

Models IPP are part of the Industrial Positive Pressure products for industrial and commercial applications. They are prefabricated modular venting systems designed for quick assembly and using a continuous welded joint stainless steel inner wall. Given that all parts have a male and female end, each model part fit into one another, thus eliminating the need for all kinds of adapters. This unique method of coupling provides an incomparable flexibility in selecting models of flues and chimneys. Models IPP are single wall constructions. The high quality of stainless steel inner wall construction using a continuous welded method for the longitudinal joint provides a high strength-to-weight ratio and low friction losses.

APPLICATION FOR MODELS IPP & HEP CAT 1

UL 103

1. Chimney Liners Listing (Category I, for oil and gas) – Under this category, model IPP liners have been determined suitable for field-installation into new or existing masonry chimneys and used to vent gas-fired and oil-fired appliances in which the maximum continuous flue-gas outlet temperature does not exceed 570°F for oil and 480°F for gas. It also complies with test at 1700°F temperature for 10 minutes.

CAN/ULC-C959

1. Standard for Lining Systems for Existing Masonry or Factory-Built Chimneys and Vents (Class II, for oil and gas) – Under this category, model IPP liners have been determined suitable for installation into existing masonry and used to vent gas-fired and oil-fired appliances in which the maximum continuous flue-gas outlet temperature does not exceed 300°C for oil and 245°C for gas. It also complies with test at 927°C temperature for 10 minutes.

WARNING
NOT FOR USE WITH SOLID-FUEL-FIRED APPLIANCES.

SURROUNDINGS/ENCLOSURES

- 1. In United-States, Models IPP chimney liners are primarily intended to be installed in new or existing masonry chimneys with or without a liner of fire-clay tile, or to be used as a substitute for masonry fire-clay tile flue liners in new chimneys.
- 2. In Canada, Models IPP chimney liners are primarily intended to be installed in existing masonry chimneys with or without a liner of fire-clay tile, or factory-built chimneys and vents.
- 3. The minimum brick thickness of the masonry chimney must be of 3-1/2". Also, the masonry chimney must comply with the National Building Code, the Standard for "Design and Construction of Masonry Chimneys and Fireplaces" CAN/CSA A405 and NFPA 211.
- 4. The heating appliance connected to the chimney liner must not have a flue outlet size larger than the chimney liner area at its smallest point.
- 5. Rain cap and rain cap with bird screens should be checked for ice formation during low ambient temperature. Consult authority having jurisdiction. Also, it's important to size correctly the venting of low temperature flue products in geographical areas experiencing sustained low ambient temperature.

CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA.

SYSTEM SIZING

Complete system sizing and capacity may be obtained from the "Chimney, Gas Vent, and Fireplace Systems" chapter of the ASHRAE Handbook or contact your Cheminee Lining representative. In spite of any sizing guidelines, when sizing exhaust systems, it is most important that the heating appliance, engine or turbine manufacturer's installation instructions be followed. Not following these instructions may result in inadequate chimney performance and/or a violation of the equipment manufacturer's installation requirements.



PART NUMBERS

These instructions identify major models IPP & HEP parts by part number.

Example no.2: Number: HEP 36L 24			
Model	Description	Inside Diameter	
HEP Single Wall	3" Pipe Section Length	24"	

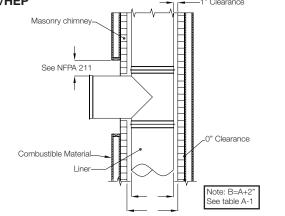
CLEARANCES

The following table serves to identify the minimum clearances required when installing a liner system in a masonry chimney.

Table A-1. Minimum air space clearance

	Air space location		
Model and diameter "A"	Between masonry chimney exterior and combustible	Between masonry chimney interior and the liner	
IPP 6" to 48"	0"	1"	

EX 1: Clearance and dimension of masonry chimney for model IPP/HEP



WARNING
DO NOT INSTALL ANY TYPE OF INSULATION IN THE REQUIRED CLEARANCE SPACES SURROUNDING THE LINER.

CHIMNEY LINER PIPE AND FITTING JOINT ASSEMBLY

All components have a male and a female end. The installation orientation is indicated on the labeling of each pipe section with an arrow. The arrow indicates the direction of the flue (See Fig. A-1). Clean all inner and outer surfaces of male and female ends with an appropriate organic solvent, such as acetone, Mek, or other commercial degreaser.

- 1. Before fitting the male and female ends in one another, a sealant is applied on the male end, at the gap between the inner band and the inner pipe. (See Fig. A-1 and A-3). Table A-2 for Sealant.
- 2. After joining the male and female ends together, a layer of sealant is applied inside the V-groove of the Assembly Band (AB) prior to its installation over the joint (See Fig. A-3). Table A-2 for Sealant.
- 3. The Assembly Band (AB) (Fig.A-2 and A-3) is installed and clamped in place with the 4 screws (supplied).
- 4. Where the chimney passes outdoor, an exterior seal-ant (ES) is applied at the joint of the Storm Collar (SC) and the outer wall of the pipe for weather protection (see Fig.A-4). Table A-2 for Sealant.

CAUTION A. DO NOT ALLOW SCREWS TO PENETRATE THE INNER PIPE. THIS CAN CAUSE CORROSION, GAS LEAKAGE OR EXPANSION FAILURE B. OBSERVE ADEQUATE SAFETY MEASURES WHEN USING A DEGREASER.

Fig. A-1 - Models IPP & HEP Flue Direction

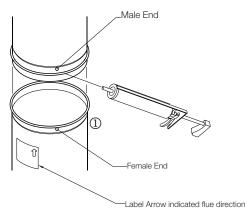


Table A-2 - Sealant Usage

interior installatio	n			
Sealant Application	Supplier	Model	Color	Max. Temp.
Inner Joints	Adchem	X-Trasil H.T. 4706_3	red	500°F
alternate	GE	RTV-106	red	500°F
alternate	Dow Corning	RTV-736	red	500°F
Exterior Installati	on			
Sealant Application	Supplier	Model	Color	Max. Temp.
Outer Joints	Adchem	Adsil 4809	Gray	375°F

Fig. A-2 - Joint Components Models IPP & HEP

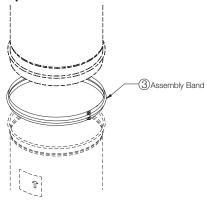
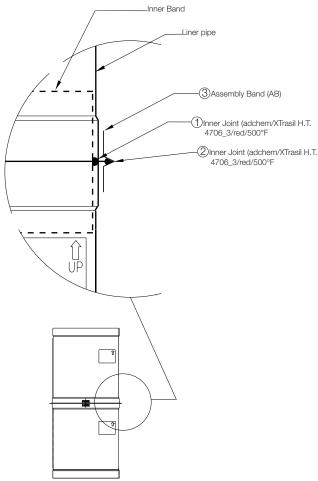


Fig. A-3 - Assembled Models IPP & HEP



SUPPORT METHODS AND HEIGHT LIMITS

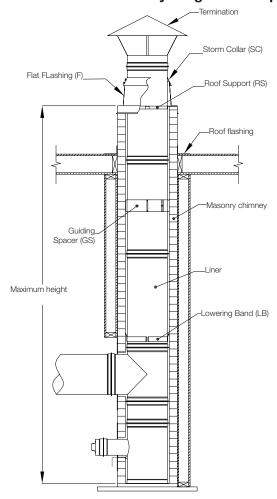
- 1. The optimal method to support the liner system is to rest the liner system on a solid foundation and to use a roof support (RF) at the exit of the masonry chimney (Fig.A-4).
- 2. The maximum heights between the base and to Roof Support (RF) are shown in Table A-3.

Table A-3 - Maximum Chimney Heights

Inside Diameter (in)	Maximum Height (ft)
6" thru 14"	90 (27.4 m)
16 thru 48"	125 (38.1 m)

Note: if higher height is needed, please call manufacturer, the engineering team can provide solutions.

Fig. A-4 - Maximum Chimney Height and Support



Note: Use Guiding Spacer (GS) at every 50 feet, See Section C.

PIPE WEIGHT

Pipe weight is given in pounds per foot of pipe for each diameter.

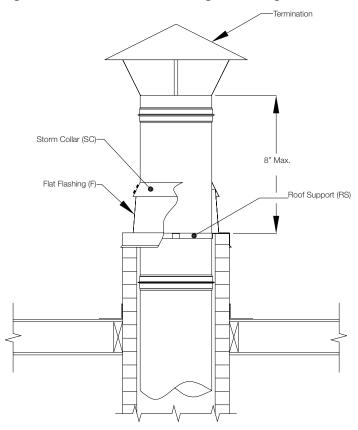
Table A-4 - Pipe weight in lb/ft

Inside diameter	IPP Model	HEP Model
6	3.2	2.2
8	4.3	2.9
10	5.4	3.6
12	6.5	4.3
14	7.6	5.1
16	8.6	5.8
18	9.7	6.5
20	10.8	7.2
22	11.9	7.9
24	12.9	8.7
26	14.0	9.4
28	15.1	10.1
30	16.2	10.8
32	17.3	11.5
34	18.3	12.3
36	19.4	13.0
38	20.5	13.7
40	21.6	14.4
42	28.8	15.2
44	30.1	15.9
46	31.5	16.6
48	32.9	17.3

LINER FREESTANDING HEIGHT

1. Maximum freestanding height above the masonry chimney is 4 feet (1.2 m). See Fig. A-5.

Fig. A-5 - Maximum Freestanding Liner Height

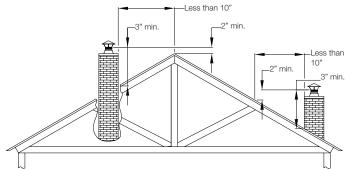


TERMINATION HEIGHT

Chimneys and vents shall terminate above the roof level in accordance with the following requirements (Fig. A-6):

- Five feet above the roof level or any adjacent flat roof, wall parapet or air intakes, and/or in accordance with the following NFPA 211 requirements.
- 2. Where chimney terminates at less than 10 feet from any adjacent ridge, wall or parapet, the chimney shall terminate at minimum of 3 feet above the ridge, wall, or parapet.
- 3. Where chimney terminates at more than 10 feet from ridge, wall, or parapet, a minimum height of 2 feet shall be required above the ridge wall or parapet.

Fig. A-6 - Chimney Termination Height



90° TEE (T90)

- 1. Generally used to connect the horizontal length from an appliance to the vertical length in boiler exhaust systems.
- 2. There are two types of 90° Tee (T90), one for model IPP and another for HEP model.
- 3. For model IPP, a removable tee branch is used for easy installation in two steps. First, insert the tee section in the masonry chimney. After, install the tee branch on the tee section with screws (Fig. B-1).
- 4. Also, a welded tee branch can be used. There are two ways to install this type of 90° Tee (T90). First way is, if the dimension of masonry chimney allows it, insert the tee section with the welded branch in the chimney (Fig. B-2a). Second way is to enlarge the masonry chimney inlet opening (Fig. B-2b) by demolishing the masonry wall and rebuilding it.
- 5. A 90° Tee (T90) section with a Tee Cap (TC) can be use to facilitate access for inspection and maintenance (Fig. B-1).

Note: if those configurations can not be used, please call manufacturer, the engineering team can provide solutions.

Fig. B-1 - Detachable 90° Tee (DT90) Assembly

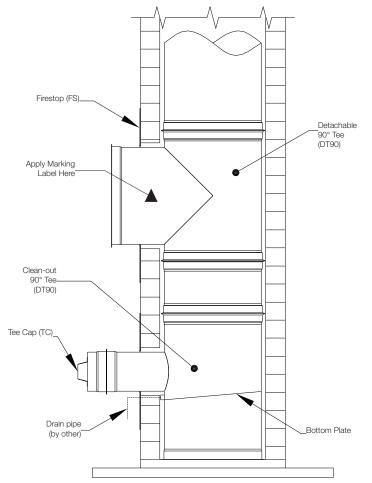


Fig. B-2a - Welded 90° Tee (T90) Assembly

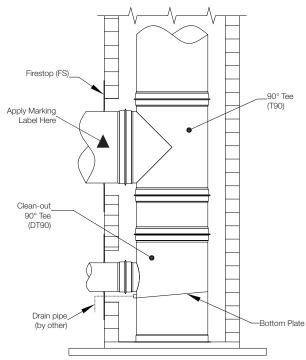
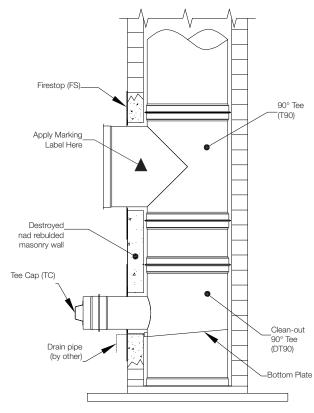


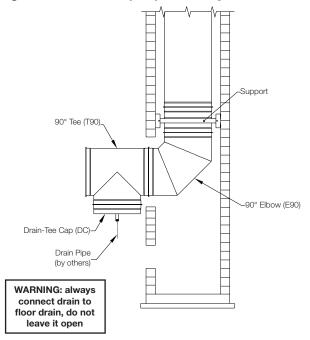
Fig. B-2b - Welded 90° Tee (T90) Assembly



90° ELBOW (E90)

Another assembly option is to use a 90° Elbow (E90) with a 90° Tee (T90) and Drain-Tee Cap (DC). (See Fig. B-3)

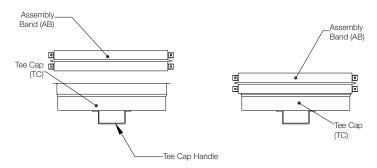
Fig. B-3 - 90° Elbow (E90) Assembly



TEE CAP (TC)

- 1. Used to block the horizontal opening of the tee, see Fig. B-1. Removable, it facilitates access for inspection and maintenance of the chimney (Fig. B-4).
 - 2. The assembly includes an Assembly Band (AB).
- 3. Joint assembly between the Tee Cap (TC) and the Tee is done in the same manner as described in Section A Piping and Fitting Assembly.

Fig. B-4 - Tee Cap (TC)

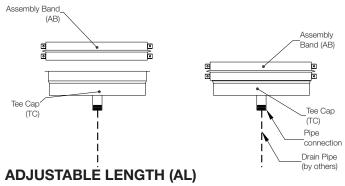


DRAIN-TEE CAP (DC)

- 1. Used in some configurations to block the lower vertical opening of a tee, see Fig. B-3. It serves to collect rainwater that may enter the chimney (Fig. B-5).
- 2. Removable, it facilitates access for inspection and maintenance of the chimney.
- 3. To be connected to a drain of 1" diameter-NPT. It is connected to the tee with the joint assembly.

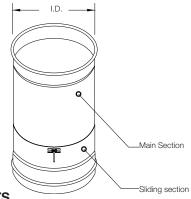
4. Joint assembly between the Drain-Tee Cap (DC) and the tee is done in the same manner as described in Section A Piping and Fitting Assembly.

Fig. B-5 - Drain-Tee Cap (DC)



- 1. Used in horizontal straight runs of models IPP and HEP, the Adjustable Length (AL) serves two major functions:
 - a) To make up for odd lengths of pipe in short runs
 - b) To extend the Tee Cap (TC) outside the masonry chimney
- 2. This part is designed to be adjustable to any needed exact length and its internal joint must be sealed by working sealant under the seal section, as well as at the joint between the male and the female ends to be closed with the Assembly Band (AB).
- 3. The adjustable length includes a main section and an outer sliding section that can be secured in the desired length position. Cutting the main section may be required for proper fitting.
- 4. The sliding section is designed to fit outside the standard main section.
- 5. Once the final length of the section is set, it is secured using a single clamp and screw. This seal section will prevent the inner section from slipping after the assembly.

Fig. B-6 - Adjustable Length (AL) Detail



SPECIAL PARTS

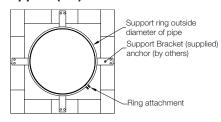
Available when specified are special parts or components used in chimney systems that can be factory-built to accommodate field situations where standard parts cannot be used.

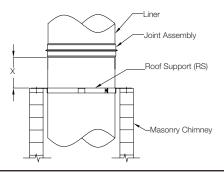


ROOF SUPPORT (RS)

Used to support and guide the portion of the chimney which extends to the masonry chimney. It is attached to the masonry chimney by means of four angles (See Fig. C-1). It maintains a minimum distance between the liner and the masonry chimney.

Fig. C-1 - Roof Support (RS)



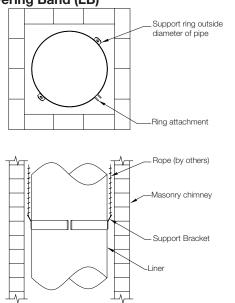


Keep joint away From support X=6" Min. above and under

LOWERING BAND (LB)

Used to insert the liner in the masonry chimney by supporting the liner during the lowering.

Fig. C-2 - Lowering Band (LB)

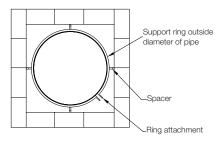


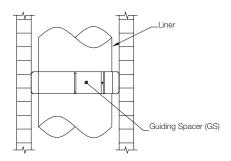
Note: Must be used with shackles.

GUIDING SPACER (GS)

Used to guide the liner every 50 feet and to keep the clearance between the liner and the masonry chimney. Also, it prevents bending of the liner in the masonry chimney and has for effect to increase the maximum height of the liner.

Fig. C-3 - Guiding Spacer (GS)





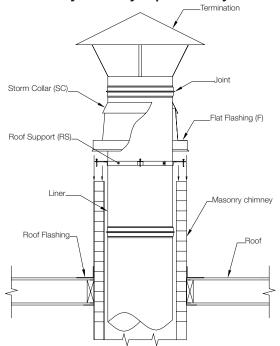
Note: See Section D Masonry Chimney Top and Wall Penetrations for complete Roof Support (RS) assembly details an use.



FLAT FLASHING (F) AND VENTILATED FLASHING (VF) ASSEMBLIES

The Flat Flashing assembly (F) is primarily used for boiler or low temperature exhaust to close the masonry chimney exit opening. It is design to be installed on a flat masonry chimney top of a minimum height of 3 feet from the roof (See Fig. D-1). For some areas, greater heights may be needed according to local code requirements. The roof framing dimension and the masonry chimney dimension must provide sufficient opening to comply with the minimum clearance from combustibles. (See Table A-1) The Roof Support (RS) is secured to the top of the masonry chimney using two 1/4" masonry screws in each support bracket. The Flat Flashing (F) is then lowered on the top of the masonry chimney and the Storm Collar (SC) secured to the chimney section with the screws supplied. A Ventilated Flashing (VF) option is also available where air circulation between the liner and the masonry chimney is wanted. The Ventilated Flashing (VF) option may serve as a ventilation outlet in small boiler rooms with gravity air supply.

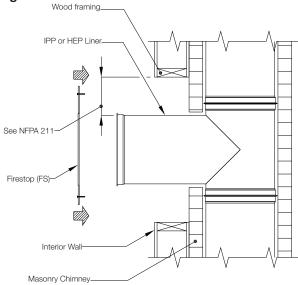
Fig. D-1 - Masonry Chimney Top Assembly



WALL PENETRATION

Where a liner section passes through a wall and a masonry chimney, the combustible material needs to be at a minimum clearance from the exterior of the liner to be protected from radiation heat from the liner. See NFPA 211 or local codes for minimum distances to respect (Fig. D-2). Also, use a FireStop (FS) to close the masonry chimney inlet opening.

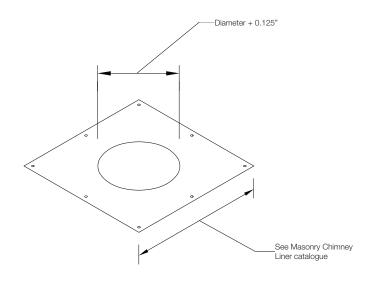
Fig. D-2 - Wall Penetration



FIRESTOP (FS)

Used to close the opening of a masonry chimney where a liner passes through. see Fig. D-3.

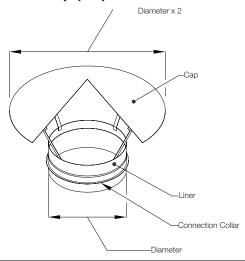
Fig. D-3 - Firestop (FS) Assembly



RAIN CAP (RC)

Installed at the top of the IPP liner, it prevents entry of rain into the chimney. (See Fig. E-7 for assembly)

Fig. E-1 - Rain Cap (RC) Detail

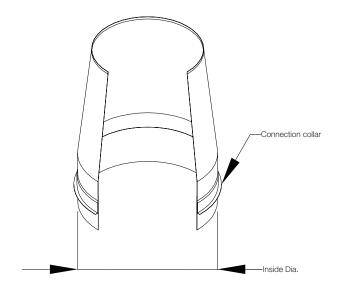


Note: Do not use with HEP model.

EXHAUST CONE (EC)

Installed at the top the chimney, it improves the draft and increases the speed of escaping gases by 50%. Installation of a drain at the base of the liner is required to collect rainwater. For installation details Exhaust Cone (EC) (See Fig.E-7).

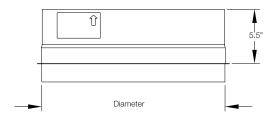
Fig. E-2 - Exhaust Cone (EC) Detail



CLOSURE SECTION (CS)

Installed at the chimney extremity, the use of a drain at the base of the liner is required to collect any excess rain that may enter the chimney.

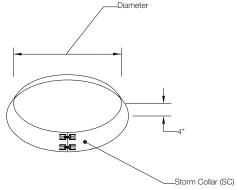
Fig. E-3 - Closure Section (CS) Detail



STORM COLLAR (SC)

Used for sealing the opening between the chimney and the Flat Flashing (F), the Storm Collar (SC) must be sealed to the chimney with silicone putty. It is supplied with the Flat Flashing (F) roof assembly or Adjustable Flashing (AF) roof assembly.

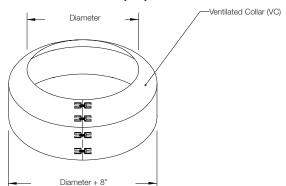
Fig. E-4 - Storm Collar (SC) Detail



VENTILATED COLLAR (VC)

Used for sealing the opening between the chimney and Ventilated Flashing (VF), the Ventilated Collar (VC) must be sealed to the chimney with silicone putty. It is supplied with the Ventilated Flashing (VF).

Fig. E-5 - Ventilated Collar (VC) Detail



FAN ADAPTER (FA)

Installed at the chimney extremity. It is used to connect the chimney to an up-blast exhaust fan.

Fig. E-6 - Fan Adapter (FA) Detail

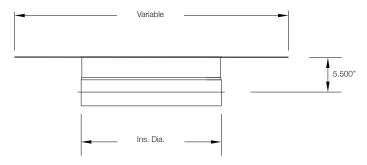


Fig. E-7a - Typical Installation for Rain Cap (RC)

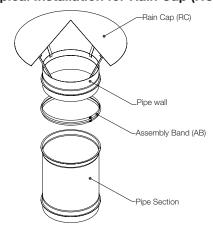
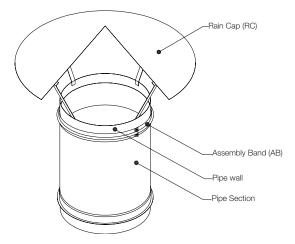


Fig. E-7b - Finished Assembly for Rain Cap (RC)



Terminations Use and Application

Termination	Model	Temperature from 0°F to less than 570°F continuous or boiler applications
Rain Cap	IPP	6" to 48" diameter
Exhaust Cone	IPP and HEP	6" to 48" diameter
Closure Section	IPP and HEP	6" to 48" diameter



CLEANING OF THE MASONRY CHIMNEY

Prior to install, we recommend to check the masonry chimney for cracks, loose, other materials that could inhibit correct installation of the liner and missing bricks or mortar. Also, clean and neutralize the existent masonry chimney.

- 1. Clean with a water jet all interior surfaces of the masonry chimney in order to remove any residue of combustion and materials releases or not healthy. After cleaning, all surfaces must be solid and healthy.
- 2. Wash with clean water on air pressure with a mixture of 10% of potassium carbonate all surface interns chimney. Let act at least 12 hours the alkaline solution in order to neutralize the accumulated acid. Rinse with clean water on air pressure.

OTHER WAY TO INSTALL LINER

- 1. Joint the access door Tee section with the flue gases 90° Tee (see section B).
- 2. The use of a lowering band (see section C) and a rope is necessary. The lowering band is to be installed on lower section of the liner above the 90° Tee (T90). Two shackles are to be installed on each side of the lowering band and the rope must be attached to them (Fig. F-1).
- 3. The first section is lowered in the masonry chimney until the edge of the liner is above the top of the chimney. The rope must be blocked to support the liner and another liner section can be added on the first one (Fig. F-1).
- 4. Continue step 3 until the liner system is resting on the base of the masonry chimney by adding section one by one.
- 5. Remove the rope and the shackle from the lowering band above the 90° Tee (T90) and leave the lowering band on the liner (Fig. F-2).

Fig. F-1 - Insertion of Liner in Masonry Chimney

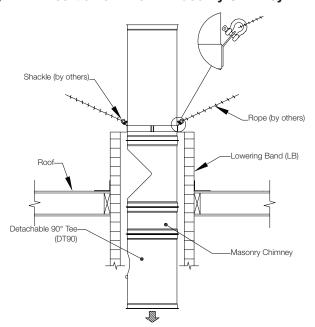
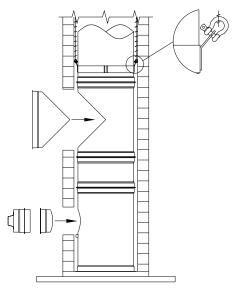


Fig. F-2 - Tee Branch Installation



- 6. Install the removable branch on the 90° Tee (T90) with screws (Fig. F-2). Also, install a FireStop (FS) to close the masonry chimney inlet opening.
- 7. Install the Roof Support (RF), the Flat Flashing (F), the Storm Collar (SC) and a termination section on the top of the masonry chimney (See section D and E).

INSERTION OF THE IPP LINER

- 1. If the welded 90° Tee (T90) (see section B) can pass through the masonry chimney, use same steps as model IPP.
- 2. If the dimension of the masonry chimney doesn't allowed the 90° Tee (T90) to pass through, the masonry inlet opening must be enlarged to permit the tee section to be installed.
- 3. Joint the clean-out 90° Tee section with the flue gases 90° Tee and insert the assembly in the masonry chimney by enlarging the inlet opening (Fig. F-3)

Note: Verify the integrity and the solidity of the masonry chimney prior to demolishing the masonry

- 4. For the liner sections above the 90° Tee (T90), the use of a lowering band (see section C) and a rope is necessary. The lowering band is to be installed at the base of the liner section for easy access to remove the rope at the end. Two shackles are to be installed on each side of the lowering band and the rope must be attached to them (Fig. F-4).
- 5. The section is lowered in the masonry chimney until the edge of the liner is above the top of the chimney. The rope must be blocked to support the liner and another liner section can be added on the first one (Fig. F-4).
- 6. Continue step 2 until the liner system is resting on the top of the 90° Tee (T90) by adding section one by one.



Fig. F-3 - Installation of Liner Tee Section in **Masonry Chimney**

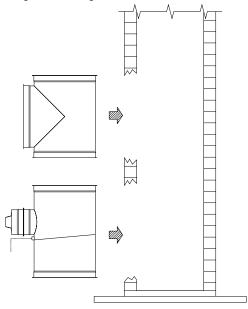
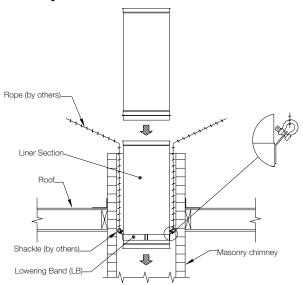


Fig. F-4 - Lowering of Liner Section in Masonry **Chimney**



- 7. Remove the rope and the shackle from the lowering band at the bottom of the liner.
- 8. Rebuild the masonry chimney wall and install a FireStop
- (FS) to close the masonry chimney inlet opening.

 9. Install the Roof Support (RF), the Flat Flashing (F), the Storm Collar (SC) and a termination section on the top of the masonry chimney (See section D and E).

Note: If those configurations can not be used, please call manufacturer, the engineering team can provide solutions.



CHIMNEY LINER PART LISTED FOR CLASS 2, CATEGORY 1 BUILDING HEATING APPLIANCES WHICH BURN NATURAL GAS, PROPANE OR OIL FUEL THAT PRODUCE GASES AT A TEMPERATURE OF MAXIMUM 570°F (300°C).

MODEL IPP **WARNING**

IN CANADA, CHIMNEY LINER IS LISTED ONLY FOR EXISTING MASONRY OR FACTORY-BUILT CHIMNEY AND VENTS. LINING SYSTEMS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS. ALSO LISTED FOR NEW AND EXISTING MASONRY CHIMNEYS IN UNITED STATES.

MINIMUM CLEARANCE FOR APPLIANCES WHICH BURN NATURAL GAS, PROPANE OR OIL AS A FUEL			
MODEL IPP 6" to 48" dia. category I			
AIR SPACE LOCATION	Between Between masonry chimney masonry chimney		
CLEARANCE	0"	1"	



INSTALLATION DATE:

SUITABLE FOR EXTERIOR





3ST5

MODEL IPP & HEP CHIMNEY LINER PART LINER FOR EXISTING CHIMNEY.

MODEL HEP ALSO LISTED AS SPECIAL GAS VENT CATEGORY II, III, IV; GAS VENT TYPE BH CLASS I AND II MAX 550°F / 288°C

MODEL IPP - HEP -LINER COMPONENT

MATERIAL FOR USE WITH FACTORY BUILT CHIMNEY MODEL IPP OR HEP.

CHIMNEY LINER IS LISTED ONLY FOR EXISTING CHIMNEY IN CANADA. LINING SYSTEMS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS. ALSO LISTED FOR NEW AND EXISTING MASONRY CHIMNEYS IN UNITED STATES.



Lining www.chemineelining.com



PART 2: HEP Category I, II, III, IV



UNDERWRITERS LABORATORIES LISTINGS:

Venting systems Models IPP and HEP are Listed by Underwriters Laboratories, Inc. (UL) under File MH46608 and Tested in accordance with UL 1777 Chimney Liners and the Canadian Standard for Lining Systems CAN/ULCS635-M91. Listings include the following chimney product categories and diameters.

UL 1777

Model	Classification	Diameters
IPP	Chimney Liners	6" to 48" I.D.

CAN / ULC-S635-M91

Model	Classification	Diameters
HEP	Lining systems for existing masonry	6" to 48" I.D.

FEATURES

Models IPP are part of the Industrial Positive Pressure products for industrial and commercial applications. They are prefabricated modular venting systems designed for quick assembly and using a continuous welded joint stainless steel inner wall. Given that all parts have a male and female end, each model part fit into one another, thus eliminating the need for all kinds of adapters. This unique method of coupling provides an incomparable flexibility in selecting models of flues and chimneys. Models IPP are single wall constructions. The high quality of stainless steel inner wall construction using a continuous welded method for the longitudinal joint provides a high strength-to-weight ratio and low friction losses.

APPLICATION FOR MODELS IPP & HEP CAT 1

UL 1777

1. Chimney Liners Listing (Category I, for oil and gas) – Under this category, model IPP liners have been determined suitable for field-installation into new or existing masonry chimneys and used to vent gas-fired and oil-fired appliances in which the maximum continuous flue-gas outlet temperature does not exceed 570°F for oil and 480°F for gas. It also complies with test at 1700°F temperature for 10 minutes.

CAN / ULC-S635-M91

1. Standard for Lining Systems for Existing Masonry or Factory-Built Chimneys and Vents (Class II, for oil and gas) – Under this category, model IPP liners have been determined suitable for installation into existing masonry and used to vent gas-fired and oil-fired appliances in which the maximum continuous flue-gas outlet temperature does not exceed 300°C for oil and 245°C for gas. It also complies with test at 927°C temperature for 10 minutes.

WARNING
NOT FOR USE WITH SOLID-FUEL-FIRED APPLIANCES.

SURROUNDINGS/ENCLOSURES

- 1. In the United States, Models IPP chimney liners are primarily intended to be installed in new or existing masonry chimneys with or without a liner of fire-clay tile, or to be used as a substitute for masonry fire-clay tile flue liners in new chimneys.
- 2. In Canada, Models IPP chimney liners are primarily intended to be installed in existing masonry chimneys with or without a liner of fire-clay tile, or factory-built chimneys and vents.
- 3. The minimum brick thickness of the masonry chimney must be of 3-1/2". Also, the masonry chimney must comply with the National Building Code, the Standard for "Design and Construction of Masonry Chimneys and Fireplaces" CAN/CSA A405 and NFPA 211.
- 4. The heating appliance connected to the chimney liner must not have a flue outlet size larger than the chimney liner area at its smallest point.
- 5. Rain caps and rain caps with bird screens should be checked for ice formation during low ambient temperature. Consult authority having jurisdiction. Also, it's important to size correctly the venting of low temperature flue products in geographical areas experiencing sustained low ambient temperature.

CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA.

SYSTEM SIZING

Complete system sizing and capacity may be obtained from the "Chimney, Gas Vent, and Fireplace Systems" chapter of the ASHRAE Handbook or contact your Cheminee Lining representative. In spite of any sizing guidelines, when sizing exhaust systems, it is most important that the heating appliance, engine or turbine manufacturer's installation instructions be followed. Not following these instructions may result in inadequate chimney performance and/or a violation of the equipment manufacturer's installation requirements.



PART NUMBERS

These instructions identify major models IPP & HEP parts by part number.

Example no.2:		
Number:	HEP 36L 24	
M. J. J	D	Last de Bienesten
Model	Description	Inside Diameter
HEP Single Wall	36" Pipe Section Length	24"

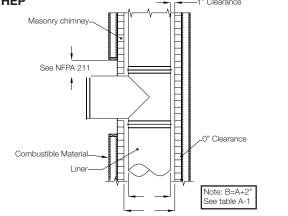
CLEARANCES

The following table serves to identify the minimum clearances required when installing a liner system in a masonry chimney.

Table A-1. Minimum air space clearance

	Air space	location
Model and diameter "A"	Between masonry chimney exterior and combustible	Between masonry chimney interior and the liner
HEP 6" to 48"	0"	1"

EX 1: Clearance and dimension of masonry chimney for model IPP/HEP ——1" Clearance



WARNING
DO NOT INSTALL ANY TYPE OF INSULATION IN THE REQUIRED CLEARANCE SPACES SURROUNDING THE LINER.

CHIMNEY LINER PIPE AND FITTING JOINT ASSEMBLY

All components have a male and a female end. The installation orientation is indicated on the labeling of each pipe section with an arrow. The arrow indicates the direction of the flue (See Fig. A-1). Clean all inner and outer surfaces of male and female ends with an appropriate organic solvent, such as acetone, Mek, or other commercial degreaser.

- 1.Before fitting the male and female ends in one another, a sealant is applied on the male end, at the gap between the inner band and the inner pipe. (See Fig. A-1 and A-3). Table A-2 for Sealant.
- 2. After joining the male and female ends together, a layer of sealant is applied inside the V-groove of the Assembly Band (AB) prior to its installation over the joint (See Fig. A-3). Table A-2 for Sealant.
- 3. The Assembly Band (AB) (Fig.A-2 and A-3) is installed and clamped in place with the 4 screws (supplied).
- 4. Where the chimney passes outdoor, a exterior sealant (ES) is applied at the joint of the Storm Collar (SC) and the outer wall of the pipe for weather protection (see Fig.A-4). Table A-2 for Sealant.

CAUTION
A. DO NOT ALLOW SCREWS TO PENETRATE THE INNER PIPE. THIS CAN
CAUSE CORROSION, GAS LEAKAGE OR EXPANSION FAILURE
B. OBSERVE ADEQUATE SAFETY MEASURES WHEN USING A DEGREASER.

Fig. A-1 - Models IPP & HEP Flue Direction

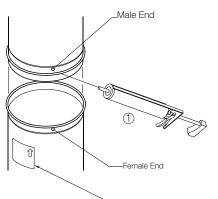


Table A-2 - Sealant Usage

-Label Arrow indicated flue direction

Interior Installation

Sealant Application	Supplier	Model	Color	Max. Temp.
Inner Joints	Adchem	X-Trasil H.T. 4706_3	red	500°F
alternate	GE	RTV-106	red	500°F
alternate	Dow Corning	RTV-736	red	500°F
Exterior Installati	on			
Sealant Application	Supplier	Model	Color	Max. Temp.
Outer Joints	Adchem	Adsil 4809	Grav	375°F

Fig. A-2 - Joint Components Models IPP & HEP

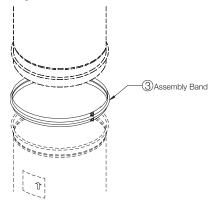
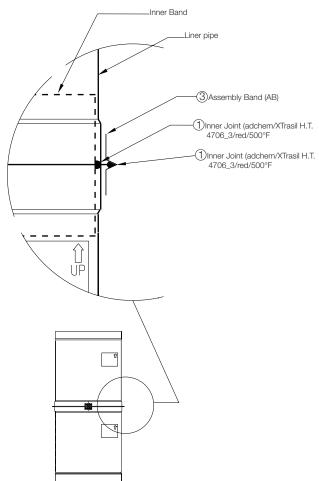




Fig. A-3 - Assembled Models IPP & HEP



SUPPORT METHODS AND HEIGHT LIMITS

1. The optimal method to support the liner system is to rest the liner system on a solid foundation and to use a roof support (RF) at the exit of the masonry chimney (Fig.A-4).

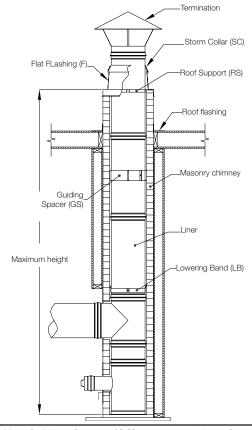
2. The maximum heights between the base and to Roof Support (RF) are shown in Table A-3.

Table A-3 - Maximum Chimney Heights

Inside Diameter (in)	Maximum Height (ft)
6" thru 14"	90 (27.4 m)
16" thru 48"	125 (38.1 m)

Note: if higher height is needed, please call manufacturer, the engineering team can provide solution.

Fig. A-4 - Maximum Chimney Height and Support



Note: Use Guiding Spacer (GS) at every 50 feet, See Section C.

PIPE WEIGHT

Pipe weight is given in pounds per foot of pipe for each diameter.

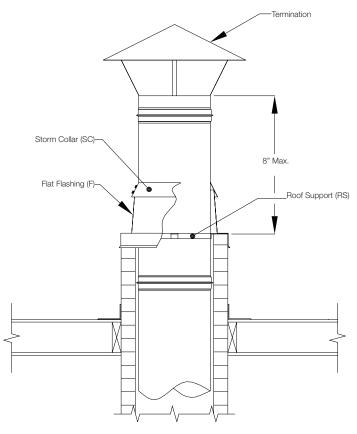
Table A-4 - Pipe weight in lb/ft

Inside diameter	IPP Model	HEP Model
6	3.2	2.2
8	4.3	2.9
10	5.4	3.6
12	6.5	4.3
14	7.6	5.1
16	8.6	5.8
18	9.7	6.5
20	10.8	7.2
22	11.9	7.9
24	12.9	8.7
26	14.0	9.4
28	15.1	10.1
30	16.2	10.8
32	17.3	11.5
34	18.3	12.3
36	19.4	13.0
38	20.5	13.7
40	21.6	14.4
42	28.8	15.2
44	30.1	15.9
46	31.5	16.6
48	32.9	17.3

LINER FREESTANDING HEIGHT

1. Maximum freestanding height above the masonry chimney is 4 feet (1.2 m). See Fig. A-5.

Fig. A-5 - Maximum Freestanding Liner Height

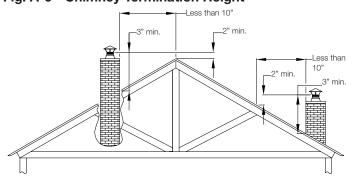


Termination HEIGHT

Chimneys and vents shall terminate above the roof level in accordance with the following requirements (Fig. A-6):

- 1. Five feet above the roof level or any adjacent flat roof, wall parapet or air intakes, and/or in accordance with the following NFPA 211 requirements.
- 2. Where chimney terminates at less than 10 feet from any adjacent ridge, wall or parapet, the chimney shall terminate at minimum of 3 feet above the ridge, wall, or parapet.
- 3. Where chimney terminates at more than 10 feet from ridge, wall, or parapet, a minimum height of 2 feet shall be required above the ridge wall or parapet.

Fig. A-6 - Chimney Termination Height



90° TEE (T90)

- 1. Generally used to connect the horizontal length from an appliance to the vertical length in boiler exhaust systems.
- 2. There are two types of 90° Tee (T90), one for model IPP and another for HEP model.
- 3. For model HEP, due to corrosive action of condensing appliances category II and IV, a welded tee branch is necessary. There are two ways to install this type of 90° Tee (T90). First way is, if the dimension of masonry chimney allows it, insert the tee section with the welded branch in the chimney (Fig. B-1). Second way is to enlarge the masonry chimney inlet opening (Fig. B-2) by demolishing the masonry wall and rebuilding it.
- 4. A 90° Tee (T90) section with a Tee Cap (TC) can be used to facilitate access for inspection and maintenance (Fig. B-1).

Note: If those configurations can not be used, please call manufacturer, the engineering team can provide solutions.

Fig. B-1 - Detachable 90° Tee (DT90) Assembly

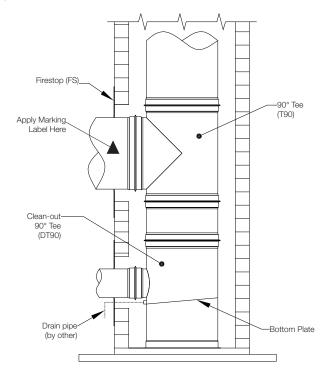
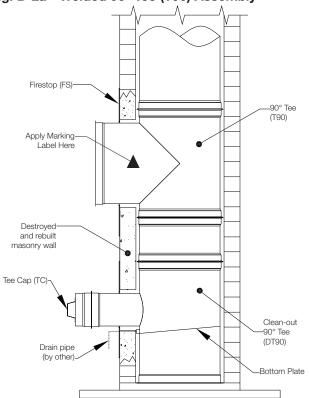


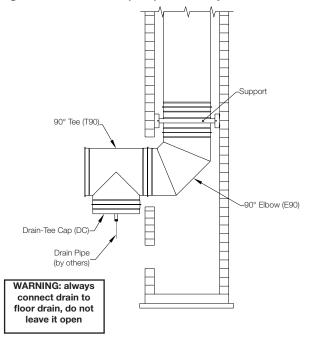
Fig. B-2a - Welded 90° Tee (T90) Assembly



90° ELBOW (E90)

Another assembly option is to use a 90° Elbow (E90) with a 90° Tee (T90) and Drain-Tee Cap (DC). (See Fig. B-3)

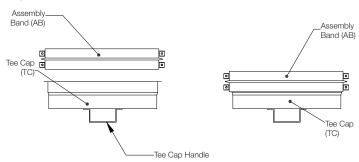
Fig. B-3 - 90° Elbow (E90) Assembly



TEE CAP (TC)

- 1. Used to block the horizontal opening of the tee, see Fig. B-1. Removable, it facilitates access for inspection and maintenance of the chimney (Fig. B-4).
 - 2. The assembly includes an Assembly Band (AB).
- 3. Joint assembly between the Tee Cap (TC) and the Tee is done in the same manner as described in Section A Piping and Fitting Assembly.

Fig. B-4 - Tee Cap (TC)

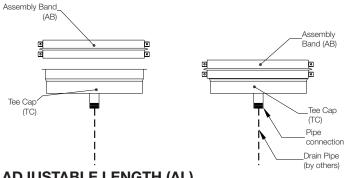


DRAIN-TEE CAP (DC)

- 1. Used in some configurations to block the lower vertical opening of a tee, see Fig. B-3. It serves to collect rainwater that may enter the chimney (Fig. B-5).
- 2. Removable, it facilitates access for inspection and maintenance of the chimney.
- 3. To be connected to a drain of 1" diameter-NPT. It is connected to the tee with the joint assembly.

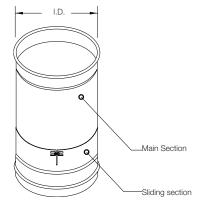
4. Joint assembly between the Drain-Tee Cap (DC) and the tee is done in the same manner as described in Section A Piping and Fitting Assembly.

Fig. B-5 - Drain-Tee Cap (DC)



- **ADJUSTABLE LENGTH (AL)**
- 1. Used in horizontal straight runs of models IPP and HEP, the Adjustable Length (AL) serves two major functions:
 - a) To make up for odd lengths of pipe in short runs
 - b) To extend the Tee Cap (TC) outside the masonry chimney
- 2. This part is designed to be adjustable to any needed exact length and its internal joint must be sealed by working sealant under the seal section, as well as at the joint between the male and the female ends to be closed with the Assembly Band (AB).
- 3. The adjustable length includes a main section and an outer sliding section that can be secured in the desired length position. Cutting the main section may be required for proper
- 4. The sliding section is designed to fit outside the standard main section.
- 5. Once the final length of the section is set, it is secured using a single clamp and screw. This seal section will prevent the inner section from slipping after the assembly.

Fig. B-6 - Adjustable Length (AL) Detail



SPECIAL PARTS

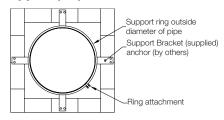
Available when specified are special parts or components used in chimney systems that can be factory-built to accommodate field situations where standard parts cannot be used.

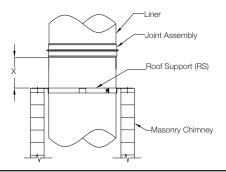


ROOF SUPPORT

Used to support and guide the portion of the chimney which extends to the masonry chimney. It is attached to the masonry chimney by means of four angles (See Fig. C-1). It maintains a minimum distance between the liner and the masonry chimney.

Fig. C-1 - Roof Support (RS)



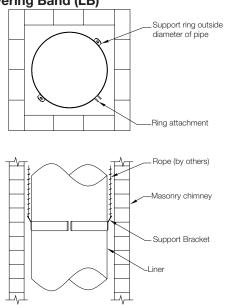


Keep joint away From support X=6" Min. above and under

LOWERING BAND (LB)

Used to insert the liner in the masonry chimney by supporting the liner during the lowering.

Fig. C-2 - Lowering Band (LB)

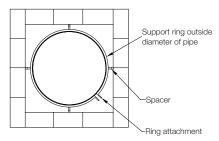


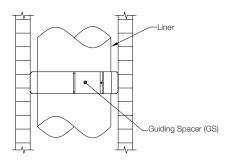
Note: Must be used with shackles.

GUIDING SPACER (GS)

Used to guide the liner every 50 feet and to keep the clearance between the liner and the masonry chimney. Also, it prevents bending of the liner in the masonry chimney and has for effect to increase the maximum height of the liner.

Fig. C-3 - Guiding Spacer (GS)





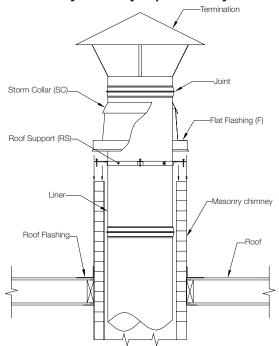
Note: See Section D Masonry Chimney Top and Wall Penetrations for complete Roof Support (RS) assembly details an use.



FLAT FLASHING (F) AND VENTILATED FLASHING (VF) ASSEMBLIES

The Flat Flashing assembly (F) is primarily used for boiler or low temperature exhaust to close the masonry chimney exit opening. It is design to be installed on a flat masonry chimney top of a minimum height of 3 feet from the roof (See Fig. D-1). For some areas, greater heights may be needed according to local code requirements. The roof framing dimension and the masonry chimney dimension must provide sufficient opening to comply with the minimum clearance from combustibles. (See Table A-1) The Roof Support (RS) is secured to the top of the masonry chimney using two 1/4" masonry screws in each support bracket. The Flat Flashing (F) is then lowered on the top of the masonry chimney and the Storm Collar (SC) secured to the chimney section with the screws supplied. A Ventilated Flashing (VF) option is also available where air circulation between the liner and the masonry chimney is wanted. The Ventilated Flashing (VF) option may serve as a ventilation outlet in small boiler rooms with gravity air supply.

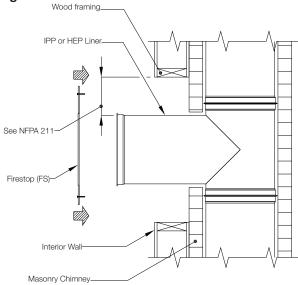
Fig. D-1 - Masonry Chimney Top Assembly



WALL PENETRATION

Where a liner section passes through a wall and a masonry chimney, the combustible material needs to be at a minimum clearance from the exterior of the liner to be protected from radiation heat from the liner. See NFPA 211 or local codes for minimum distances to respect (Fig. D-2). Also, used a FireStop (FS) to close the masonry chimney inlet opening.

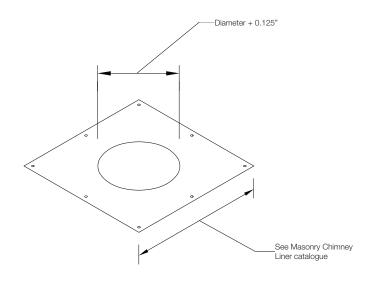
Fig. D-2 - Wall Penetration



FIRESTOP (FS)

Used to close the opening of a masonry chimney where a liner passes through. see Fig. D-3.

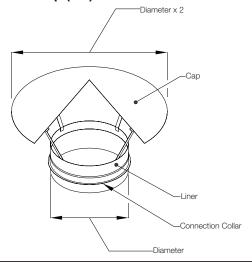
Fig. D-3 - Firestop (FS) Assembly



RAIN CAP (RC)

Installed at the top of the IPP liner, it prevents entry of rain into the chimney. (See Fig. E-7 for assembly)

Fig. E-1 - Rain Cap (RC) Detail

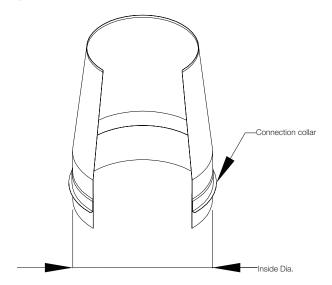


Note: Do not use with HEP model.

EXHAUST CONE (EC)

Installed at the top the chimney, it improves the draft and increases the speed of escaping gases by 50%. Installation of a drain at the base of the liner is required to collect rainwater. For installation details Exhaust Cone (EC) (See Fig.E-7).

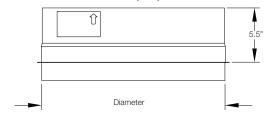
Fig. E-2 - Exhaust Cone (EC) Detail



CLOSURE SECTION (CS)

Installed at the chimney extremity, the use of a drain at the base of the liner is required to collect any excess rain that may enter the chimney.

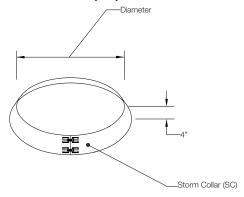
Fig. E-3 - Closure Section (CS) Detail



STORM COLLAR (SC)

Used for sealing the opening between the chimney and the Flat Flashing (F), the Storm Collar (SC) must be sealed to the chimney with silicone putty. It is supplied with the Flat Flashing (F) roof assembly or Adjustable Flashing (AF) roof assembly.

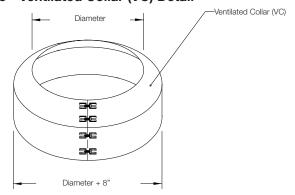
Fig. E-4 - Storm Collar (SC) Detail



VENTILATED COLLAR (VC)

Used for sealing the opening between the chimney and Ventilated Flashing (VF), the Ventilated Collar (VC) must be sealed to the chimney with silicone putty. It is supplied with the Ventilated Flashing (VF).

Fig. E-5 - Ventilated Collar (VC) Detail



FAN ADAPTER (FA)

Installed at the chimney extremity. It is used to connect the chimney to an up-blast exhaust fan.

Fig. E-6 - Fan Adapter (FA) Detail

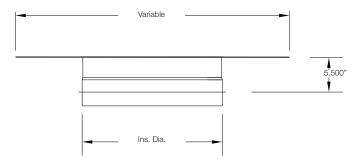


Fig. E-7a - Typical Installation for Rain Cap (RC)

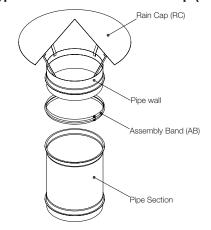
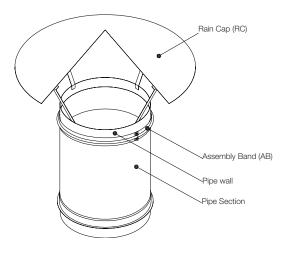


Fig. E-7b - Finished Assembly for Rain Cap (RC)



Terminations Use and Application

		Temperature from 0°F to less than 570°F
Termination	Model	continuous or boiler applications
Rain Cap	IPP	6" to 48" diameter
Exhaust Cone	IPP and HEP	6" to 48" diameter
Closure Section	IPP and HEP	6" to 48" diameter



CLEANING OF THE MASONRY CHIMNEY

Prior to install, we recommend to check the masonry chimney for cracks, loose, other materials that could inhibit correct installation of the liner and missing bricks or mortar. Also, clean and neutralize the existent masonry chimney.

- 1. Clean with a water jet all interior surfaces of the masonry chimney in order to remove any residue of combustion and materials releases or not healthy. After cleaning, all surfaces must be solid and healthy.
- 2. Wash with clean water on air pressure with a mixture of 10% of potassium carbonate all surface interns chimney. Let act at least 12 hours the alkaline solution in order to neutralize the accumulated acid. Rinse with clean water on air pressure.

INSERTION OF THE HEP LINER

- 1. If the welded 90° Tee (T90) (see section B) can pass through the masonry chimney, use same steps as model IPP.
- 2. If the dimension of the masonry chimney doesn't allow the 90° Tee (T90) to pass through, the masonry inlet opening must be enlarged to permit the tee section to be installed.
- 3. Joint the clean-out 90° Tee section with the flue gases 90° Tee and insert the assembly in the masonry chimney by enlarging the inlet opening (Fig. F-1).

Note: Verify the integrity and the solidity of the masonry chimney prior to demolishing the masonry

- 4. For the liner sections above the 90° Tee (T90), the use of a lowering band (see section C) and a rope is necessary. The lowering band is to be installed at the base of the liner section for easy access to remove the rope at the end. Two shackles are to be installed on each side of the lowering band and the rope must be attached to them (Fig. F-2).
- 5. The section is lowered in the masonry chimney until the edge of the liner is above the top of the chimney. The rope must be blocked to support the liner and another liner section can be added on the first one (Fig. F-2).
- 6. Continue step 2 until the liner system is resting on the top of the 90° Tee (T90) by adding section one by one.

Fig. F-1 - Installation of HEP Tee Section in Masonry Chimney

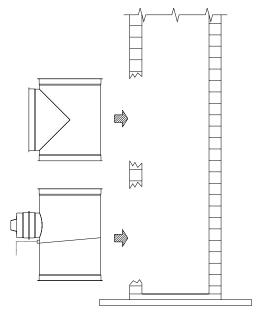
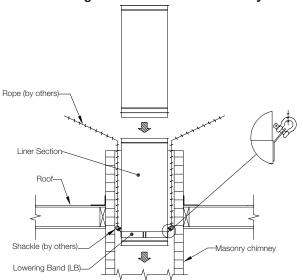


Fig. F-2 - Lowering of HEP Sections in Masonry Chimney



- 7. Remove the rope and the shackle from the lowering band at the bottom of the liner.
- 8. Rebuild the masonry chimney wall and install a Firestop (FS) to close the masonry chimney inlet opening.
- 9. Install the Roof Support (RF), the Flat Flashing (F), the Storm Collar (SC) and a termination section on the top of the masonry chimney (See section D and E).

Note: If those configurations can not be used, please call manufacturer, the engineering team can provide solutions.



3ST5 CHIMNEY LINER LISTED FOR APPLIANCES WHICH BURN NATURAL GAS, PROPANE OR OIL FUEL THAT PRODUCE GASES AT A TEMPERATURE OF MAXIMUM 570°F (300°C).

28KJ

ALSO LISTED AS SPECIAL GAS VENT GAS VENT TYPE BH MAX 550°F / 288°C



MODEL **HEP WARNING / AVERTISSEMENT**

IN CANADA, CHIMNEY LINER IS LISTED ONLY FOR EXISTING MASONRY OR FACTORY-BUILT CHIMNEY AND VENTS, LINING SYSTEMS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS. ALSO LISTED FOR NEW AND EXISTING MASONRY CHIMNEYS IN UNITED STATES.

	Minimum cle	earance to c	om	bus	stib	le n	nat	eria	l (ir	n)					
Used as	a Liner		Use	ed a	as a	a sp	oec	ial	gas	s ve	ent				
Diameter	6" to 48"		6	8-10	12-14	16.20	22:24	26.28	30	32	3A.38	40-42	Νħ	84.84	
Between masonry chimney exterior and combustibles	0"	Unenclosed vertical	1.5	2	3	4	5	6	7	7	8	9	9	10	4
Between masonry chimney interior and the liner	1"	Unenclosed horizontal	3	3	4	5	6	6	6	7	7	8	9	9	

RISK OF CARBON MONOXIDE POISONING AND RISK OF FIRE IF IMPROPERLY INSTALLED. FOLLOW ALL CAUTIONS, WARNINGS, AND INSTRUCTIONS REGARDING INSTALLATION OF THIS VENT PIPE SYSTEM.

> SUITABLE FOR EXTERIOR INSTALLATION

INSTALLATION DATE / DATE D'INSTALLATION:

3ST5

MODEL IPP & HEP CHIMNEY LINER PART LINER FOR EXISTING CHIMNEY.

MODEL HEP ALSO LISTED AS SPECIAL GAS VENT CATEGORY II, III, IV; GAS VENT TYPE BH CLASS I AND II MAX 550°F / 288° C

MODEL IPP U HEP U LINER COMPONENT

MATERIAL FOR USE WITH FACTORY BUILT CHIMNEY MODEL IPP OR HEP.

CHIMNEY LINER IS LISTED ONLY FOR EXISTING CHIMNEY IN CANADA. LINING SYSTEMS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS. ALSO LISTED FOR NEW AND EXISTING MASONRY CHIMNEYS IN UNITED STATES.

Lining www.chemineelining.com



Section	Page	Fig.	Description	Part no.
			Appliance	
D	12	D-1	Flat Flashing	IPPF1616-16
Е	13	E-4		IPPSC1616-STD
D	12	D-3		2FS161616-STD
D	12	D-3	Firestop	IPPFS616-STD
С	11	C-2	Lowering Band	IPPLB1616
Е	13	E-1	Rain Cap	IPPRC1616
В	9	B-1, -2a, -2b	Base Tee 10"Ø to 16"	Ø IPPBT101616
А	6-7	A-1, -2, -3	36" Length	IPP36L1616
А	6-7	A-1, -2, -3	48" Length	IPP48L1616
В	9	B-1	Detachable 90° Tee	IPPDT901616
В	10	B-6	Adjustable Length	IPPAL616
В	10	B-5, -6	Tee Cap	IPPTC616
С	11	C-1	Roof Support	IPPRS1616-STD
			0	
	E D D C E B A A B B B B	E 13 D 12 D 12 C 11 E 13 B 9 A 6-7 A 6-7 B 9 B 10 B 10	E 13 E-4 D 12 D-3 D 12 D-3 C 11 C-2 E 13 E-1 B 9 B-1, -2a, -2b A 6-7 A-1, -2, -3 A 6-7 A-1, -2, -3 B 9 B-1 B 10 B-6 C 11 C-1	E 13 E-4 Storm Collar D 12 D-3 Firestop IPPL D 12 D-3 Firestop C 11 C-2 Lowering Band E 13 E-1 Rain Cap B 9 B-1, -2a, -2b Base Tee 10"0 to 16" A 6-7 A-1, -2, -3 36" Length A 6-7 A-1, -2, -3 48" Length B 9 B-1 Detachable 90° Tee B 10 B-6 Adjustable Length B 10 B-5, -6 Tee Cap C 11 C-1 Roof Support



