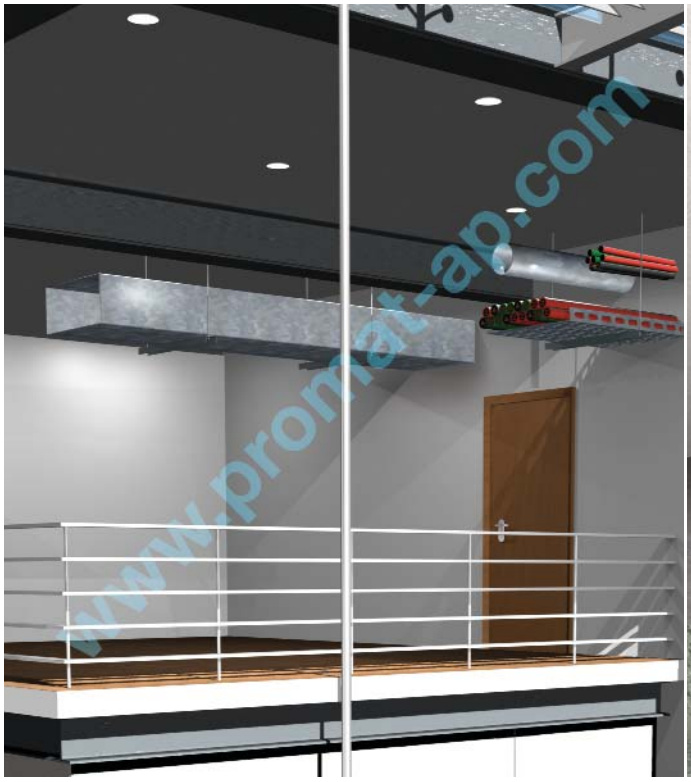
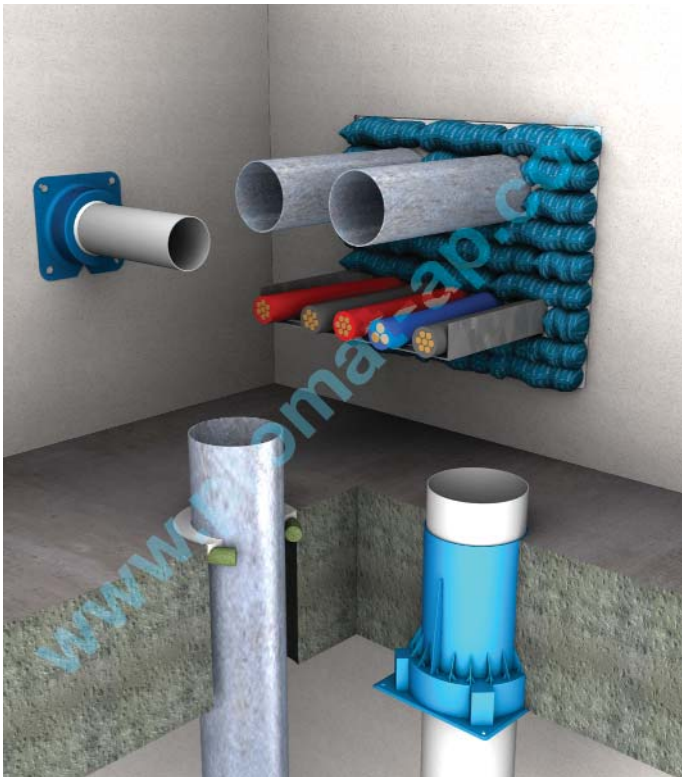
Promat

PROMASEAL® Hi-Blu/Green Cast-in Collar
For Plastic Pipes Fire Protection





Introduction

Fire resisting compartments are created to inhibit and prevent fire and smoke from spreading within building structures. This also creates a parallel threat as most concealed cavities between fire resisting walls and floors are interlinked. The importance of sealing gaps in this type of construction is thus vital to the integrity of compartmentation systems and their ability to prevent fatalities and loss of property. Such gaps are typically service penetrations through walls and floors but also include gaps created for structural movement and gaps due to poor workmanship.

These unfortunate but inevitable facts of construction industry life have led in recent years to the increased development of effective solutions to seal gaps wherever they occur. Intumex is a leading worldwide solution provider.

It should be noted that every service passing through fire resistant building elements reacts in a different way to fire, heat, smoke and fumes. There is no single solution, product or system that will protect all services.

Services must be tested in accordance with the test method outlined in appropriate standards. Tests are generally carried out in accordance with the General Principles of BS476: Part 20: 1987 or EN1366: Part 3 and 4 covering both penetration seals and linear joint seals respectively. In addition, many countries use the Australian Standard AS4072: Part 1: 2005 (Components for the Protection of Openings in Fire-Resistant Separating Elements), which specifies testing in accordance with the test method set out in AS1530: Part 4: 2005. It is also important to note that although all of the above test methods can be considered similar, there are some major differences which affect particular applications. Please see following pages for comparative test method/data.

Failure Criteria

Failure is measured in terms of integrity and insulation. Stability (or Structural Adequacy) is not recorded for service penetrations except those which are required to be loadbearing, e.g. PROMASTOP® Cement.

Integrity failure occurs when cracks, holes or openings allow the passage of flames or hot gases. Furthermore, integrity failure is measured in different ways, depending on which standard is used.

For example, AS1530: Part 4: 2005 measures integrity failure as flaming on the unexposed face for a time greater than 10 seconds and by using a cotton pad, held against any gap, to see if the cotton pad ignites within 10 seconds. Other standards measure integrity failure using the same criteria but also using additional methods such as:

a) using a cotton pad, held against any gap, to see if the cotton pad ignites within 10 seconds; or

b) if the gap is equal to or greater than 150mm x 6mm; or

c) if a 25mm diameter probe can pass through a gap.

Insulation failure occurs when the temperature rise on the unexposed surface of the service, on the unexposed face of the building element 25mm from the penetration or on the seal itself exceeds 180°C. Insulation failure is inevitable on many metal service penetrations and is often waived as a failure criterion by local building regulations. Under such circumstances it is essential that combustibles be kept at least 100mm clear of these services at the point of penetration.

The PROMASEAL® and PROMASTOP® range of products were introduced to complement Promat's wide range of fire protection board systems.

Due to the ongoing development of fire test standards for this product, penetration seals and similar applications, only brief details can be provided at the time of this press. For detailed information and advice on the current range of PROMASEAL® and PROMASTOP® range of products, please contact Promat.

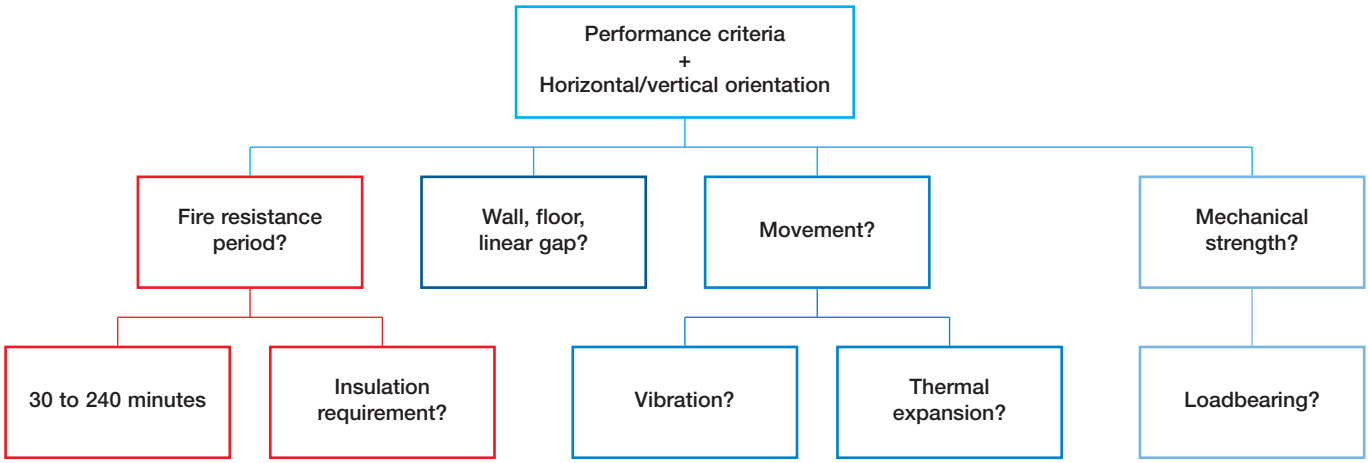
IMPORTANT: Because of the diversity of applications and the on-going test programme, the above and the following notes in this section are of a general nature only and it is essential to confirm that the system specified or being installed is approved for use. Always contact Promat to confirm the specification is correct prior to usage.

	British Standards BS476: Part 20: 1987	European Standards EN1366: Part 3: 2004/ EN1366: Part 4: 2006	Australian Standards AS4072: Part 1: 2005/ AS1530: Part 4: 2005	United States Standards ASTM E814: 1997/ UL1479: 1998
Orientation	Requires representative specimen in both orientations. For asymmetrical specimens, a test should be conducted from each side using separate specimens.	Representative or standard service configurations tested both in horizontal and vertical orientation.	Requires full size or representative specimen and testing in both horizontal and vertical orientation if intended for use in both orientation. Provide standard test configurations.	UL requires both orientations must be tested unless it can be demonstrated that testing in a single orientation does not affect the results. ASTM does not specify but there are differences in temperature and pressure measurements for the two orientations so that, by default, both would be required.
Test sample	Does not specify projection distances of through penetrating elements. The end conditions of pipes should reflect the "as installed" conditions.	The services shall be installed so that they extend 500mm on each side of the supporting construction, of which at least 300mm shall extend beyond the extremities of the sealing system. No part of the service shall be <200mm from the furnace wall or another service. Movement joint seals shall be installed in uniform design cross-sectional area and to maximum length that can be accommodated by separating test element. For non-movement joint seals a shorter length may be used subject to a minimum of 900mm.	The ends of the services shall be sealed on the exposed side of the furnace, to simulate normal extension through compartment. If the end condition of the the unexposed side is unspecified, it shall be left unsealed. The penetrating element shall extend 500mm into the furnace and 2000mm outside the furnace for plastic pipes, all other elements are 500mm inside and outside the furnace.	The penetrating item should extend into the furnace by 300mm and out of it by 910mm. The end of the item on the exposed face is capped, but uncapped on the unexposed side, unless is it to represent a closed system in which case it may be capped. The periphery of the specimen should not to be closer than 1.5 the thickness of the assembly, or 300mm to the furnace edge, whichever is greater.
Conditioning	Materials shall, at time of test, be at a condition approximating the state of strength and moisture content that would be expected in normal service.	The test specimens shall not be tested until both strength and moisture content approximate values the service expects to attain.	The test specimens shall not be tested until both strength and moisture content approximate values the service expects to attain.	Prior to fire testing, each test sample and test assembly is to be conditioned, if necessary, to provide a moisture condition likely to exist in similarly constructed buildings.
Protection of assembly and sample	Ambient temperature should be within 5-35°C prior to heating period, and temperature measurements on the unexposed face must be in draught-free conditions.	Provide reference for test frames and the ambient condition must be 20°C(±10°C) at the commencement of test. During testing, the laboratory temperature shall not decrease >5°C or increase by >20°C for all insulated separating elements while they still satisfy the insulation criterion.	Not specified except that the initial furnace temperature must be not less than 10°C and not more than 40°C.	The testing equipment and test sample are to be protected from any condition of wind or weather that might influence the test results (i.e. ambient temperature at the time of testing must be within 10-32°C while the velocity of air across the sample must not exceed 1.3m per second).
Pressure differential	At mid height of vertical systems, the pressure differential is 15Pa, and the same pressure 100mm below horizontal systems.	For a vertical system with height <1000mm, the pressure differential should be 15±2Pa. If the height >1000mm, pressure differential should be 20±2Pa at the top of the specimen. In this case penetrations should be included in the zone where the pressure is >10Pa. For a horizontal system, the pressure differential should be 20±2Pa at 100±10mm under the supporting construction.	Not less than 20Pa at notional 100mm below the soffit height of horizontal element or at a level with lowest point of the penetration seal of a vertical element it should be 15Pa±3.	Except for the first 10 minutes of the test, the furnace pressure shall be at least 2.5Pa greater than the pressure on the unexposed side of the following locations: a) Wall – at lowest elevation of the test specimen; b) Floors – at the location of the pressure probes. Test sponsor may also specify a unique pressure condition in which case it must be maintained throughout the duration of the test, excluding the first 10 minutes, within 20% of the specification.

	British Standards BS476: Part 20: 1987	European Standards EN1366: Part 3: 2004/ EN1366: Part 4: 2006	Australian Standards AS4072: Part 1: 2005/ AS1530: Part 4: 2005	United States Standards ASTM E814: 1997/ UL1479: 1998
Integrity	a) Cotton pad test; b) Gap gauge; c) Sustained flaming of more than 10 seconds.	a) Cotton pad test is generally performed. For penetration seal tests the use of reduced size cotton pad is permitted if necessary. b) Whilst gap gauge is used for measurement in general test specimens, it shall not be used for evaluation of penetration and linear joint seals tests. c) Sustained flaming.	Failed when: a) Cotton pad test, or b) Flaming takes place at the unexposed face of the specimen for a period exceeding 10 seconds.	Shall not permit the passage of flame throughout the fire test, or water through the hose stream test. Mandatory for all ratings in both standards, i.e. ASTM and UL.
Insulation	The insulation of the specimen is judged to have failed if the temperature on the unexposed side and on penetrations reaches 180°C above the initial temperature.	The insulation of the specimen is judged to have failed if the temperature on the unexposed side and on penetrations reaches 180°C (K) above its initial temperature.	The criteria for failure of insulation is if the temperature of any of the thermocouples on the unexposed side reaches 180°C above the initial temperature.	Shall not permit the passage of flame through the fire test, or water through the hose stream test or allow the temperature to increase by 180°C on the unexposed side. Mandatory for T rating in both standards.
Hose stream test	No specification.	No specification.	No specification.	For both F and T ratings, a duplicate specimen is subjected to a fire exposure test for period half of the desired rating but not more than 60 minutes. Immediately after the fire exposure, the specimen shall be subject to the hose stream test. Same test assembly can be used for both tests but must take place within 10 minutes from the completion of the fire test.
Specification	a) Integrity; b) Insulation; c) Loadbearing capacity where applicable.	a) Integrity; b) Gap gauge (not applicable for penetration and linear joints seal tests); c) Cotton pad; d) Insulation; e) Insulation area 2 (if the test element incorporating two discrete areas of different thermal insulation).	AS1530: Part 4 states results to be expressed in: a) Integrity; b) Insulation.	Specified in terms of F rating which require a hose stream test, and T rating which does not require a hose stream test, measures the insulation. UL have an additional L rating for air-leakage.
Reporting	a) Temperature data from all specified critical thermocouple; b) A detailed description of all penetrating services; c) A detailed description of the test construction.	In addition to requirements of EN1363: Part 1, the following are necessary for penetration seal tests: a) For tests on pipes, statement of the pipe end configuration (capped or uncapped); b) For cables, the cable dimensions; c) For metallic pipes, the pipe dimensions; d) For unsupported seals, the maximum area free of services; e) Whether multiple penetrations have been tested in a single test construction. For linear joint seal test, the following shall be included: a) Full description of any procedure used to induce relative movement of the seal faces; b) Orientation of test specimen; c) The limits of the range of nominal widths and the movement capability successfully tested; d) Full description of the splicing method(s) used.	In addition to the requirements of AS1530.3, some of the requirments in AS1530.3: Part 4 are: a) Temperature data from all specified critical thermocouple; b) A detailed description of all penetrating services; c) A detailed description of the test construction.	Report must have: a) Description of assembly and materials; b) Relative humidties; c) Temperature recordings; d) The achieved rating; e) Location of pressure probes and differential pressure of the test; f) Record of all observations; g) Correction factor.
Commentary	For positions of thermocouples and other items not specified in this standard, laboratories refer to the EN standard.	These standards are now in effect for use within the industry.	Comprehensive and simple standard configurations, as well as details on permissible variations.	UL also have an addition L rating which is to be reported as the largest leakage rate determined from the air leakage test.

Which System(s) To Use

As penetrations can occur in various building elements, there are a number of important criteria that require consideration in determining the appropriate type of sealing system to be used, simplified in the following chart.

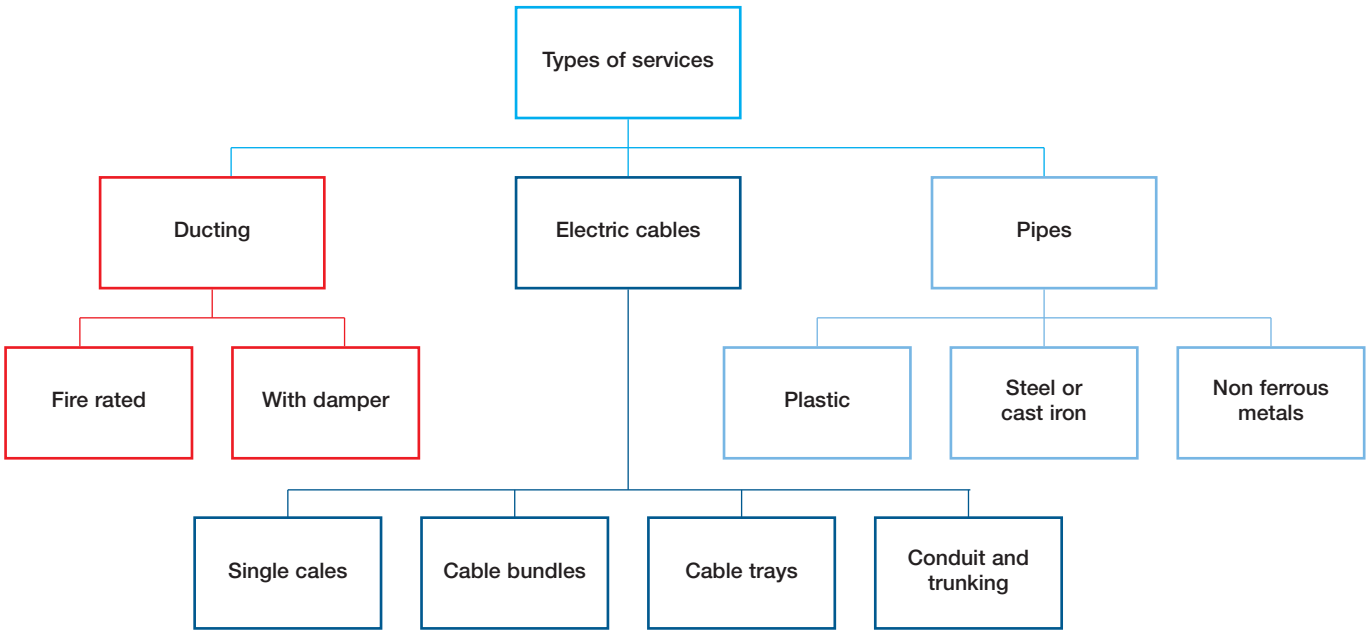


Limitations of Use

- Size of opening
- Penetration services
- Flexibility of seal(s)
- Smoke or gas lightness
- Ambient conditions
- Design life
- Frequecy of change to services
- Parent construction (type of substrate)

Special Considerations

In instances where electrical and mechanical services are involved, the selection of penetration sealing system also require the following additional elements to be carefully considered.



Compatability Considerations

- Intumescent systems in lightweight constructions
- Rigid seals in “dynamic” barriers
- Large spans and thermal expansion
- Smoke or toxicity in populated zones
- Dusty or friable materials in clean room applications

It has been shown that plastic pipes penetrating compartment walls or floors or other fire barriers represent potential for fire to pass from one compartment to another when the plastic burns and melts away. All building regulations specify that the fire resistance of the separating element of construction between compartments must not be impaired by services that pass through them.

In general, methods of maintaining acceptable fire resistance will vary between countries and regulatory authorities. The most common method of fire resistance, however, is to install fire collars around plastic pipes, penetrating separating elements.

All fire collars are designed to prevent the spread of fire where plastic pipes, cables and other services penetrate fire resistant elements of construction, maintaining the Fire Resistance Level (FRL) of the element.

Virtually all fire collars consist of intumescent compounds which, exposed to fire or sufficient heat, expand under pressure to set and seal the penetrations. The unique and patented design of PROMASEAL® and PROMASTOP® collars contain no asbestos, fibres or solvents. They are unaffected by water and most atmospheric conditions

In the case of plastic pipe penetrations, it should be clearly noted that particular care must be exercised when accepting assessments or test reports. Abundant research and empirical data indicates that different types of plastic behave in very different ways under actual fire conditions. Indeed, realistic test data reflects the following:

1. The Type of Plastic

Building materials made of different type of plastics, such as high density polyethylene (HDPE), polyvinyl chloride (PVC), unplasticised polyvinyl chloride (uPVC), polyethylene (PE), polypropylene (PP), acrylonitrile butadiene styrene (ABS) etc, are commonly used in modern buildings. These plastics soften, melt or burn at different rates and temperatures. Fire stopping products, particularly collars, have to be shown capable of coping with all variables, including the full range of diameters, in all different plastic thicknesses, in both horizontal and vertical orientations.

2. Pipe Diameters

The bigger the pipe the more difficult it is to seal, mainly due to the rate of the intumescent reaction for the fire stopping material to seal the openings.

3. The Orientation of Pipe (to Wall or Floor)

Pipes tested in a floor will not necessarily behave in the same manner when tested in a wall and the reverse equally applies.

4. The Wall Thickness of Pipe

Thin wall pipes collapse fast and fire collars have to react swiftly to close the opening. Thick walled pipes collapse slowly and fire collars have to retain sufficient expanded intumescent product to seal openings over a longer period of exposure.

5. Pipe End Conditions During Test

Pipes that have been fire tested with both the end inside and the end outside of the test furnace and capped (sealed) must only be protected with these fire collars when the end conditions on site are similar.

It is generally accepted that if a pipe is tested with the end inside the furnace capped, and the end outside the furnace uncapped, that this test would cover storm waste, sewage and water supply. If pipes are tested with both ends capped, this would represent a less onerous position, e.g. pipes that have taps or valves or water traps in line.

The Promat range of fire collars are purpose made of plastic (cast-in) painted steel shells (retrofit) with integral mounting points, containing a specially formulated intumescent material. They prevent the passage of fire through gaps in compartment walls and floors caused by the collapse and/or melting of combustible services in the event of fire. It is essential that the correct fire collars are specified and that they are installed in accordance with Promat instructions.

As a general rule there are THREE (3) types of collars:

Surface Mounted (Retrofit) Type

Surface mounted collars (also known as retrofit collars) are fixed around the plastic pipe, onto the surface of a building element. For floor slabs this is on the underside of the slab. For walls, they are generally placed on both sides to protect against fire exposure from either direction.

If it can be shown that the fire can only come from one side, then the fire collar may be placed on the fire risk side of the wall provided that test data is available to prove the application achieves the required fire resistance. PROMASTOP® UniCollar® (with the code of UC) and PROMASEAL® fire collars (with the code of CFC, FC or FCS) can all be used as retrofit collars.

Insert Type

Insert collars are placed around the pipes, within the thickness of the wall or floor. Generally, only one collar is required to protect from either direction for walls.

PROMASEAL® Wall Collars (with code FCW) can be used as insert wall collars. These collars sit within the cavity of lightweight partitions, ideal for use where space is at a premium. This is particularly useful for work in shafts or any area where access for installation is restricted to one side.

PROMASTOP® UniCollar® may also be used on some types of pipe for these applications.

Cast-in Type

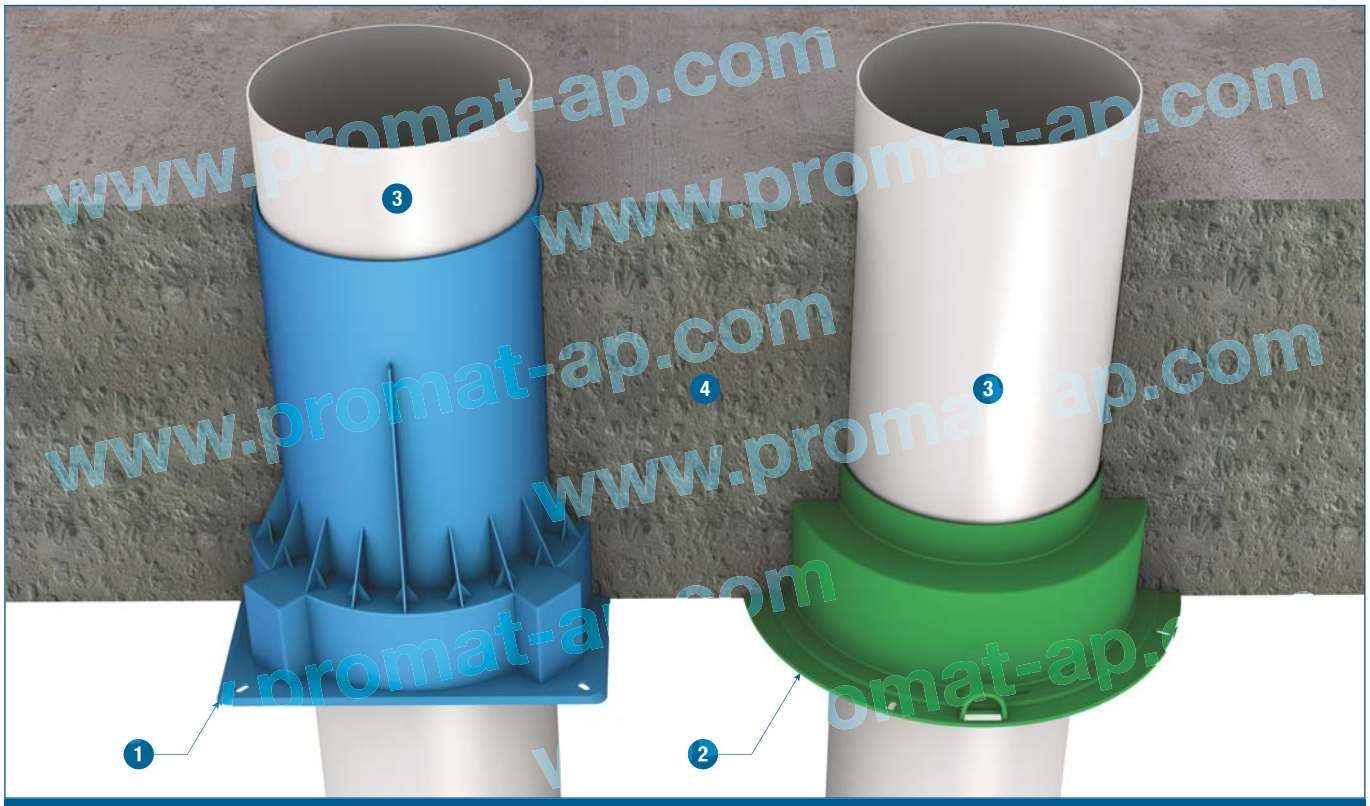
Cast-in collars are used only in floor slabs and are placed into position, on the formwork, before a slab is poured. This method means accurate setting out of all plumbing work is vital.

PROMASEAL® fire collars (with the code of Hi-Blu, Green or PSS), can be used as cast-in collars. For use with floor waste, there are two special collars, PROMASEAL® cast-in type collar (FWS) and retrofit type collar (FWR).

Recommended Specification

Where appropriate, the specified plastics penetrations through floor/wall openings should be properly fire stopped using a PROMASTOP®/PROMASEAL® collar capable of providing fire resistance of -/240/-, -/240/240, -/180/180 or -/120/120 or as specified in the appropriate regulations or by the relevant regulatory body, when tested and assessed in accordance with AS1530: Part 4 or BS476: Part 20: 1987 as applicable. From 2008 the BCA no longer allows the waiving of insulation criteria for plastic pipe penetrations as a Deemed to Satisfy solution. Such waiving is now treated as an alternate solution. Installation of any fire stopping product should be carried out according to the manufacturer's recommendations. Please consult Promat for further details.

IMPORTANT: Because of the diversity of applications and Promat's on-going test programme, the above information and the following notes in this section are of a general nature only and it is essential to confirm that the fire collar specified or being installed is approved for use on the size and type of plastic pipe, the orientation and type of service. Always contact Promat to confirm the specification is correct.



TECHNICAL DATA

1. For FRL up to -/240/180 (uPVC) and -/240/240 (HDPE), insulation criteria will vary depending on type and sizes of the pipes, and the type of penetrating elements.
   PROMASEAL® Hi-Blu Collar
2. For FRL up to -/240/240
   PROMASEAL® Green Cast-in Collar
3. **Plastic piping, e.g. HDPE, uPVC etc.**
4. **Concrete floor slab**

PROMASEAL® Hi-Blu Collar

PROMASEAL® Hi-Blu Collar is designed to be fixed to formwork prior to pouring of concrete floor slabs. It has been tested with various uPVC and HDPE pipes achieving a fire resistance up to 240 minutes in accordance with AS1530: Part 4 and AS4072: Part 1. Hi-Blu comes in THREE sizes: 1) small, for pipes up to a nominal 65mm; 2) medium, for pipes between the sizes of 65mm and 100mm; and 3) large, for pipes of a nominal 150mm.

Please check with Promat before installing the collar to ensure the size and type of pipe being installed can be used with the particular size and type of collar.

PROMASEAL® Green Cast-in Collar

PROMASEAL® Green Cast-in Collar is designed to be fixed to formwork prior to pouring of concrete floor slabs. The collar accommodates the uPVC pipe fittings within the thickness of the slab enabling space saving.

PROMASEAL® Green Cast-in Collar will close both pipe and pipe fitting in the event of fire. The collar has been tested for up to 240 minutes in accordance with AS1530: Part 4 and AS4072 with uPVC and some HDPE pipes. The collar provides integrity only criteria when tested to AS1530: Part 4 and AS4072: Part 1 for uPVC floor waste traps of 50mm and 80mm diameters. BCA 2008 no longer allows the waiving of insulation criteria for plastic pipe penetrations as a Deemed to Satisfy solution. Such waiving is now treated as an alternate solution.

For slabs that use lost formwork or are less than 120mm thick, please contact Promat Technical Department.

Dimensions Guide

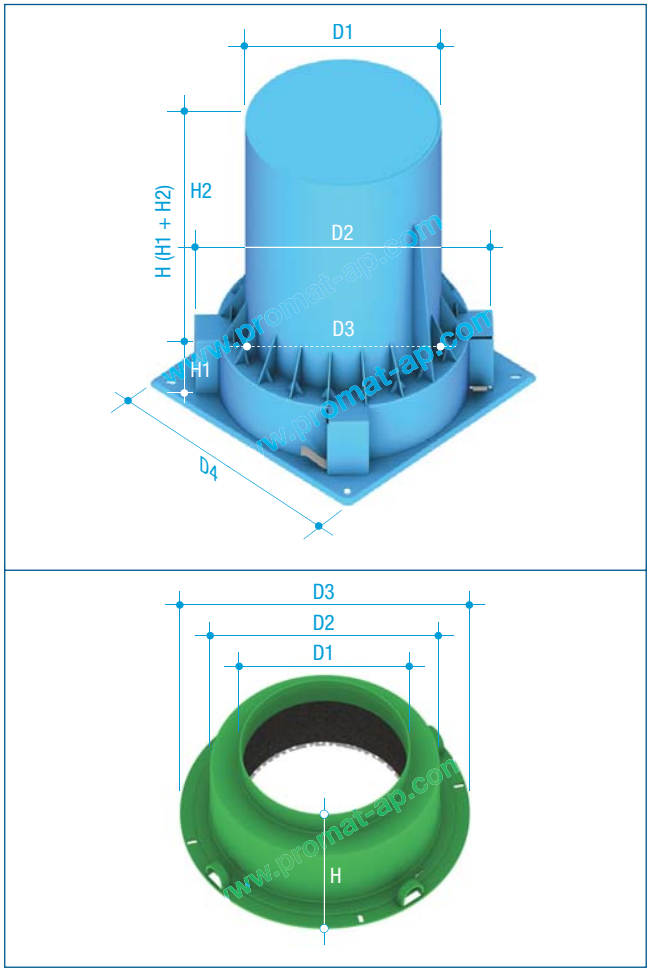
PROMASEAL® Hi-Blu Collar

Code no.	Body (mm)						Flange (mm)
	H	H1	H2	D1	D2	D3	D4
Hi-Blu 65	250	45	205	95	132	97	154
Hi-Blu 100	250	57	193	140	178	142	198
Hi-Blu 150	250	57	193	194	232	197	253

PROMASEAL® Green Cast-in Collar

Code no.	uPVC pipe nom. (mm)	Body (mm)			Flange (mm)
		H	D1	D2	D3
Green 40	40	49 + 30*	43	115	160
Green 50	50	49 + 30*	56	115	160
Green 65	65	49 + 20*	69	115	160
Green 80	80	60 + 20*	83	163	210
Green 100	100	60 + 20*	110	163	210

*Additional height of upright pipe grip



Dimensions of PROMASEAL® Green Cast-in Collar and Hi-Blu Collar.

Installation Guide

PROMASEAL® Hi-Blu Collar

PROMASEAL® Hi-Blu Collars accommodate the pipe fitting inside the soffit of the slab enabling height space savings to be achieved.

position with 20mm x 3mm flat head clouts, nailed through the notches provided. DO NOT SKEW THE NAILS. After the formwork is stripped, the short section of pipe used during casting may be knocked out of the collar and replaced with the complete pipe section.

It should be noted that if the pipe is pushed in from the top, the rubber seal will be forced downwards. Lift the pipe slightly to ensure that the rubber seal projects upwards. Any gap between the pipe and the collar must be back filled with concrete or commercial grade mortar mix.

PROMASEAL® Green Cast-in Collar

Nail or screw the collar to the formwork through the slots in the flange of the collar.

The collar sizes range from pipe OD 43mm to 110mm for fire ratings up to 180 minutes with uPVC and HDPE pipe. Different collar designs for various applications have FRL's ranging up to 240 minutes.

PROMASEAL® Green Cast-in Collars have been tested for 240 minutes with 50mm and 80mm uPVC floor waste systems for integrity only in accordance with the provisions of the BCA (insulation criteria waived). For 100mm floor waste pipes, please contact Promat for information to enable compliance with the provisions of the BCA.

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For latest information of the Promat Asia Pacific organisation, please refer to **www.promat-ap.com**

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