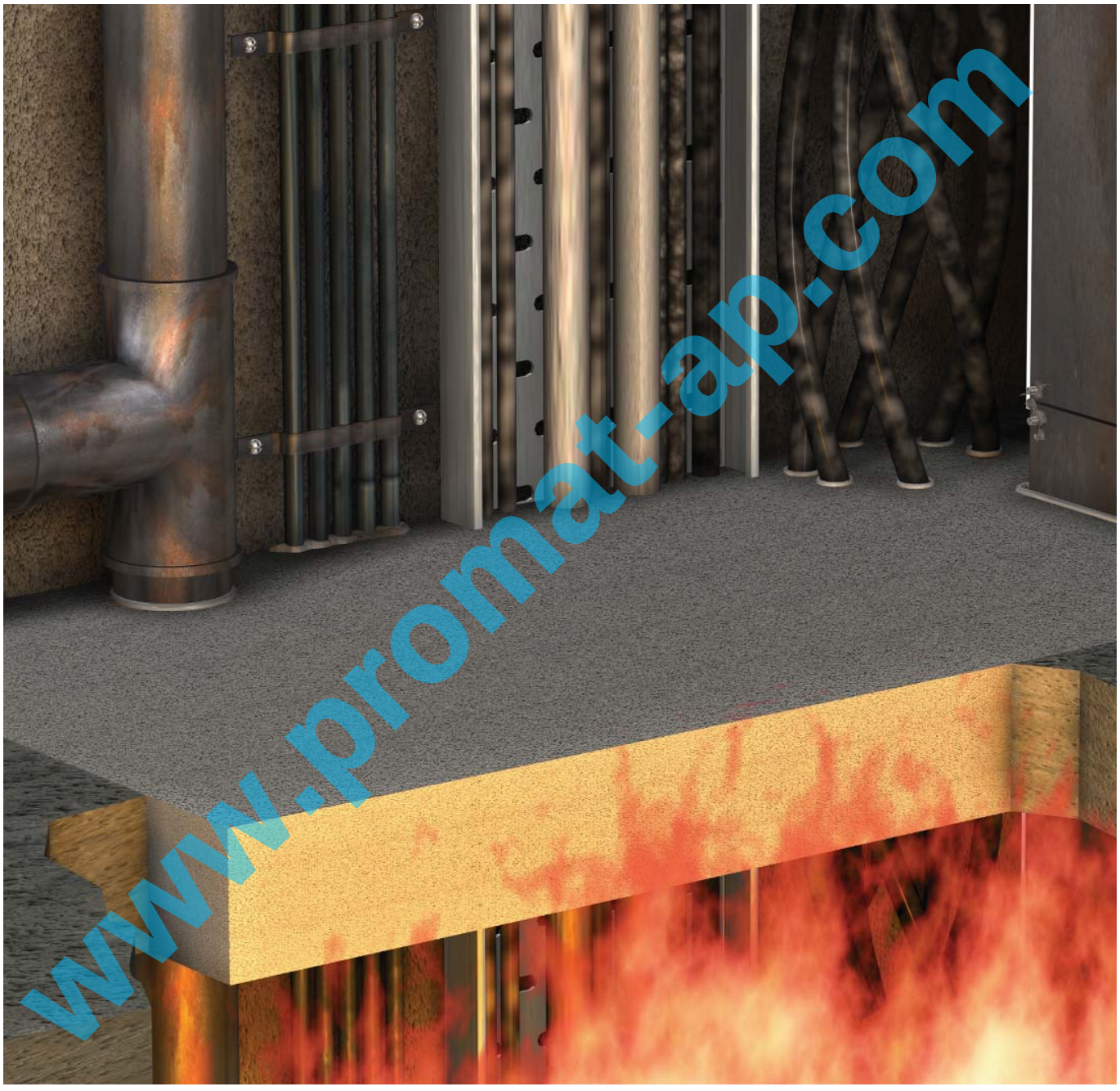
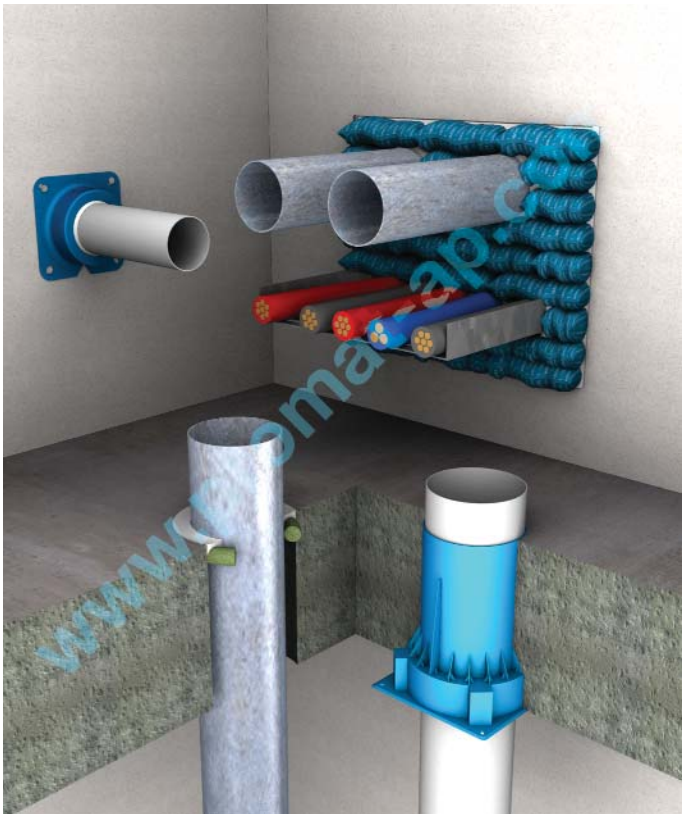
Promat

# PROMASEAL® Mortar
# For Cables And Pipes Penetration Seals





## Introduction

While fire resisting compartments are created to contain fire and smoke from spreading within building structures, this also presents 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 therefore vital to ensure the compartmentation systems work to their maximum ability to save life and property. Such gaps are typically at service penetrations through walls and floors, but would also include gaps left for structural movement and gaps left due to poor workmanship.

Recognising this, the development of effective solutions to seal gaps at service penetrations has increased over the past few years and Promat has become a world leader in supplying such solutions. Note should be taken that every service passing through fire resistant building elements react in different ways to fire, so there is no single solution or product that will protect all services.

Services must be tested in accordance with the test method set out 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 important to note that although all of the above test methods can be considered similar, there are some major differences which can affect a particular application (see following pages for comparison of test methods).

## 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 occur through which flames or hot gases can pass. This is measured in different ways, depending upon the Standard used.

For instance, AS1530: Part 4: 2005 measure integrity failure as flaming on the unexposed face for a time greater than 10 seconds. Other Standards measure integrity failure using the same criteria but with different methods of measurement.

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 continuous development of draft fire test standards for this application, and the regular improvements and additions to the product range, only brief details are given in this section of the handbook concerning the products available at the time of writing.

For detailed information and advice on the current range of PROMASEAL® products, please contact Promat.

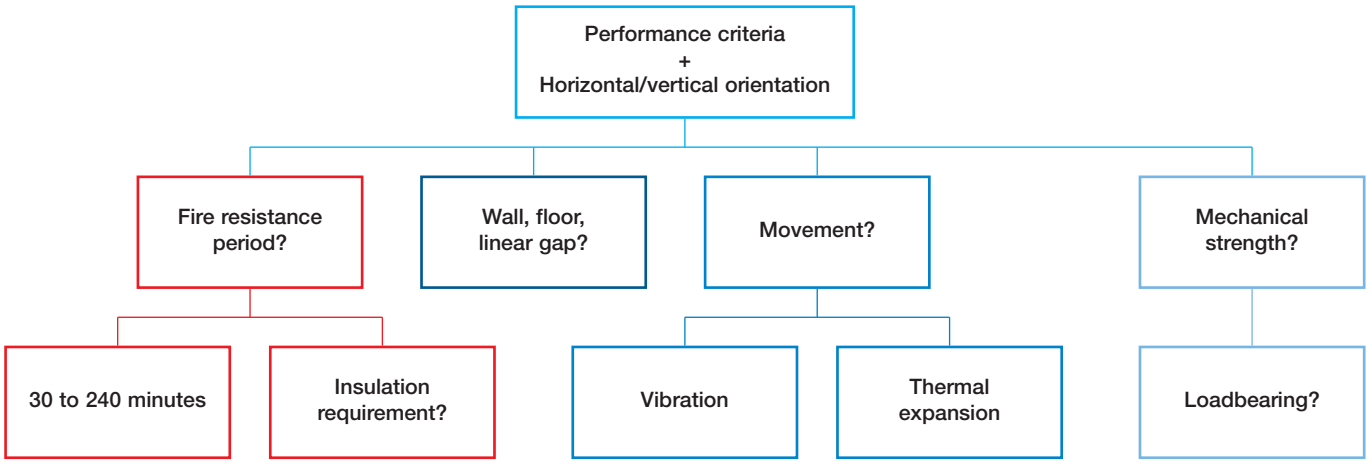
**IMPORTANT: Because of the diversity of applications and the on-going test programme, the above and the following notes in this section are of a general nature only and it is essential to confirm that the system specified or being installed is approved for use. Always contact Promat to confirm the specification 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.<br>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:<br>a) Wall – at lowest elevation of the test specimen;<br>b) Floors – at the location of the pressure probes.<br>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;<br>b) Gap gauge;<br>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.<br>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.<br>c) Sustained flaming. | Failed when:<br>a) Cotton pad test, or<br>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;<br>b) Insulation;<br>c) Loadbearing capacity where applicable. | a) Integrity;<br>b) Gap gauge (not applicable for penetration and linear joints seal tests);<br>c) Cotton pad;<br>d) Insulation;<br>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:<br>a) Structural adequacy;<br>b) Integrity;<br>c) Insulation;<br>d) Resistance to incipient spread of flame. | 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;<br>b) A detailed description of all penetrating services;<br>c) A detailed description of the test construction. | In addition to requirements of EN1363: Part 1, the following are necessary for penetration seal tests:<br>a) For tests on pipes, statement of the pipe end configuration (capped or uncapped);<br>b) For cables, the cable dimensions;<br>c) For metallic pipes, the pipe dimensions;<br>d) For unsupported seals, the maximum area free of services;<br>e) Whether multiple penetrations have been tested in a single test construction.<br>For linear joint seal test, the following shall be included:<br>a) Full description of any procedure used to induce relative movement of the seal faces;<br>b) Orientation of test specimen;<br>c) The limits of the range of nominal widths and the movement capability successfully tested;<br>d) Full description of the splicing method(s) used. | In addition to the requirements of AS1530: Part 3, the report should have:<br>a) Temperature data from all specified critical thermocouple;<br>b) A detailed description of all penetrating services;<br>c) A detailed description of the test construction. | Report must have:<br>a) Description of assembly and materials;<br>b) Relative humidties;<br>c) Temperature recordings;<br>d) The achieved rating;<br>e) Location of pressure probes and differential pressure of the test;<br>f) Record of all observations;<br>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.

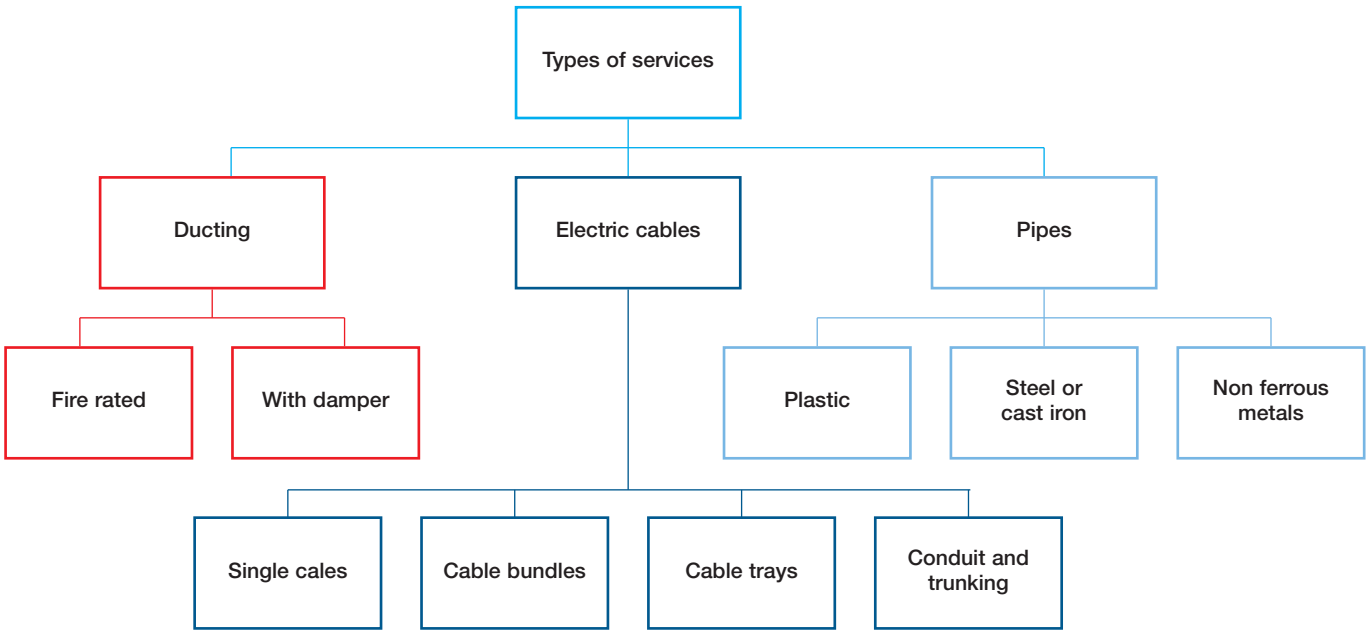



## Limitations of Use

- 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)

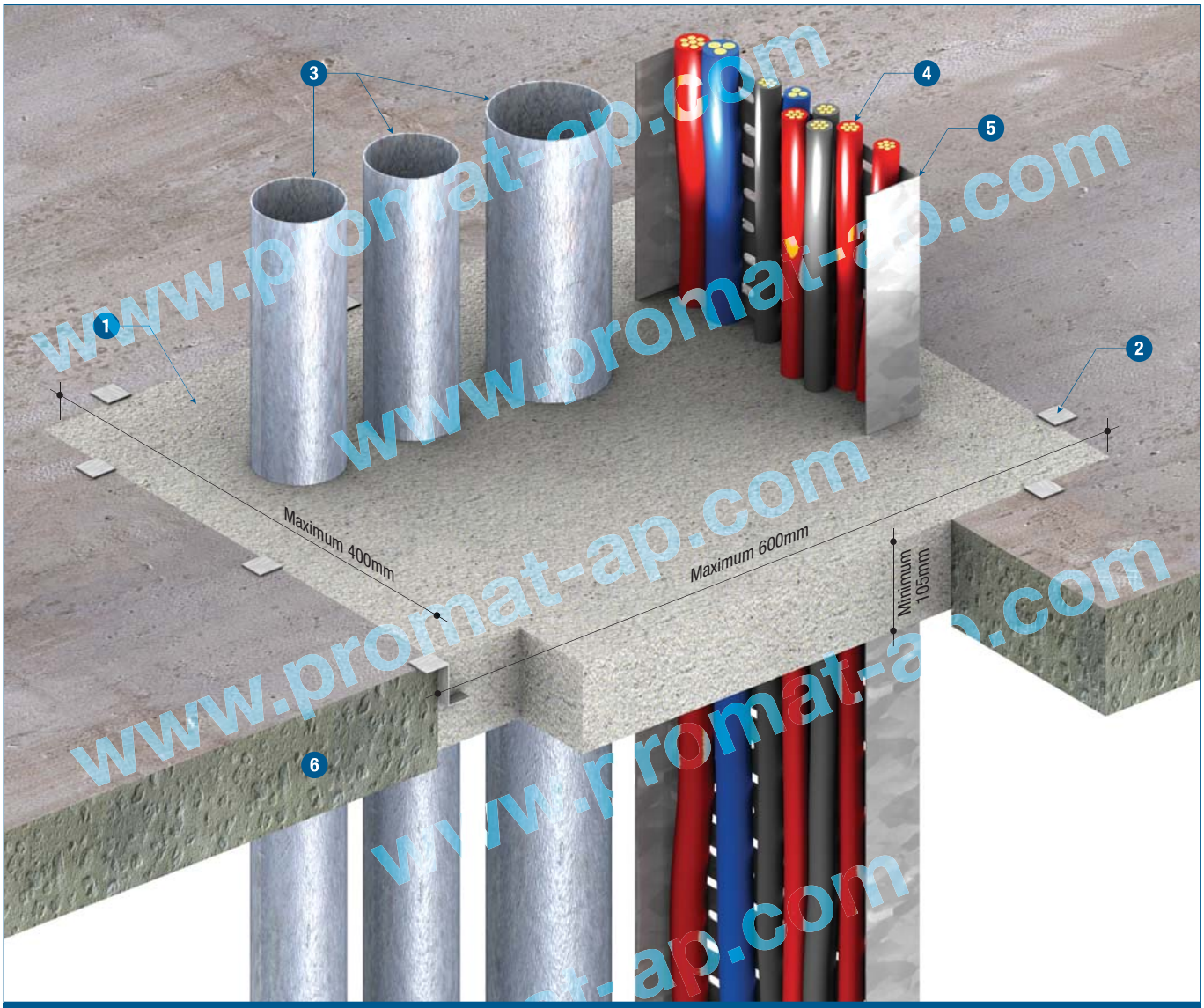
## Special Considerations

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






## TECHNICAL DATA

1. **For FRL up to -/240/180*, insulation criteria will vary depending on application and types of the services and penetrating elements. PROMASEAL® Mortar**

   ***Insulation is the time to failure measured on the surface of the PROMASEAL® Mortar. In some instances, where insulation measured upon the services is the required criteria, this time to insulation failure can be substantially shorter, e.g. for a steel or copper pipe passing through the barrier. If insulation measured upon the services is the relevant criteria for a specific project, please consult Promat Technical Department to ensure the appropriate performance can be obtained.**

2. **25mm wide steel Zed clips at nominal 300mm centres**
3. **Metal pipes**
4. **Electrical cables**
5. **Steel cable tray**
6. **Masonry or concrete floor slab**

**NOTE: PROMASEAL® AN Acrylic Sealant to be liberally applied to all joints and contact points between the barrier and services, and the barrier on the substrate (not shown above).**

PROMASEAL® Mortar is a specially formulated, lightweight (density approximately 700kg/m³), hydraulic cement composition supplied as a premixed dry powder. It can be trowelled into position for sealing of openings required for the passage of services such as electrical cables/pipes, busways and busbars, telecommunication cables/conduits etc. through floors and walls, thus maintaining the fire resistance of building elements that have been penetrated. It can also be used to seal openings after services have been removed or where no services are present.

PROMASEAL® Mortar has been successfully tested and assessed to AS1530: Part 4 and BS476: Part 20 for fire ratings up to 240 minutes depending on service penetration. Insulation criteria will vary depending upon the penetrating services.

PROMASEAL® Mortar is grey in colour and is packaged in convenient 20kg bags. It can be mixed with varying quantities of clean water for different consistencies.

## Installation Guide

Maximum sizes of openings for PROMASEAL® Mortar without the need for additional framing are:

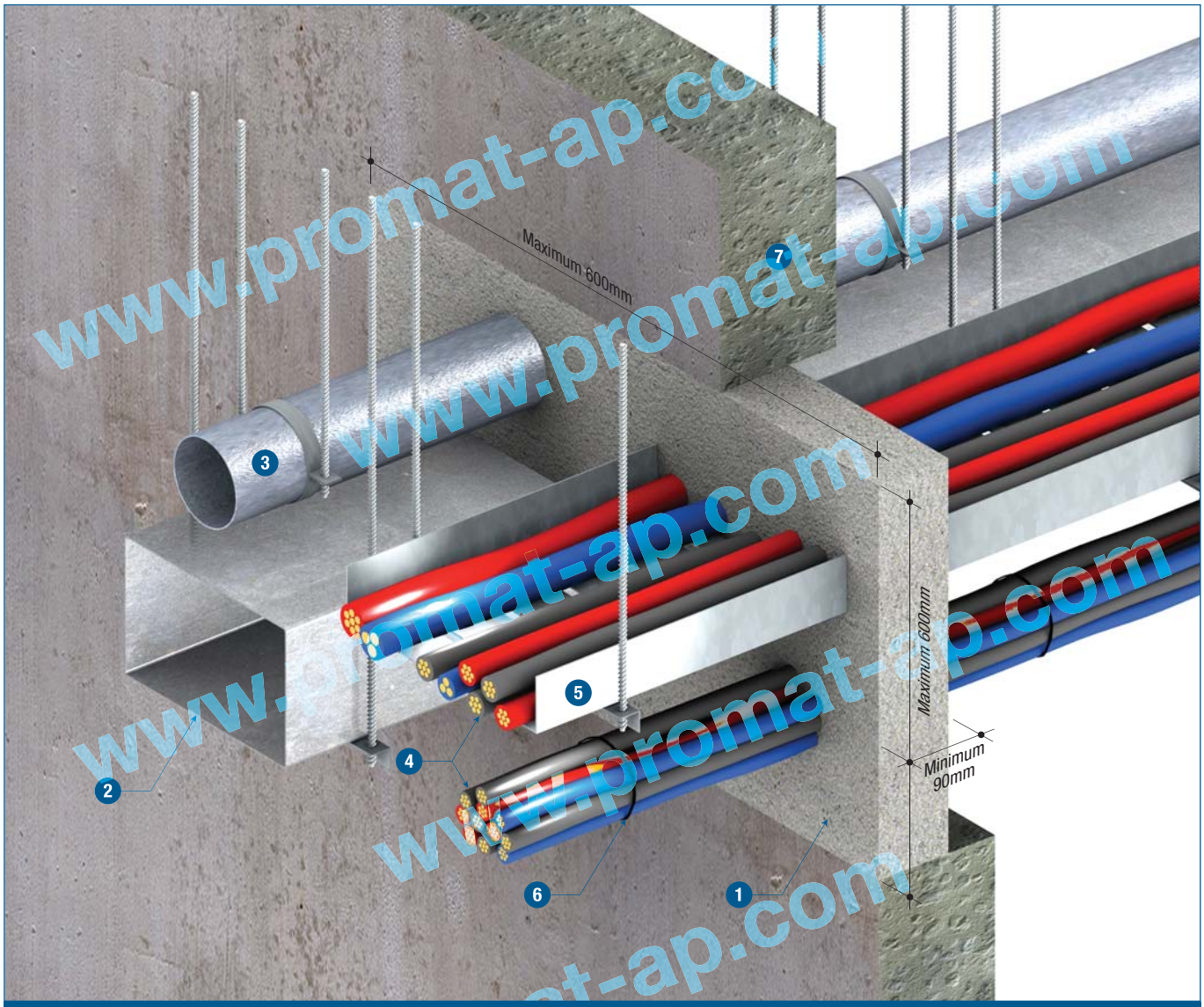
Floors: Maximum 600mm x 400mm
Walls: Maximum 600mm x 600mm

For larger openings, please consult Promat Technical Department.

For floors, 25mm wide Zed clips of 30mm x 50mm x 30mm x 1mm thick must be placed around the top of the opening at 300mm centres. Where the mortar abuts a wall this clip is replaced with 25mm wide L-angle of 100mm x 30mm x 1mm thick fixed to the wall, ensuring that at least 50mm is below the top level of the mortar.

## Recommended Specification

Where appropriate, with or without service penetrations, the specified floor/wall openings should be properly fire stopped using PROMASEAL® Mortar capable of providing fire resistance of -/240/- when tested and assessed in accordance with AS1530: Part 4 and/or BS476: Part 20: 1987. Installation of any fire stopping product should be carried out according to the manufacturer's recommendations. Please consult Promat for more details.






## TECHNICAL DATA

1. For FRL up to -/240/240*, insulation criteria will vary depending on application and types of the services and penetrating elements. PROMASEAL® Mortar

   *See same note on opposite page

2. Steel ventilation duct with appropriate support
3. Metal pipe with appropriate support and damper where required
4. Electrical cables
5. Steel cable tray with appropriate support
6. Cable tie
7. Masonry or concrete wall

**NOTE: PROMASEAL® AN Acrylic Sealant to be liberally applied to all joints and contact points between the barrier and services, and the barrier on the substrate (not shown above).**

## Coverage & Mixing Guide

When mixed with 12 to 16 litres of water, 20kg of the powder will produce approximately 35 litres of mix which will fill an area approximately 0.35m² of clear opening at 100mm depth. This equates to approximately 3 x 20kg bags of PROMASEAL® Mortar per 1m² of clear opening at 100mm depth or around 30 bags per m³.

PROMASEAL® Mortar can be mixed to a consistency to suit the application. For floors, if the services are close together and difficult to access, it may be necessary to make a wet pouring mix. However if the PROMASEAL® Mortar can be easily installed, use a medium dry mix. If the mortar has to be stacked in a wall opening, make a dry mix. The following may be used as a guide in preparing the required mix:

- Dry (packing) mix: 10 litres of water to 20kg of powder;
- Medium dry mix: 12 litres of water to 20kg of powder;
- Wet (pourable) mix: 16 litres of water to 20kg of powder.

Care should be taken on the order of mixing. Water should be added into the PROMASEAL® Mortar powder.

PROMASEAL® Mortar can be premixed and kept for several hours in a plastic bucket with an air tight lid. This enables an installer to do a number of small openings in a building without have to make several mixes on the site. The mix may set within a few hours of installation. However, setting time is dependent on weather conditions.

In some applications it may be necessary to provide bond breakers around services that may move as a result of natural building or thermal movement. This can be achieved using PROMASEAL® IBS™. Always apply a bead of PROMASEAL® AN Acrylic Sealant at the junction of the services and PROMASTOP® Cement as this will provide an effective smoke, water and movement seal.

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For latest information of the Promat Asia Pacific organisation,
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2. Promat is not responsible if recipients of fire test reports, assessments or literature incorrectly interpret said contents and use products based on those interpretations.

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