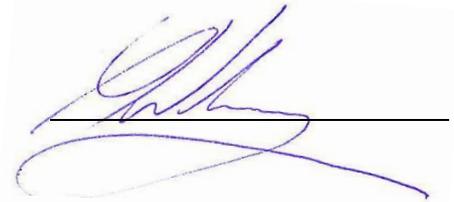


# **FAR 3318**

## **Fire resistance of Blazebrake 201 Sealant Applied to Pipe Penetrations in Concrete Floors**

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BRANZ's agreement with its Client in relation to this report contains the following terms and conditions in relation to ***Liability and Indemnification***

- a. Limitation and Liability
- i. BRANZ undertakes to exercise due care and skill in the performance of the Services and accepts liability to the Client only in cases of proven negligence.
  - ii. Nothing in this Agreement shall exclude or limit BRANZ's liability to a Client for death or personal injury or for fraud or any other matter resulting from BRANZ's negligence for which it would be illegal to exclude or limit its liability.
  - iii. BRANZ is neither an insurer nor a guarantor and disclaims all liability in such capacity. Clients seeking a guarantee against loss or damage should obtain appropriate insurance.
  - iv. Neither BRANZ nor any of its officers, employees, agents or subcontractors shall be liable to the Client nor any third party for any actions taken or not taken on the basis of any Output nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to BRANZ.
  - v. BRANZ shall not be liable for any delayed, partial or total non-performance of the Services arising directly or indirectly from any event outside BRANZ's control including failure by the Client to comply with any of its obligations hereunder.
  - vi. The liability of BRANZ in respect of any claim for loss, damage or expense of any nature and howsoever arising shall in no circumstances exceed a total aggregate sum equal to 10 times the amount of the fee paid in respect of the specific service which gives rise to such claim or NZD\$50,000 (or its equivalent in local currency), whichever is the lesser.
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    - The date of performance by BRANZ of the service which gives rise to the claim;
    - or
    - The date when the service should have been completed in the event of any alleged non-performance.
- b. Indemnification: The Client shall guarantee, hold harmless and indemnify BRANZ and its officers, employees, agents or subcontractors against all claims (actual or threatened) by any third party for loss, damage or expense of whatsoever nature including all legal expenses and related costs and howsoever arising relating to the performance, purported performance or non-performance, of any Services.
- c. Without limiting clause b above, the Client shall guarantee, hold harmless and indemnify BRANZ and its officers, employees, agents or subcontractors against all claims (actual or threatened) by any party for loss, damage or expense of whatsoever nature including all legal expenses and related costs arising out of:
- i. any failure by the Client to provide accurate and sufficient information to BRANZ to perform the Services;
  - ii. any misstatement or misrepresentation of the Outputs, including Public Outputs;
  - iii. any defects in the Products the subject of the Services; or
  - iv. any changes, modifications or alterations to the Products the subject of the Services.



# Fire resistance of Blazebrake 201 Sealant Applied to Pipe Penetrations in Concrete Floors

## 1. CLIENT

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## 2. INTRODUCTION

This report gives BRANZ's assessment of the fire resistance to AS 1530.4 of copper and stainless steel pipes in concrete floors with Blazebrake 201 sealant.

## 3. BACKGROUND

Specimens of Blazebrake 201 acrylic based fire stopping sealant used to seal pipe penetrations in concrete floor slabs have been tested in accordance with AS1530.4-1990, in BRANZ fire resistance tests FR 3700 and FP 3701. The full scale test FR 3700 incorporated a floor slab measuring 170 mm thick, pilot test FP 3701 incorporated a floor slab measuring 180 mm thick.

The pipe specimens tested relevant to this assessment are as follows.

- Specimen 1 Fire Resistance Test FP 3701
  - 180 mm thick concrete slab
  - Copper pipe nominal 200 mm OD (203 mm OD x 2.2 mm wall thickness)
  - Opening 244 mm internal diameter.
  - Foamed polyurethane former inserted into annular gap between the pipe and the concrete slab to provide a depth of 20 mm, backfilled with Blazebrake 201 sealant flush with the surface of the concrete slab.
  - Test result: Integrity 120 minutes. Insulation 9 minutes.
- Specimen 20 Fire Resistance Test FR 3700
  - 170 mm thick concrete slab
  - Copper pipe nominal 80 mm OD (79 mm OD x 1.5 mm wall thickness)
  - Opening 100 mm internal diameter
  - No polyurethane backing strip included Blazebrake 201 sealant applied to the annular gap between the pipe and the concrete slab depth of 20mm flush with the surface of the slab.
  - Test result: Integrity 248 minutes NF. Insulation 30 minutes without radiation guard and 248 minutes NF with radiation guard.

  
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Specimen 20 (FR 3700) had a half circumference, steel mesh radiation guard fitted concentrically around the pipe where it protruded from the concrete slab measuring 450 mm long x 240 mm diameter.

## 4. DISCUSSION

### 4.1 Pipe Sizes

The two concrete slab pipe penetrations tested in FR 3700 and FP 3701 were nominal 200 mm OD and 80 mm OD copper pipes. It is now required to provide our assessment on the fire resistance of five smaller diameter copper pipes specifically 20 mm, 25 mm, 32 mm, 40 mm, 50 mm and 65 mm nominal diameter and one intermediate copper pipe of 100 mm nominal diameter pipe service penetrations. A single size 200 mm diameter stainless steel grade 316 pipe without a stated wall thickness is also considered. All pipe services are through a 170 mm thick concrete slab incorporating the Ramset™ Blazebrake 201 acrylic sealant system.

In FP 3701 the 200 mm diameter copper pipe with the polyurethane backing strip failed the integrity criteria after 120 minutes, due to a gap developing with vision into the furnace where the seal had receded away from one third of the circumference of the pipe. In FR 3700 the 80 mm diameter copper pipe without the backing strip did not fail the integrity criteria for the 248 minutes of the test.

The pipe sealing system comprising Ramset™ Blazebrake 201 acrylic sealant fall into two clear categories with and without the polyurethane backing strip. Both tests had a minimum depth of sealant around the pipe service of 20 mm, however the width of sealant varied from 20.5 mm wide for the 200 mm diameter pipe to 10.5 mm wide for the 80 mm diameter pipe.

The width of sealant applied to the annular space for the 80 mm diameter copper pipe in FP 3701 was 10.5 mm x 20 mm deep without a polyurethane backing strip. It is therefore expected that the smaller diameter copper pipe sizes if installed with at least 10 mm wide x 20 mm deep Ramset™ Blazebrake 201 acrylic sealant to the annular space between the pipe and the opening would achieve a similar integrity rating as the 80 mm diameter specimen tested in FR 3700 of 240 minutes.

As the nominal 100 mm OD copper pipe has a higher mass than the nearest equivalent pipe size as tested (nominal 80 mm OD copper pipe) it shall be installed as per the 200 mm OD copper pipe comprising a polyurethane backing strip with Ramset™ Blazebrake 201 acrylic sealant applied to the annular space of 20 mm wide x 20 mm deep. It is considered that the 100 mm copper pipe service penetration would achieve an integrity of at least 120 minutes.

Stainless steel has a lower thermal conductivity than copper and it is therefore expected that a 200 mm diameter stainless steel grade 316 pipe of comparable wall thickness to the 200 mm copper pipe installed and tested as per specimen 1 in FP 3701 would achieve a similar integrity rating of 120 minutes.

### 4.2 RADIATION SHIELD

The 80 mm diameter pipe tested in FR 3700 included a half circumference radiation shield, the insulation result for the specimen in question indicated that if the copper pipe was fitted with a full circumference radiation shield it would achieve a four hour insulation rating. However as the pipe diameter increases there is also a significant increase in the mass of the pipe, and for the larger diameter pipes a correspondingly steep increase in the heat conducted through the pipe and seal to the unexposed face.

  
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the smaller diameter copper pipes (nominal sizes 20 mm to 65 mm OD) would therefore be expected to achieve a similar insulation rating as the nominal 80 mm OD copper pipe as tested in FP 3700 if fitted with a radiation guard of similar dimensions as specified in FP 3700.

## 5. CONCLUSION

It is considered that the fire resistance, in accordance with AS 1530.4 of the nominal 20 mm, 25 mm, 32 mm, 40 mm, 50 mm & 65 mm diameter copper pipe service penetrations through a 170 mm thick concrete slab would maintain integrity up to and including 240 minutes, if installed as per the nominal 80 mm diameter copper pipe as tested in FR 3700. Pipe installation would include Ramset™ Blazebrake 201 acrylic sealant applied to the annular space between the pipe and the slab flush with the face of the slab to a minimum of 10 mm wide x 20 mm deep. Pipes installed without a radiation guard would achieve up to 30 minutes insulation. Where insulation in excess of 30 minutes is required up to 240 minutes a steel mesh radiation guard of diameter nominally three times the diameter of the penetration and at least 450 mm long must be installed.

The nominal 100 mm diameter copper pipe and the 200 mm diameter grade 316 stainless steel pipe penetrations through a 170 mm thick concrete slab would maintain integrity up to and including 120 minutes if installed as per the nominal 200 mm diameter copper pipe as tested in FR 3701. The pipe installation would include Ramset™ Blazebrake 201 acrylic sealant applied to the annular space between the pipe and the slab flush with the face of the slab to a minimum of 20 mm wide x 20 mm deep on top of a polyurethane backing strip.

Table 1. Integrity and Insulation Summary

Pipe Specimen Nominal diameter	Integrity minutes	Insulation minutes	Sealant W x D	Backing Strip
Copper 20 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 25 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 32 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 40 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 50 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 65 mm	240	30 / 240 <sup>R</sup>	10 mm x 20 mm	N
Copper 100 mm	120	Nil	20 mm x 20 mm	Y
Stainless Steel Grade 316 200 mm x ≤ 2.2 mm wall thickness	120	Nil	20 mm x 20 mm	Y

240<sup>R</sup> = Where an insulation of 240 minutes is required a wire mesh radiation guard must be installed with a diameter of at least three times the pipe diameter and at least 450 mm long.

## 6. LIMITATION

This assessment report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this report should additional information become available regarding the fire performance of the product assessed herein

  
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