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# Regulatory information report

## Electrical cables within PVC conduits cast in concrete slabs, protected with Hilti fire stopping products

Client: Hilti (Aust.) Pty Ltd

Report number: FAS190329 Revision: RIR1.3

Issue date: 13 August 2020 Expiry date: 28 February 2025

# Quality management

| Version | Date | Information relating to report | | | |
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| R1.2* | Issue: 06/07/2020 | Reason for issue | Initial issue. | | |
| | | | Prepared by | Reviewed by | Approved by |
| | Expiry: 28/02/2025 | Name | Yomal Dias | Omar Saad | Omar Saad |
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| | | | Prepared by | Reviewed by | Approved by |
| | Expiry: 28/02/2025 | Name | Yomal Dias | Omar Saad | Omar Saad |
| | | Signature |  |  |  |
| | Issue: | Reason for issue | | | |
| | | | Prepared by | Reviewed by | Approved by |
| | Expiry: | Name | | | |
| | | Signature | | | |

*R1.0 and R1.1 were skipped to maintain the RIR numbering consistant with the assessment report numbering.

# Contact information

Warringtonfire Australia Pty Ltd – ABN 81 050 241 524

**Melbourne – NATA registered laboratory**
Unit 2, 409-411 Hammond Road
Dandenong South, VIC 3175
Australia

T: +61 3 9767 1000

**Sydney**
Suite 802, Level 8
383 Kent Street
Sydney, NSW 2000
Australia

T: +61 2 9211 4333

**Brisbane**
Suite 6, Level 12
133 Mary Street
Brisbane, QLD 4000
Australia

T: +61 7 3238 1700

**Canberra**
Unit 2, 11 Murray Crescent
Griffith, ACT 2603
Australia

T: +61 2 6260 8488

**Perth**
Unit 22, 22 Railway Road
Subiaco, WA 6008
Australia

T: +61 8 9382 3844

# General conditions of use

# Executive summary

This report contains the minimum information required for regulatory compliance and refers to the assessment report FAS190329 R1.2. Summaries of the test data on which this assessment is based are provided in the appendices which are only available in the full report.

The analysis conducted in the referenced assessment report documents the findings of the assessment undertaken to determine the likely fire resistance level (FRL) of various electrical, data and telecommunication cables rooted in PVC conduits, cast in concrete slabs, if tested and assessed in general accordance with AS 1530.4:2014[1] and AS 4072:2005 (R2016)[2].

The analysis conducted in Section 5 of the referenced assessment report found that the tested system, subject to the proposed variations described in Table 1, if tested in general accordance with AS 1530.4:2014, would likely achieve a maximum FRL of -/120/120.

**Table 1 Variations and assessment outcome**

| No. | Item | Variations | FRL |
|---|---|---|---|
| 1 | Slab thickness ($t_{slab}$) | The concrete slab thickness must be not less than 180 mm. | FRL up to -/120/120 applicable from either side (two-way FRL) |
| 2 | Block-out size and shape | Maximum 250 mm (L) x 250 mm (W) or maximum diameter 250 mm circular block-outs.<br>Depth of block-out may be varied such that the thickness of concrete above the block-out is not less than 105 mm. | |
| 3 | Number of conduits in one block-out/ conduit spacing in a block-out | Minimum edge spacing between adjacent conduits must not be less than 50 mm. Up to three conduits can be placed through any one side of a 250 mm block-outside face.<br>Conduits may be fitted through multiple faces of a single block-out, subject to the said requirement with respect to conduit edge spacing on each face. | |
| 4 | Block-out edge spacing | $L_{total}$ must not be less than 50 mm. | |
| 5 | Total distance between block-outs on the exposed side and the unexposed side ($L_{total}$) | The distance between the block-outs on the exposed and unexposed sides must not be less than 1300 mm. | |
| 6 | Distance from block-out to the separating wall on the exposed side ($L_{exposed}$) | $L_{exposed}$ can be reduced to 250 mm, provided that $L_{total}$ is not less than 1300 mm. | |
| 7 | Distance from block-out to the separating wall on the unexposed side ($L_{unexposed}$) | $L_{unexposed}$ can be reduced to 250 mm, provided that $L_{total}$ is not less than 1300 mm. | |
| 8 | Variations of the separating wall and wall thickness ($t_{wall}$) | The separating wall and its head detailing must have an FRL of -/120/120 (or 120/120/120).<br>If a wall with a lower FRL (eg -/60/60, 60/60/60, -/90/90 or 90/90/90) is used, the FRL of the overall assembly must not exceed that of the wall. | |

[1] Standards Australia (2014) *Methods for fire tests on building materials, components and structures* Fire-resistance tests for elements of construction, AS 1530.4:2014

[2] Standards Australia (2005, R2016) *Components for the protection of openings in fire-resistant separating elements* Part 1: Service penetrations and control joints, AS 4072.1-2005 (R2016)

| No. | Item | Variations | FRL |
|---|---|---|---|
| 9 | Different cable types | Power and communication cable, include but not limited to submain, TPS, RG6, CAT, fibre optics, SDI cable, fire rated cable. | |
| 10 | Cable/cable bundle size | Single cable or bundle of cables (total copper conductor cross sectional area not more than 38mm$^2$) | |
| 11 | Conduit size | Ø20, Ø25, Ø32, Ø50 (PVC conduit, including NBN conduit) | |
| 12 | Local fire protection | Local fire protection should be provide using fire sealant at least on one side. It is recommended that sealant is provided on both sides to minimise smoke leakage.<br>When the conduit is extended beyond the point of exit on one side, the other side should be provided with local fire stopping using fire sealant.<br>Hilti CP 611A intumescent sealant may be used instead of CP 606 Firestop acrylic sealant. | |
| 13 | Omission of the block-out | The block-out can optionally be omitted and the point of exit of the conduit can be directly from the slab soffit (Figure 2) or slab edge (Figure 3), provided that the 50 mm bottom cover to the conduit is not compromised around the bend. | |

Refer Figure 1 for various parameters including $t_{slab}$, $L_{total}$, $L_{exposed}$, $L_{unexposed}$ and $t_{wall}$.

The variations and outcome of the referenced assessment report are subject to the limitations and requirements described in Sections 2, 3, 5 and 7 of this report. The results of this report are valid until 28 February 2025.

# Contents

# 1. Introduction

This report contains the minimum information sufficient for regulatory compliance and refers to the assessment report FAS190329 R1.2.

The analysis conducted in the referenced assessment report documents the findings of the assessment undertaken to determine the likely fire resistance level (FRL) of various electrical, data and telecommunication cables embedded in PVC conduits, cast in concrete slabs, if tested in general accordance with AS 1530.4:2014 and AS 4072:2005 (R2016). This assessment was carried out at the request of Hilti (Aust.) Pty Ltd. The sponsor details are included in Table 2.

**Table 2 Sponsor details**

| Client | Address |
|---|---|
| Hilti (Aust.) Pty Ltd | 1G Homebush Bay Drive, Rhodes, NSW 2138, Australia |

# 2. Limitations of assessment

AS 1530.4:2014 does not include specific requirements for the testing of services which are embedded and travelling horizontal through a concrete floor. For this reason, the referenced test is not in direct compliance with AS 1530.4:2014 and will be referenced as being tested in “general accordance” with AS 1530.4:2014.

This assessment does not address the effects on the structural adequacy of the concrete floor separating elements due to the presence of services within them. These should be addressed by qualified structural engineers who are designing or have designed the slab.

# 3. Declaration

The guide to undertaking assessments in lieu of fire tests prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal dated 14 January 2020, Hilti (Aust.) Pty Ltd confirmed that

- To their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information, they agree to ask the assessing authority to withdraw the assessment.

# 4. Description of the specimen and variations

## 4.1 System description

The tested system comprised of various electrical and telecommunication cables, spanning within PVC conduits embedded in a 200 mm thick concrete slab. A 110 mm thick single leaf brick wall acted as the vertical separating element.

## 4.2 Referenced test data

The assessment of the variation to the tested system and the determination of the likely performance is based on the results of the fire tests documented in the reports summarised in Table 3. Further details of the tested system are described in Appendix B of the referenced report.

**Table 3 Referenced test data**

| Report number | Test sponsor | Test date | Testing authority |
|---|---|---|---|
| FSP 2036 | NOS Automation Solutions Pty Ltd | 12 August 2019 | Infrastructure Technologies, 14 Julius Avenue, North Ryde, NSW 2113 |

Hilti (Aust.) Pty Ltd has confirmed that they share ownership of FSP 2036 together with test sponsor.

## 4.3 Variations to tested system

An identical system has not been subject to a standard fire test. We have therefore assessed the system using baseline test information for similar system. The variations to the tested system together with the referenced baseline standard fire tests are described in Table 4. In addition to individually assessing each of these variations, this assessment also addresses the use of multiple variations in combination in the proposed systems.

Figure 1 shows the general arrangement of the electrical cables within conduits cast in concrete slabs. It also provides further clarity with respect to the variations addressed in Table 4.

Figure 1 to Figure 3 were provided by Hilti Australia Pty Ltd and updated by Warringtonfire Australia Pty Ltd.

**Table 4 Variation to tested systems**

| No. | Item | Reference test | Description | Variations |
|---|---|---|---|---|
| 1 | Slab thickness ($t_{slab}$) | FSP 2036,<br>FRT 190246 R2.0 | FSP 2036 comprised of a 200 mm thick concrete slab. The slab thickness used in FRT 190246 R2.0 was 180 mm. | The concrete floor slab thickness must be not less than 180 mm. |
| 2 | Block-out size and shape | FSP 2036<br>FRT 190246 R2.0 | The block-outs used in FSP 2036 were150 mm (L) × 100 mm (W) × 75 mm (D).<br>Those used in FRT 190246 R2.0 were 225 mm (L) × 225 mm (W) × 75 mm (D) in size. | It is proposed that the block-out size can be increased to 250 mm (L) × 250 mm (W).<br>Block-out geometry may be altered provided that the dimensions are not excessive (eg for circular block-outs, the maximum diameter is 250 mm).<br>Depth may be varied such that the thickness of concrete above the block-out is not less than 105 mm. |
| 3 | Number of conduits in one block-out/ conduit spacing in a block-out | FSP 2036 | FSP 2036 contained one conduit per block-out and the C/C spacing between conduits was 180 mm (edge spacing between conduits was around 150 mm). | It is proposed that the spacing between conduits can be reduced such that the edge spacing between adjacent conduits is not less than 50 mm. Consequently, up to three conduits can be placed through any one side of a 250 mm block-outside face.<br>Conduits may be fitted through multiple faces of a single block-out, subject to the said requirement with |

| No. | Item | Reference test | Description | Variations |
|---|---|---|---|---|
| | | | | respect to conduit edge spacing on each face. |
| 4 | Block-out edge spacing | FSP 2036 | The edge spacing between adjacent block-outs was approximately 100 mm. | The edge spacing between adjacent block-outs may be reduced provided that the edge spacing between two adjacent conduits is not less than 50 mm. |
| 5 | Total distance between block-outs on the exposed side and the unexposed side ($L_{total}$) | FSP 2036 | The distance between block-outs in FSP 2036 was 1300 mm. | The distance between the block-outs on the exposed and unexposed sides must not be less than 1300 mm. |
| 6 | Distance from block-out to the separating wall on the exposed side ($L_{exposed}$) | FSP 2036 | The distance from block-out to the separating wall on the exposed side in FSP 2036 was 900 mm. | The distance can be reduced to 250 mm, provided that the distance between the block-outs on the exposed and unexposed sides are not less than 1300 mm. |
| 7 | Distance from block-out to the separating wall on the unexposed side ($L_{unexposed}$) | FSP 2036 | The distance from block-out to the separating wall on the unexposed side in FSP 2036 was 300 mm. | The distance can be reduced to 250 mm, provided that the distance between the block-outs on the exposed and unexposed sides are not less than 1300 mm. |
| 8 | Variations of the separating wall and wall thickness ($t_{wall}$) | FSP 2036 | The separating wall was a 110 mm thick single lead brick wall with a nominal FRL of -/240/90 in accordance with AS 3700:2018[3] | It is proposed that any separating wall with an FRL not less than -/120/120 or 120/120/120, established either by testing or assessment in accordance with AS 1530.4:2014 by a registered testing authority, can be used as the wall separating element. The FRL of the head detail must have also been established either via testing or assessment to achieve the same FRL.<br>If a wall with a lower FRL (eg -/60/60, 60/60/60, -/90/90 or 90/90/90) is used, the FRL of the overall assembly must not exceed that of the wall. |
| 9 | Different cable types | FSP 2036 | The tested specimens included single 15 mm diameter 16mm$^2$ two core plus Earth copper/XLPE/PVC electrical cables, a data and communication bundle and a bundle of TPS electrical cables. | Power and communication cable, include but not limited to submain, TPS, RG6, CAT, fibre optics, SDI cable, fire rated cable. |

[3] Standards Australia (2018) *Masonry structures*, AS 3700:2018

| No. | Item | Reference test | Description | Variations |
|---|---|---|---|---|
| 10 | Cable bundle size | FSP 2036 | The tested system included a data and communication cable bundles as well as a flat TPS electrical cable bundle. These bundles were of different sizes and left different sized gaps within the PVC conduit. | Single cable or bundle of cables (total copper conductor cross sectional area not more than 38mm$^2$) |
| 11 | Conduit size | FSP 2036 | Ø25, Ø32, Ø50 | Ø20, Ø25, Ø32, Ø50 |
| 12 | Local fire protection[b] | FSP 2036 | Hilti Firestop Acrylic Sealant CP 606 was used for Specimens 1 and 3 on the unexposed side only to a depth of 20 mm and finished with a 20 mm fillet | Local fire protection should be provide using fire sealant at least on one side. It is recommended that sealant is provided on both sides to minimise smoke leakage.<br>When the conduit is extended beyond the point of exit on one side, the other side should be provided with local fire stopping using fire sealant.<br>Hilti CP 611A intumescent sealant may be used instead of CP 606 Firestop acrylic sealant. |
| 13 | Omission of the block-out | FSP 2036 | Block-outs were available on both sides of the separating wall in FSP 2036. | It is proposed that the block-out can optionally be omitted and the point of exit of the conduit can be directly from the slab soffit (Figure 2) or slab edge (Figure 3), provided that the 50 mm bottom cover to the conduit is not compromised around the bend. |
| 14 | Two-way FRL | FSP 2036<br>FRT 190246 R2.0 | The tested systems were exposed to fire from one side. | It is proposed that FRLs for the system, subject to the variations 1 to 13, can be prescribed from either direction – ie addressing fire exposure from either side, but not simultaneously. |

[a] The FRL of the overall system is limited by that of the wall separating element, including its head detailing.

[b]If the conduit extends on both ends, it is recommended to cut the conduit on one end and seal this end with Hilti CP 611A or CP 606 to a depth of 20mm from the concrete surface going inward. Then, apply an additional 20 mm cone of sealant on the cable/s as illustrated in Figure 1 to Figure 3. The conduit may be reattached over the seal to cover the full length of the cables, if necessary.

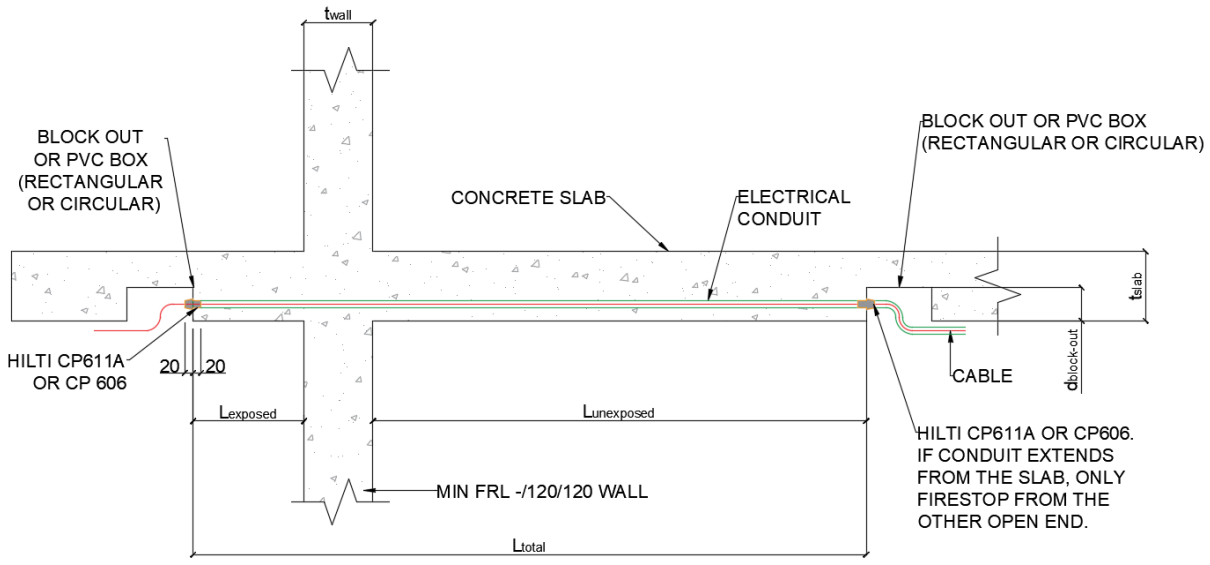


**Figure 1** General arrangement of electrical cables within conduits cast in slab to achieve FRL up to -/120/120

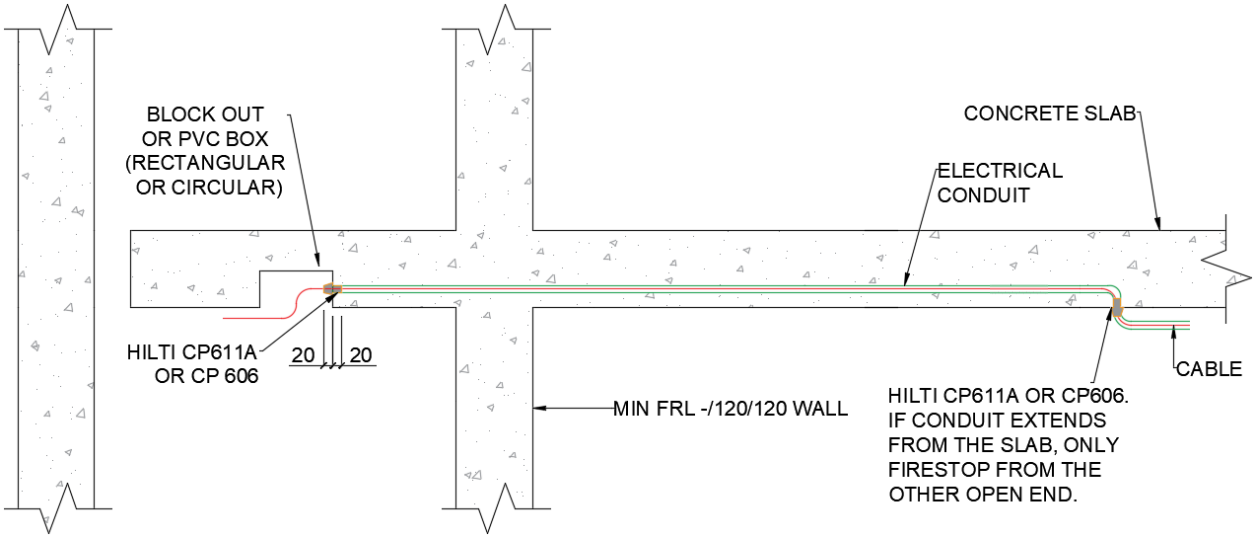


**Figure 2** General arrangement of electrical cables within conduits exiting from slab soffit to achieve FRL up to -/120/120

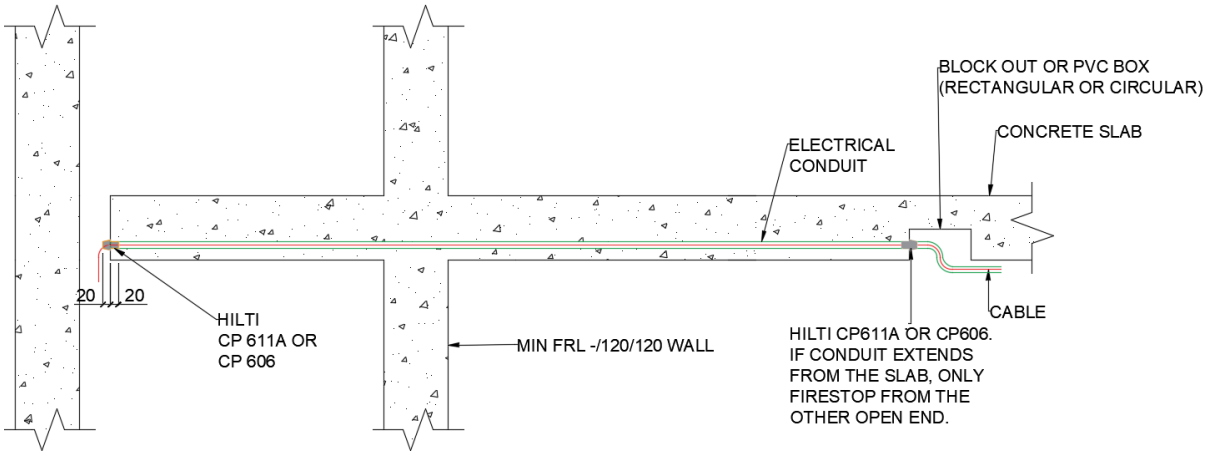


**Figure 3** General arrangement of electrical cables within conduits exiting from slab edge to achieve FRL up to -/120/120

## 4.4 Purpose of the test

AS 1530.4:2014 sets out the methods for conducting fire tests on building materials, components and structures. Specifically, Section 2 of this standard contains the general requirements for these tests. Section 10 addresses the fire resistance testing of service penetrations.

However, AS 1530.4:2014 does not include specific requirements for the testing of services which are embedded and travelling horizontal through a concrete floor. For this reason, the test is not in direct compliance with AS 1530.4:2014 and will be referenced as being tested in “general accordance” with AS 1530.4:2014.

AS 4072.1-2005 (R2016) sets out the minimum requirements for the construction, installation and application of fire resistance tests to sealing systems.

# 5. Scope, objective and assumptions

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3 of this report.
- The referenced assessment report details the methods of construction, test conditions and assessed results that would have been expected if the specific elements of construction described here had been tested in general accordance with AS 1530.4:2014.
- The results of the referenced assessment are applicable to systems exposed to fire from either side, but not simultaneously.
- This referenced assessment report is only valid for the assessed systems. Any changes with respect to size, construction details, loads, stresses, edge or end conditions, other than those identified in this report, may invalidate the findings of this assessment. If there are changes to the system, a reassessment will be needed to verify consistency with the assessment in this report.
- The data, methodologies, calculations and conclusions documented in the referenced assessment report specifically relate to the assessed systems and must not be used for any other purpose.
- The referenced assessment report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.

# 6. Conclusion

Details of the assessment and discussion are only available in the referenced main assessment report. It has been concluded that the tested system described in Section 4.2, if varied as described in Section 4.3, and tested in general accordance with the test method described in Section 4.4, would likely achieve a maximum FRL of -/120/120, as specified in Table 1, subject to the limitations and requirements specified in Sections 2, 3, 5 and 7. A summary of the assessment outcome is outlined in Table 1.

# 7. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on or, before, the stated expiry date.

This assessment represents our opinion about the performance likely to be demonstrated on a test in general accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to the Hilti (Aust.) Pty Ltd for its own purposes and we cannot express an opinion on whether it will be accepted by building certifiers or any other third parties for any purpose.