



FIRE ASSESSMENT REPORT

FC11356-001

**USE OF FORMCRAFT FASTFORM PTY LTD PERMANENT FORMWORK SYSTEM
WITHIN THE NCC (BCA) VOLUME ONE**

CLIENT

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PAGE:

1 of 9

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ASSESSMENT OBJECTIVE

To assess the fire resistance, as given in the Formcraft Pty Ltd document 'Design Manual for FastForm® Wall System', and the use of Formcraft Pty Ltd FastForm® permanent formwork system within the NCC (BCA) Volume One and applicability of AS 5113.

The fire resistance is assessed on the basis that the requirements of AS 3600:2018 for 'Concrete Structures' are complied with such that if subjected to a fire resistance test in accordance with the test standard AS 1530.4:2014 the appropriate failure criterion will be achieved.

CONCLUSION

It is considered that:

- concrete walls built in accordance with the provisions of the Formcraft Pty Ltd "Design Manual for FastForm® Wall System" will provide the fire resistances given in Table 3 if tested in accordance with AS 1530.4:2014.
- Formcraft Pty Ltd FastForm® permanent formwork system with fibre cement formwork and metal connectors is of non-combustible construction and therefore a Type A construction within the NCC (BCA) Volume One, and application of AS 5113 and the debris criteria is not required.
- as a Type A construction, FastForm® permanent formwork, code TT, with fibre cement facings plastic connection system, may be used for common walls and internal walls where they are required to be fire-resisting and also lift shafts and stair wells, and anywhere a Type A construction is required except external walls.
- as a Type A construction, FastForm® permanent formwork, code TT, with fibre cement facings and metal connection system, may be used for external walls, common walls and internal walls where they are required to be fire-resisting and also lift shafts and stair wells, and anywhere a Type A construction is required.
- All Formcraft Pty Ltd FastForm® permanent formwork systems, including ET using EPS permanent formwork may be used in a Class 1 building with no restriction on number of storeys.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in BRANZ Services Agreement for this work.

The results reported here relate only to the item/s described in this report.



REPORT NUMBER:

FC11356-001

ISSUE DATE:

5 April 2019

PAGE:

2 of 9

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CONTENTS

SIGNATORIES	4
DOCUMENT REVISION STATUS	4
1. INTRODUCTION	5
2. BACKGROUND	5
3. DISCUSSION.....	5
3.1 All FastForm® permanent formwork systems, EE, TE/ET and TT	5
3.1.1 Fire Resistance Level	5
3.1.2 Insulation.....	5
3.1.3 Structural Adequacy.....	6
3.1.4 Integrity.....	6
3.1.5 Summary	6
3.2 FastForm® permanent formwork, code TT with metal connectors	7
3.2.1 NCC (BCA) Volume One.	7
3.2.2 AS 5113:2016.....	8
3.3 Plastic Connectors.....	8
3.4 Class 1 Buildings.....	8
4. CONCLUSION.....	8

TABLES

Table 1: Minimum effective thickness of concrete core for Insulation	6
Table 2: Minimum cover.....	6
Table 3: Summary of FRL of Formcraft panel systems.....	7

FIGURES

Figure 1: Section through FastForm® FC permanent formwork system.....	9
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REPORT NUMBER:

FC11356-001

ISSUE DATE:

5 April 2019

PAGE:

3 of 9

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REPORT NUMBER:
FC11356-001

ISSUE DATE:
5 April 2019

PAGE:
4 of 9

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1. INTRODUCTION

This report gives BRANZ's assessment of the fire resistance, as given in the Formcraft Pty Ltd document 'Design Manual for FastForm® Wall System', and the use of Formcraft Pty Ltd FastForm® permanent formwork system within the NCC (BCA) Volume One and applicability of AS 5113.

The fire resistance is assessed on the basis that the requirements of AS 3600:2018 for 'Concrete Structures' are complied with such that if subjected to a fire resistance test in accordance with the test standard AS 1530.4:2014 the appropriate failure criteria will be achieved.

FastForm® is a permanent formwork system comprising Expanded Polystyrene (EPS) both sides, code "EE", Expanded Polystyrene (EPS)/Fibre Cement (FC) both sides, code "ET/TE", Fibre Cement (FC), code TT, metal or plastic connectors and concrete infill.

Figure 1 shows essential features of the system with FC formwork and metal connectors.

2. BACKGROUND

FAR 3112 previously assessed Formcraft Pty Ltd insulated concrete formwork walls of 220 mm, 270 mm and 320 mm thickness for fire resistances of 90, 180 and 240 minutes respectively and this assessment is an extension of that assessment.

3. DISCUSSION

3.1 All FastForm® permanent formwork systems, EE, TE/ET and TT

3.1.1 Fire Resistance Level

The Formcraft design manual has been reviewed for compliance with AS 3600:2018 as follows.

Three different models of permanent formwork are offered as: EE model, TE/ET model and TT model. Whereby the designation E or T refers to the outer surface as 60 mm EPS or 6 mm FC respectively. The essential parameters of interest are the actual thickness of concrete within the block and the concrete cover over the reinforcement and tendons.

3.1.2 Insulation

For compliance with AS 3600:2018 the minimum concrete core thickness of the wall that is required to meet the Insulation criterion is shown in Table 1.



REPORT NUMBER:

FC11356-001

ISSUE DATE:

5 April 2019

PAGE:

5 of 9

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.
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Table 1: Minimum effective thickness of concrete core for Insulation

Insulation, (min)	Thickness, (mm)
60	80
90	100
120	120
180	150
240	170

3.1.3 Structural Adequacy

For compliance with AS 3600:2018 the minimum concrete cover over the steel reinforcement and tendons that is required to meet the Structural Adequacy criterion is shown in Table 2.

Table 2: Minimum cover

Structural fire resistance, mins	Minimum concrete cover to reinforcement, mm	Minimum concrete cover to tendons, mm
60	20	30
90	35	30
120	40	30
180	45	35
240	50	45

While the descriptions of the three permanent formwork systems do not show what the cover will be, the figures in later sections typically show that in general the reinforcing is centrally located within the blocks and on this basis, it is assumed that there will be adequate cover on each side. It is assumed that this will be the subject of inspections before the concrete is poured

3.1.4 Integrity

In compliance with AS 3600:2018 the Integrity criterion will be achieved by default if the concrete thickness and cover provisions as stated above for the Insulation and Structural Adequacy criteria are met or exceeded.

3.1.5 Summary

The review of the Formcraft design manual has established that all of the permanent formwork systems have sufficient thickness of the concrete in the core to meet the Insulation criterion in accordance with AS 3600:2018.

The table of minimum cover to reinforcement and tendons in the Performance and BCA Compliance section of the Formcraft design manual shows there will be adequate cover, provided the steelwork is located as near as practical to the centre of the blocks prior to pouring with concrete, and will meet the Structural Adequacy criterion in accordance with AS 3600:2018.



Since the criteria of Insulation and Structural Adequacy are met or exceeded, then it follows that the Integrity criterion in accordance with AS 3600:2018 will also be met.

The Formcraft panel systems for which this assessment applies are listed in Table 3.

Table 3: Summary of FRL of Formcraft panel systems

Model No.	Wall Thickness (mm)	Concrete Thickness, (mm)	External Material	FRL
EE220	220	100	60mm EPS/60mm EPS	90/90/90
EE270	270	150	60mm EPS/60mm EPS	180/180/180
EE320	320	200	60mm EPS/60mm EPS	240/240/240
ET174	174	108	60mm EPS/6mm FC	90/90/90
ET216	216	150	60mm EPS/6mm FC	180/180/180
ET254	254	188	60mm EPS/6mm FC	240/240/240
TT120	120	108	6mm FC /6mm FC	90/90/90
TT162	162	150	6mm FC /6mm FC	180/180/180
TT200	200	188	6mm FC /6mm FC	240/240/240
TT262	262	250	6mm FC /6mm FC	240/240/240

This fire assessment report is to be read in conjunction with an edition of the Formcraft Pty Ltd “Design Manual for FASTFORM® Wall System” where the above stated minimum or greater concrete thicknesses and cover are included in the text or tables.

It is further established that the addition of ‘control joints’ will prejudice the fire resistance and are not permitted.

3.2 FastForm® permanent formwork, code TT with metal connectors

3.2.1 NCC (BCA) Volume One.

FastForm® permanent formwork system with fibre cement facings and metal connectors comprise non-combustible components. The metal connectors and concrete are non-combustible because they contain no organic compounds and the fibre cement formwork can be used where non-combustible materials are required by virtue of clause NCC (BCA) Volume One, C1.9 Non-combustible building elements, C1.9(e), where such is stated for fibre-reinforced cement sheeting.

With all components being non-combustible, FastForm® permanent formwork system is a Type A construction and can therefore be used under the Deemed-to-Satisfy Provisions in class 2, 3, 5 to 9 buildings with no limit to the rise in storeys.

C1.9 Non-combustible building elements, C1.9(a) states that in a building required to be Type A construction, external walls must be non-combustible.

FastForm® permanent formwork system meets all these requirements with no further tests or documents required.



REPORT NUMBER:

FC11356-001

ISSUE DATE:

5 April 2019

PAGE:

7 of 9

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As a Type A construction, FastForm[®] permanent formwork, code TT, with fibre cement facings and metal connectors, may be used in class 2, 3, 5 to 9 buildings as external walls, common walls, internal walls where they are required to be fire-resisting, shafts and stair shafts, and anywhere a Type A construction is required when installed with a thickness of concrete core that achieves the required FRL.

3.2.2 AS 5113:2016

AS 5113:2016, Fire propagation testing and classification of external walls of buildings, is referenced in the NCC (BCA) Volume One, 2019, Verification method CV3. A building can be designed in accordance with Deemed-to-Satisfy Provisions or a Verification Method. As discussed above, FastForm[®] permanent formwork system meets the Deemed-to-Satisfy Provisions, therefore a Verification Method is not required and the requirements of AS 5113:2016, specifically the debris criteria, do not apply.

3.3 Plastic Connectors

The use of plastic connectors is not considered to be detrimental to the fire resistance of the systems and as they are imbedded in the concrete core and will not contribute to fire spread through the element, the systems can be considered as a Type A construction. Therefore, the discussion given in section 3.2 above applies equally to systems with plastic connectors with the exclusion of use as external walls where metal connectors must be used.

3.4 Class 1 Buildings

NCC (BCA) Volume Two, 2019. (Class 1 and 10a buildings) has no requirements for type of construction therefore all FastForm[®] wall system, including ET using EPS, may be used in a Class 1 building with no restriction on number of storeys.

4. CONCLUSION

It is considered that:

- concrete walls built in accordance with the provisions of the Formcraft Pty Ltd “Design Manual for FastForm[®] Wall System” will provide the fire resistances given in Table 3 if tested in accordance with AS 1530.4:2014.
- Formcraft Pty Ltd FastForm[®] permanent formwork system with fibre cement formwork and metal connectors is of non-combustible construction and therefore a Type A construction within the NCC (BCA) Volume One, and application of AS 5113 and the debris criteria is not required.
- as a Type A construction, FastForm[®] permanent formwork, code TT, with fibre cement facings plastic connection system, may be used for common walls and internal walls where they are required to be fire-resisting and also lift shafts and stair wells, and anywhere a Type A construction is required except external walls.
- as a Type A construction, FastForm[®] permanent formwork, code TT, with fibre cement facings and metal connection system, may be used for external walls, common walls and internal walls where they are required to be fire-resisting and also lift shafts and stair wells, and anywhere a Type A construction is required.
- All Formcraft Pty Ltd FastForm[®] permanent formwork systems, including ET using EPS permanent formwork may be used in a Class 1 building with no restriction on number of storeys.



REPORT NUMBER:

FC11356-001

ISSUE DATE:

5 April 2019

PAGE:

8 of 9

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Figure 1: Section through FastForm® FC permanent formwork system

