MODIFICATION TO MAJOR PROJECT M09_0183

Telopea Urban Renewal Project - Stage 1: Shortland and Part Moffatts Precinct Redevelopment

LOT 101 DP 1169945 *(PREVIOUSLY KNOWN AS LOTS 219A, 219B & J DP 36743 SHORTLAND PRECINCT)* AND LOT 1724 DP 216673

TELOPEA
PARRAMATTA LGA

APPLICANT: NSW LAND & HOUSING CORPORATION

October 2014

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1.0 INTRODUCTION

Application is made for modification to Major Project No. M09_0183, approved 29 August 2010, which granted project approval for Stage 1 of the *Telopea Urban Renewal Project: Shortland and Part Moffatts Precinct Redevelopment*.

Specifically the Stage 1 Project Approval encompassed:

- Demolition of five buildings on Shortland precinct and removal of trees;
- Construction of two 6 storeys buildings containing a total of 103 units, car parking, bicycle parking, landscaping and other services in the Shortland Precinct.
- Demolition of one building in the Moffatts precinct and removal of trees;
- Construction of a 7 storey building containing 49 apartments, car parking, bicycle parking, landscaping and other services in Moffatts Precinct; and
- Subdivision of Shortland Precinct.

The details of the subject site are as follows:
- Lot 101 DP 1169945 (previously known as Lots 219a, 219b & J DP 36743)
- Lot 1724 DP 216673

NSW Land and Housing Corporation now seeks the Minister's approval to modify the Stage 1 Project Approval in the following ways:

a) Deletion of Condition G1 and Commitment No's 5.1 & 5.2 of Section 2B of the Statement of Commitments.

b) Subdivision of Lot 1724 DP 216673 into two lots in order for Building J3, 15-17 Sturt Street, to be accommodated on its own Torrens tile lot in order for it to be vested to community housing provider, Hume Community Housing Association.

2.0 DESCRIPTION OF PROPOSED MODIFICATION

Approval is sought for the modification of Major Project No. 09_0183 – Stage 1 Project Approval. Details of the proposed modification are outlined below:

1. **Deletion of condition G1 and Commitment No's 5.1 & 5.2 of Section 2B of the Statement of Commitments**
   In response to the indeterminate nature of the future of the Telopea Urban Renewal Project approval is sought to modify the Determination to delete Condition G1 and Commitment No's 5.1 & 5.2 of Section 2B of the Statement of Commitments, see below:

   Extracts from Determination MP 09_0183:

G1 ***Building J3***

(a) Within two years of the commencement of construction of Building J3, No. 2 Evans Road and No. 13 Sturt Street (located immediately adjacent to Building J3) are to be demolished to ensure a satisfactory level of amenity is achieved for all occupants of Building J3.

(b) Notwithstanding a) above, the Proponent may seek the Director-General's approval to vary the two year timeframe identified in a), subject to the Proponent demonstrating that a satisfactory level of amenity can be achieved for the affected residents. Measures to be adopted, including consultation with affected residents, will need to be detailed in any request for a variation.

SCHEDULE 3

MP 09_0170
SHORTLAND AND PART MOFFATS PRECINCT REDEVELOPMENT, TELOPEA
PROPONENT'S STATEMENT OF COMMITMENTS

SECTION 2B - Project Specific – Moffatts Precinct

5. General Amenity

5.1 Within two years of commencement of construction of Building J3. Housing NSW will decant existing occupants from units within 10 metres of existing buildings directly fronting and sharing a common boundary with Building J3.

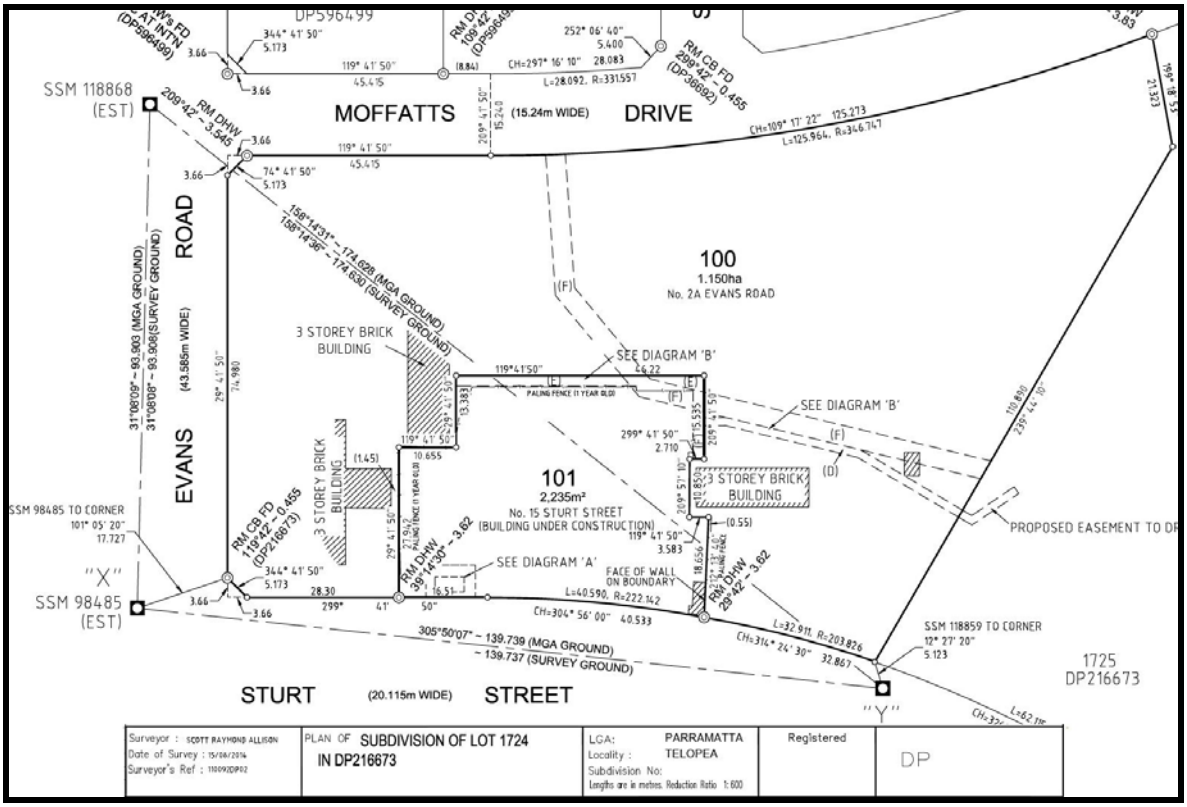
5.2 Housing NSW will endeavour, prior to the occupation of Building J3, to lodge project application/s for the redevelopment of part of Moffatts Precinct including the two buildings at 2 Evans Road, namely 'Building 1' (units 1-12) and 'Building 2' (units 13-18) and one building at 13 Sturt Street namely, 'Building 3' (units 65-70).

2. **Subdivision of Lot 1724 DP 216673 into two lots in order for Building J3, at 15-17 Sturt Street, to be accommodated on its own Torrens title lot.**
   Approval is also sought to modify the Stage 1 Project Approval in order to include the subdivision of Lot 1724 into 2 Torrens Title lots. The primary purpose of the proposed subdivision is administrative. It will permit Building J3 to be accommodated on its own lot, Proposed Lot 101, which can then be vested to community housing provider, Hume Community Housing Association. There is no subdivision work associated with the proposed activity.

   The particulars of each proposed lot is listed below:

Proposed Lot	Size
Lot 101*	2235m^2
Lot 100	11,500.0m^2
TOTAL AREA	13,735m^2 / 1.373Ha

* To be vested to Hume Community Housing Association



Extract from Proposed Plan of Subdivision

3.0 JUSTIFICATION FOR MODIFICATION

The land the subject of this modification, Moffatts Precinct, forms part of the Telopea Renewal Area which is a long term program expected to extend over 25 years. However, due to a variety of reasons progress of the project has stymied.

As part of this program there was an expectation that the tenants currently being housed in the buildings *(Buildings 1 & 2 - 2 Evans Road and Building 3 - 13 Sturt Street)* adjoining the recently constructed J3 Building *(15-17 Sturt Street)* would be relocated into subsequent stages of the project to allow for the existing buildings demolished/redeveloped.

However, as the progress of the project has halted there is no ability to relocate existing tenants to alternative accommodation either within or outside the project area as was originally anticipated. As such the retention of the existing buildings is now necessary.

If and when the project is recommenced, the Land and Housing Corporation still intends to proceed with the demolition and redevelopment of the buildings referred to in Condition G1. In the meantime, and in order to facilitate the vesting of 15-17 Sturt Street to community housing provider, Hume Community Housing Association, it is necessary to subdivide Lot 1724 into 2 lots. This will enable the recently constructed J3 Building at 15-17 Sturt Street to be accommodated on its own Torrens title lot.

The Amenity Report attached in Appendix A indicates that the best basis for Condition G1 and the associated Commitment No's 5.1 & 5.2 of Section 2B of the Statement of Commitments twill not be compromised with the retention of the existing buildings.

The fire report, *Alternative Solution Report*, by Defire (Appendix D) demonstrates that, subject to the fire protection of a number of windows within the buildings and the installation of self closing or automatic closing doors in one of the buildings, the proposed subdivision and retention of the existing buildings will comply with the requirements of the BCA.

4.0 CONCLUSION

This statement concludes that the Minister should be satisfied that the proposed modification will not give rise to any significant adverse environmental impacts and as such should be approved.

As the delegate for the Secretary Family & Community Services I consent to the making of this application:

Name: Daniel Ouma-Machio

Designation: Director Technical Services
NSW Land and Housing Corporation

Signature: Dan Ouma-Machio **Date:** 20.10.14

APPENDIX A:

Moffatts Apartments, Telopea: Amenity Report, dated 1 August 2014

ARCHITECTURE
INTERIOR ARCHITECTURE
URBAN DESIGN

MOFFATTS APARTMENTS, TELOPEA :: AMENITY REPORT

1 August 2014

Nominated Architect
Nicholas Turner 6695

Introduction
The following report has been prepared by TURNER for the Department of Family & Community Services in order to address condition G1 of the Planning Proposal approval by the Department of planning, number 09_0170 dated 29 August 2010.

TURNER were the original architects for the development, and the author of this report was the Project Architect for both the Project Application and subsequent documentation through to handover of the buildings.

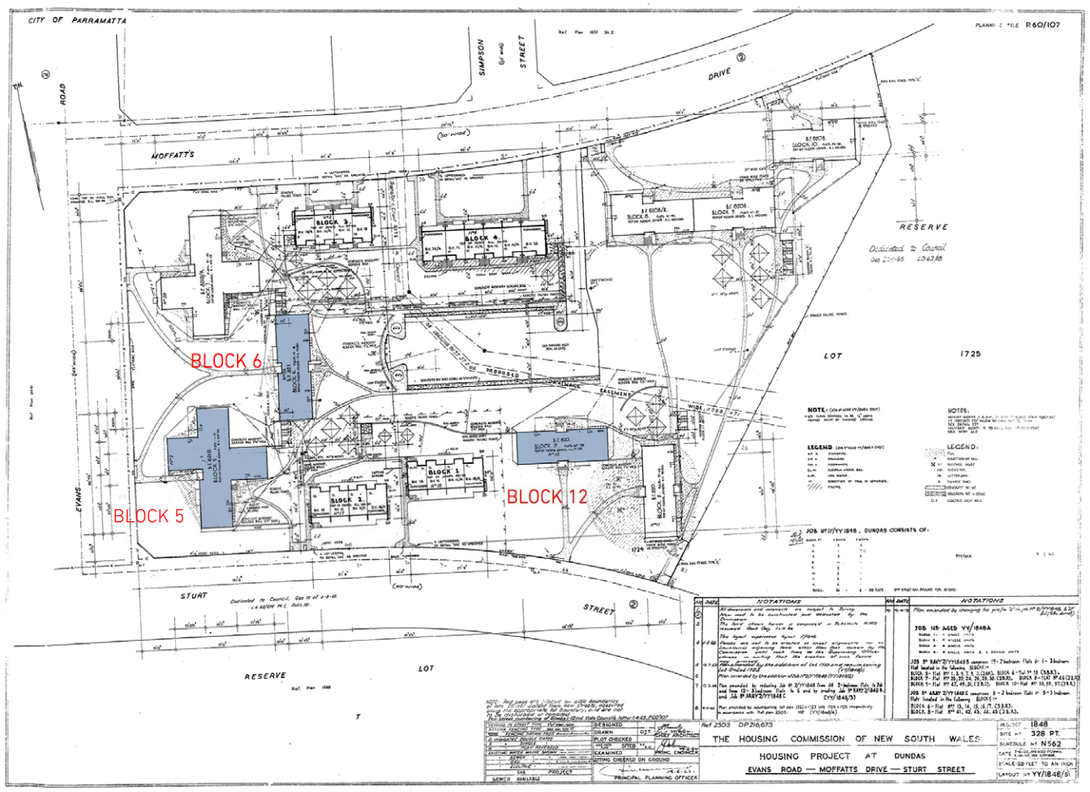
Building J3 referred to in the condition is known as Moffatts at 17 Sturt Street, Telopea NSW 2117. The condition states:

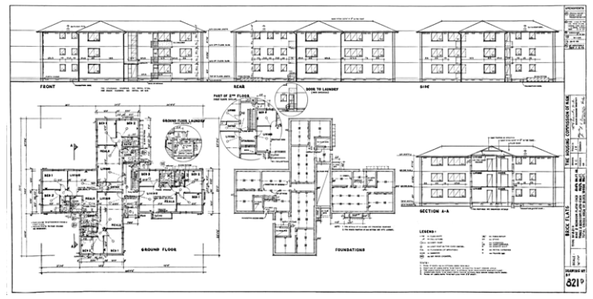
G1 Building J3

(a) Within two years of the commencement of construction of Building J3, No.2 Evans Road and No. 13 Sturt Street (located immediately adjacent to Building J3) are to be demolished to ensure a satisfactory level of amenity is achieved for all occupants of Building J3.
(b) Notwithstanding a) above, the Proponent may seek the Director-General's approval to vary the two year timeframe identified in a), subject to the Proponent demonstrating that a satisfactory level of amenity can be achieved for the affected residents. Measures to be adopted, including consultation with affected residents, will need to be detailed in any request for a variation.

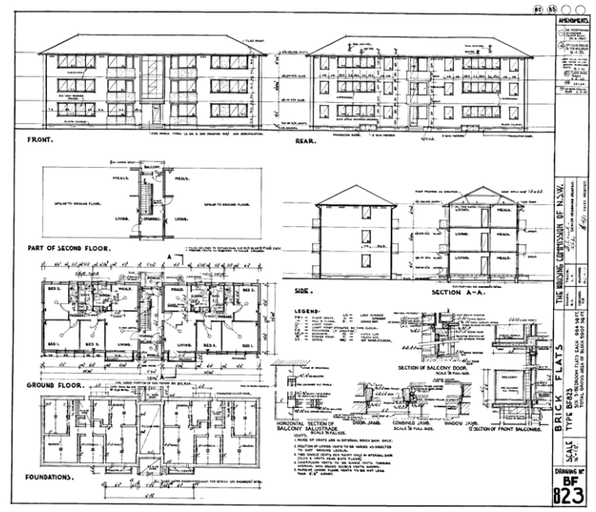
It is worth noting that the condition references the amenity of the new building, not the existing buildings, however this report will look at both sets of affected apartments.

There are two existing buildings to the west and one to the east that are in proximity to the new building. The plan below shows these as being buildings 5, 6 and 12.

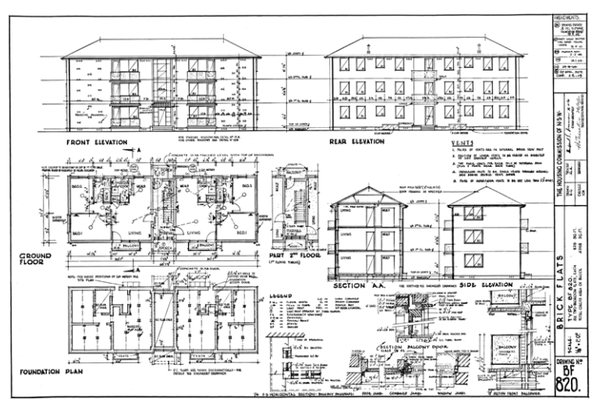




BLOCK 5



BLOCK 6

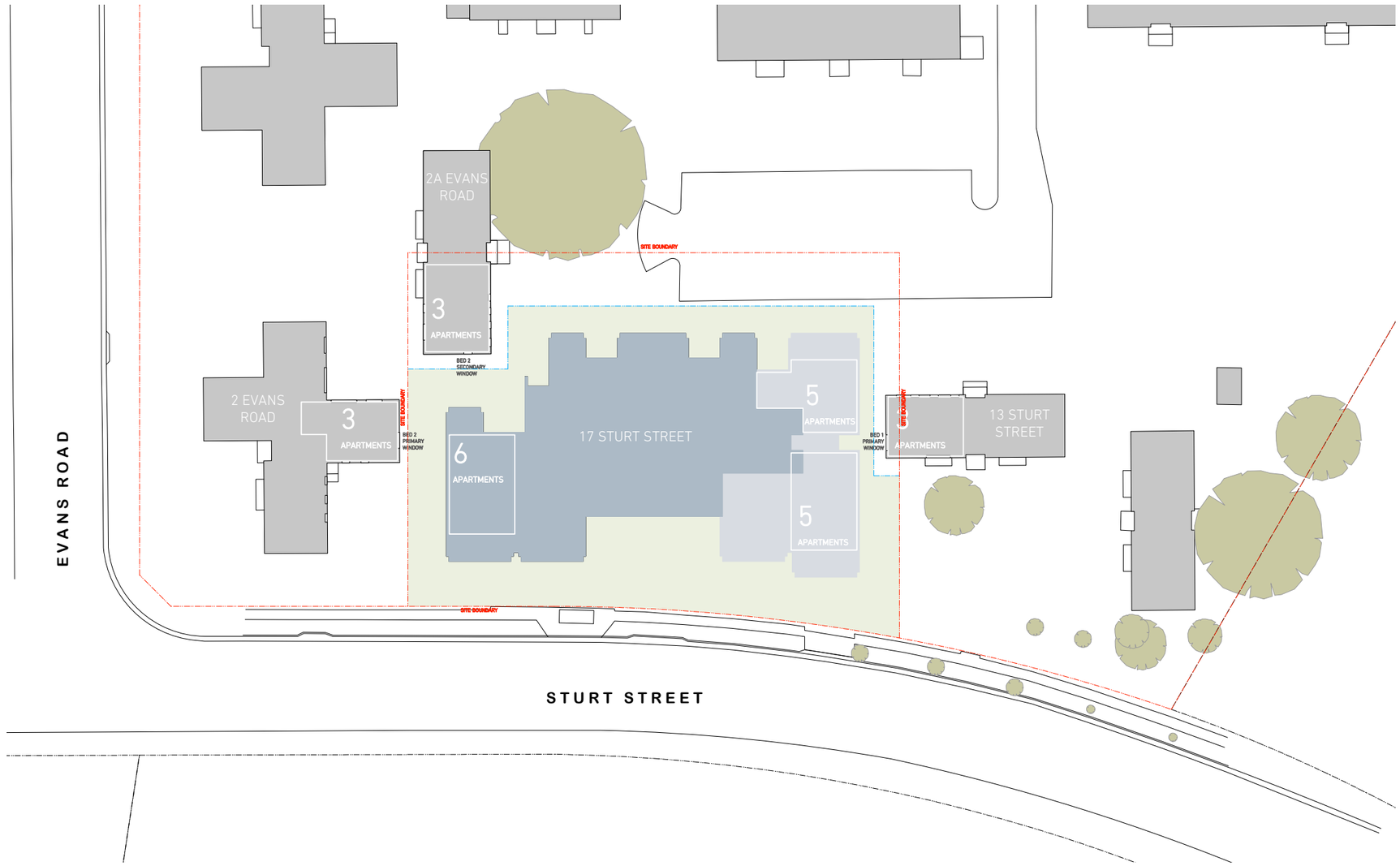


BLOCK 12

Current condition

Each of the three previously existing buildings is 3-storeys. The new building is typically 6-storeys, with 6 apartments to the west and two sets of 5 apartments to the east in proximity. The levels above 3-storeys are therefore unaffected by the previously existing buildings.

Following is an assessment of the amenity of the specific rooms in proximity to both the west and the east.



Nominated Architect
Nicholas Turner 6695

Western junction with 2 Evans Road

There are two conditions of proximity at the western end of the building. Each will be discussed separately.

CONDITION A

The apartment in Moffatts includes bedroom 1 of a 2-bed apartment. On this face of the building there are two small windows, both of which are secondary. Opposite this is bedroom 2 of the apartment in Block 5 that has its primary window facing towards Moffatts.

The distance between the buildings is approximately 5.25m.

Neither of the rooms in question is a living room, so the occupancy of the rooms is likely to be intermittent, and windows are likely to include treatments such as curtains or blinds. Therefore from a visual amenity viewpoint the disturbance between the two apartments is low, especially as one of the windows is secondary.

From an acoustic privacy point of view, as neither space includes a balcony, the effects of noise transmission is likely to be relatively low.

Daylight access in the Residential Flat Design Code incorporates standards for living rooms and private outdoor spaces. Neither of these spaces are affected in this situation.

CONDITION B

The apartment in Moffatts includes bedroom 1 of a 2-bed apartment. On this face of the building there is the primary glazing with a small balcony.

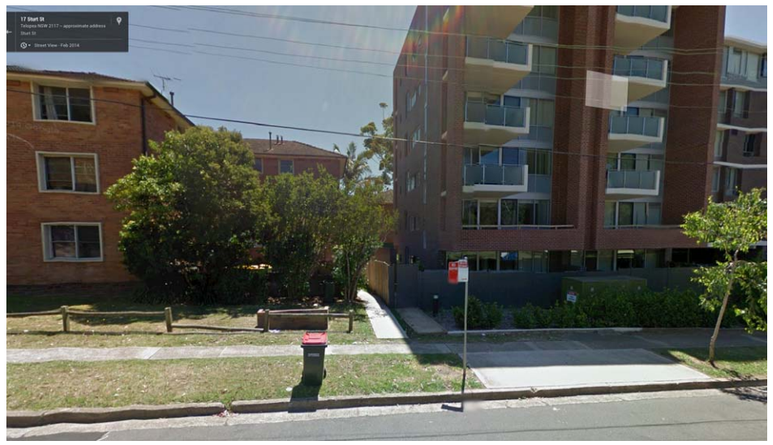
Opposite this is bedroom 2 of the apartment in Block 6 that has its secondary window facing towards Moffatts.

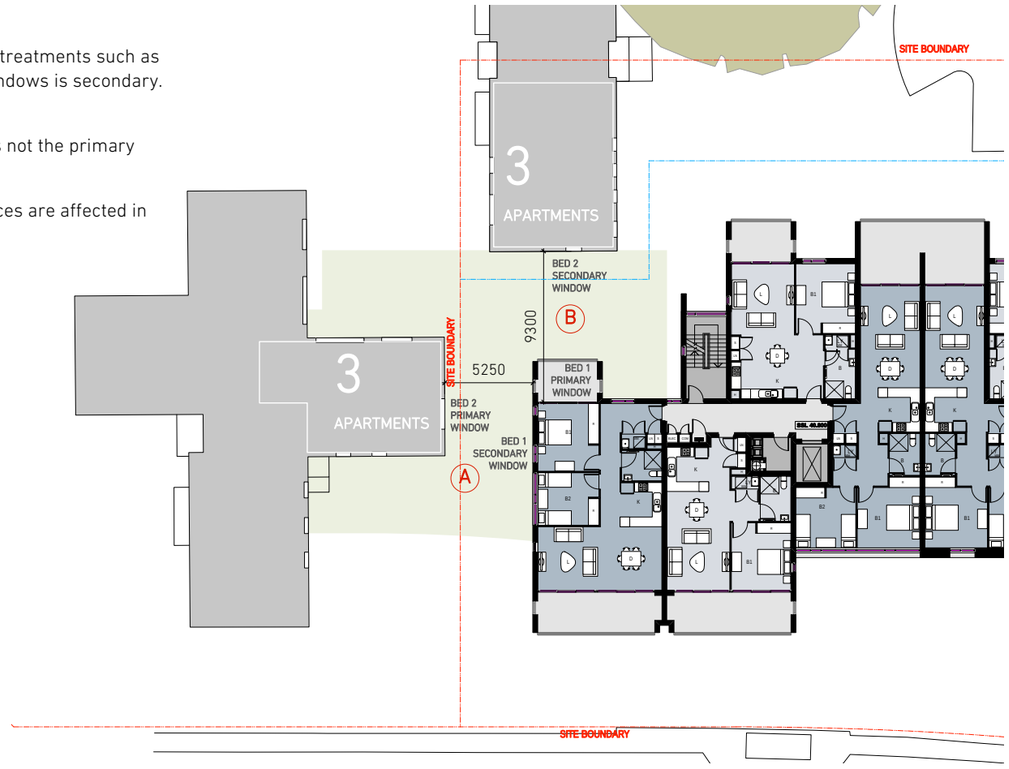
The distance between the buildings' glazing is approximately 9.3m.

Neither of the rooms in question is a living room, so the occupancy of the rooms is likely to be intermittent, and windows are likely to include treatments such as curtains or blinds. Therefore from a visual amenity viewpoint the disturbance between the two apartments is low, especially as one of the windows is secondary. The inclusion of a balcony also acts as a further layering between the neighbouring building and the glazing in Moffatts.

From an acoustic privacy point of view, the effects of noise transmission is likely to be relatively low as the balcony to Moffatts is small and is not the primary balcony for the apartment.

Daylight access in the Residential Flat Design Code incorporates standards for living rooms and private outdoor spaces. Neither of these spaces are affected in this situation.





Eastern junction with 13 Sturt Street

There is one condition of proximity at the eastern end of the building.

CONDITION C

The window in Moffatts is to the end of the lift lobby corridor. Opposite this is a bedroom 1 of the apartment in Block 12 that has its primary window facing towards Moffatts.

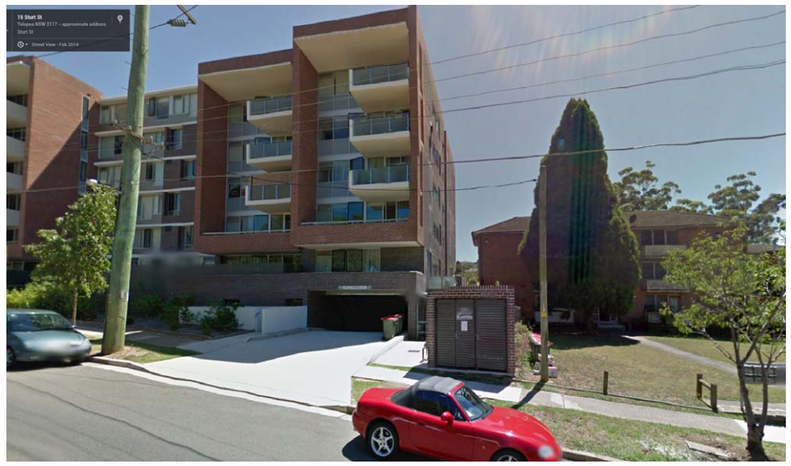
The distance between the buildings' glazing is approximately 5.5m.

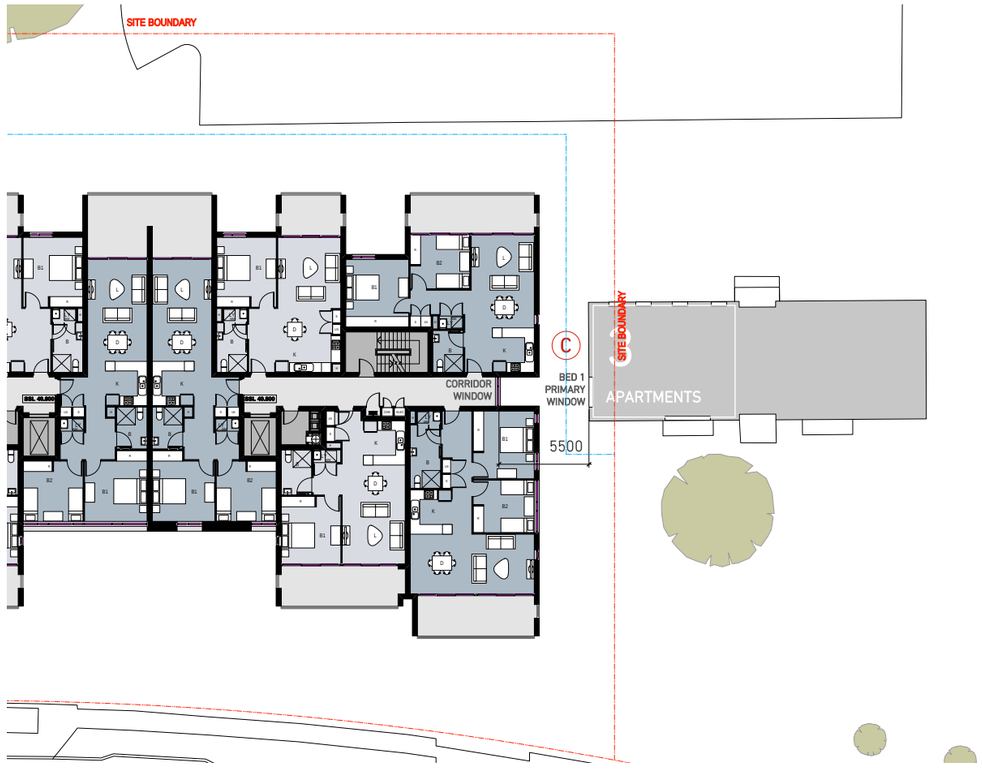
Neither of the spaces in question is a living room, so the occupancy of the rooms is likely to be intermittent, and the window to Block 12 is likely to include treatments such as curtains or blinds. Therefore from a visual amenity viewpoint the disturbance between the two spaces is low, especially as one of the windows is not to an apartment.

From an acoustic privacy point of view, as neither space includes a balcony, the effects of noise transmission is likely to be relatively low.

Daylight access in the Residential Flat Design Code incorporates standards for living rooms and private outdoor spaces. Neither of these spaces are affected in this situation.

The residents of Block 12 in the three affected apartments might be contacted to ascertain whether they have felt their privacy affected by the proximity of the corridor window, and if this is the case, a translucent film could be fixed to the surface of the corridor windows to mitigate this situation.





Nominated Architect
Nicholas Turner 6695

Conclusion

The analysis above reflects the care taken in the original design to ensure that no primary windows are facing each other, and that no contradictory room types are in proximity. In each of the cases there is minimum risk of a disturbance in visual and acoustic amenity, or the effects of overshadowing on living/balconies.

Other windows to both the west and east of Moffatts are not in direct proximity to the neighbouring buildings' fenestration, and their amenity is therefore not affected.

The layouts of the apartments in Moffatts were designed such that they maximise the solar access to the living rooms and balconies, with no detrimental affect from the existing neighbouring buildings. Solar access is therefore not affected by the retention of the existing buildings.

We also believe that there are no issues in relation to acoustic and visual privacy, as Moffatts was designed to mitigate the proximity issues that might otherwise cause disturbances.

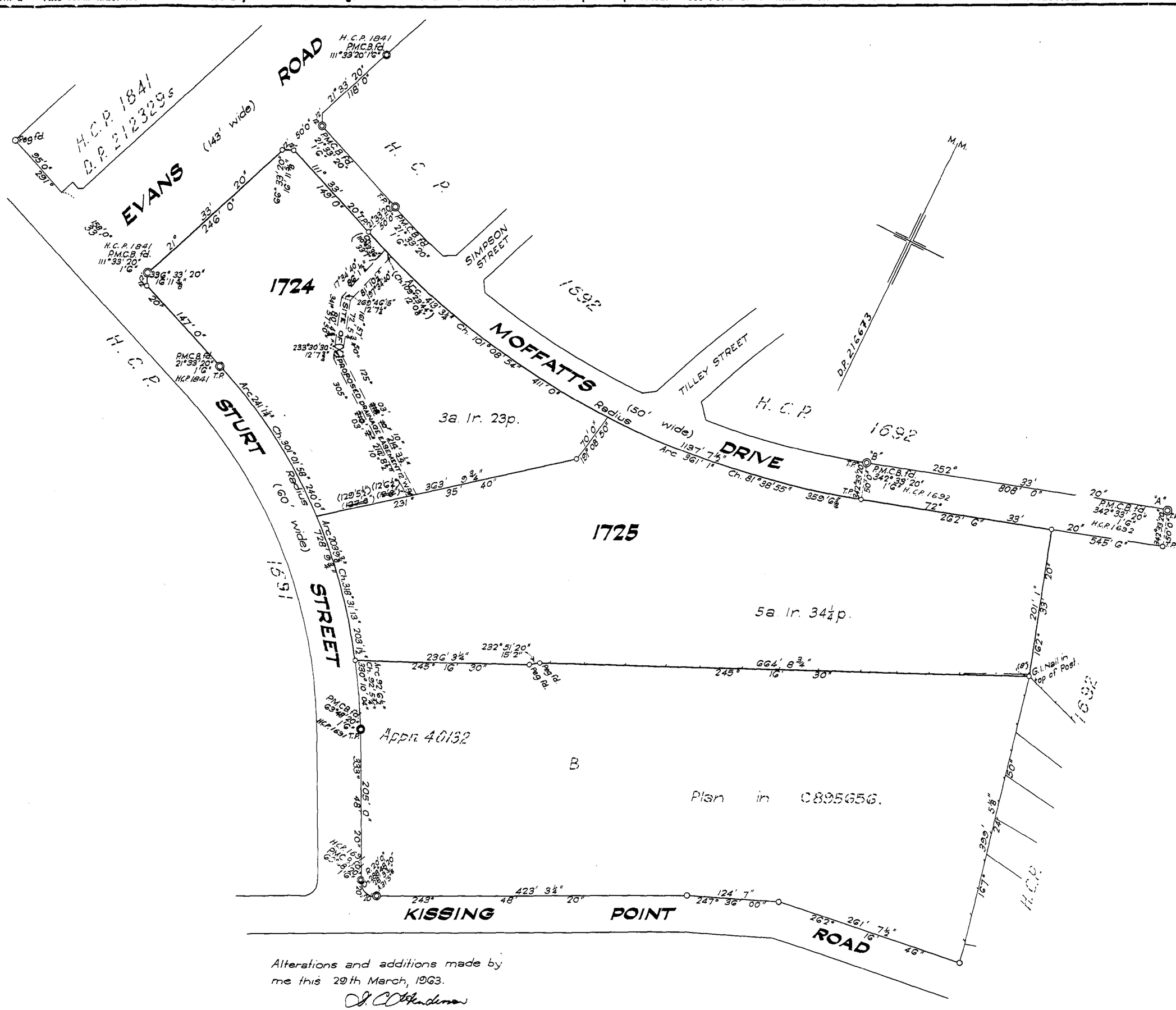
We therefore see no reason why the two-year timeframe for demolition of the existing buildings should not either be extended, or that the existing structures be permitted to be retained.

Nominated Architect
Nicholas Turner 6695

APPENDIX B:

Current Deposited Plan 216673

Form 2 — This form must NOT be used where any Dedication, Drainage Reserve or Public Garden and Recreation Space is provided. — See Form 3. WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION.



M.P.D.

DP216673 (E)

Registered: 31/1/63

C.A.:

Title System: Torrens

Purpose: Subdivision

Ref. Map: Dundas Valley Project

Last Plan " " "

OFFICE USE ONLY.

PLAN OF

subdivision of part of land in C. of T. Vol. 7700 Fol. 205.

Scale: 100 Feet to an inch

~~Mun. Shire~~

City: Parramatta

Locality: Dundas

Parish: Field of Mars

County: Cumberland.

I, Donald Clifton Henderson

of T.S. McKeon, 13 Bligh St. Sydney

a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan is accurate and has been made * (1) by me (2) ~~under my immediate supervision~~ in accordance with the Survey Practice Regulations, 1933, and was completed on †30th July 1962.

Signature: D. C. Henderson

Surveyor registered under Surveyors Act, 1929, as amended, Datum Line of Azimuth. A–B

Statements of Proposed Easements.

It is intended to create an easement for drainage over the land shown as site of proposed drainage easement 12 feet wide in Lot 1724 in favour of the Council of the City of Parramatta.

Approved by Council. I hereby certify that the requirements of the Local Government Act, 1919 (other than the requirements for registration of plans), have been complied with by the applicant in relation to the proposed subdivision set out herein.

Subdivision No. ..... Date .....

Council Clerk .....

WARNING. Plan Drawing only to appear in this space.

* Strike out either (1) or (2). † Insert date of survey.

WARNING. Plan Drawing only to appear in this space.

1745 S 328 1 YY/1818

APPENDIX C:

Proposed Plan of Subdivision

PLAN FORM 6 (2013) **WARNING: Creasing or folding will lead to rejection**

DEPOSITED PLAN ADMINISTRATION SHEET

Office Use Only

Registered:

Title System:

Purpose:

Office Use Only

PLAN OF SUBDIVISION OF LOT 1724 IN DP216673

LGA: PARRAMATTA

Locality: TELOPEA

Parish: FIELD OF MARS

County: CUMBERLAND

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the land shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

*Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of s.109J of the *Environmental Planning and Assessment Act 1979* have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature: .....

Accreditation number: .....

Consent Authority: .....

Date of endorsement: .....

Subdivision Certificate number: .....

File number: .....

*Strike through if inapplicable.

Survey Certificate

I, SCOTT RAYMOND ALLISON

of CRUX SURVEYING PTY LTD, PO BOX 391 MIRANDA 1490

a surveyor registered under the *Surveying and Spatial Information Act 2012*, certify that:

*(a).....

The land shown in the plan was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on 15/08/2014

~~*(b)..... The part of the land shown in the plan (*being/*excluding ^ ....) was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on,..... the part not surveyed was compiled in accordance with that Regulation.~~

~~*(c) The land shown in this plan was compiled in accordance with the *Surveying and Spatial Information Regulation 2012.*~~

Signature: .....Dated: 15/08/2014

Surveyor ID: 8501

Datum Line: X - Y

Type: *Urban/*~~Rural~~

The terrain is *Level-Undulating / ~~*Steep-Mountainous~~.

Statements of intention to dedicate public roads create public reserves and drainage reserves, acquire/resume land.

Plans used in the preparation of survey/compilation.

DP36692, DP216673, DP227861, DP596499

If space is insufficient continue on PLAN FORM 6A

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

Surveyor's Reference: 110092DP02

PLAN FORM 6A (2012) **WARNING: Creasing or folding will lead to rejection**

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 2 of 2 sheet(s)

Office Use Only

Registered:

Office Use Only

PLAN OF SUBDIVISION OF LOT 1724 IN DP216673

This sheet is for the provision of the following information as required:

- A schedule of lots and addresses - See 60(c) *SSI Regulation 2012*
- Statements of intention to create and release affecting interests in accordance with section 88B *Conveyancing Act 1919*
- Signatures and seals- see 195D *Conveyancing Act 1919*
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Subdivision Certificate number: .....

Date of Endorsement: .....

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919, AS AMENDED IT IS INTENDED TO CREATE:

1. EASEMENT FOR PADMOUNT SUBSTATION 5.5m WIDE (A)
2. RESTRICTION ON THE USE OF LAND (B)
3. EASEMENT FOR UNDERGROUND CABLES 1m WIDE (C)
4. EASEMENT TO DRAIN WATER 1.5m WIDE (D)
5. RIGHT OF CARRIAGEWAY VARIABLE WIDTH (E)

SCHEDULE OF LOTS AND ADDRESSES:

Lot 100 – No. 2A Evans Road, Telopea

Lot 101 – No. 15 Sturt Street, Telopea

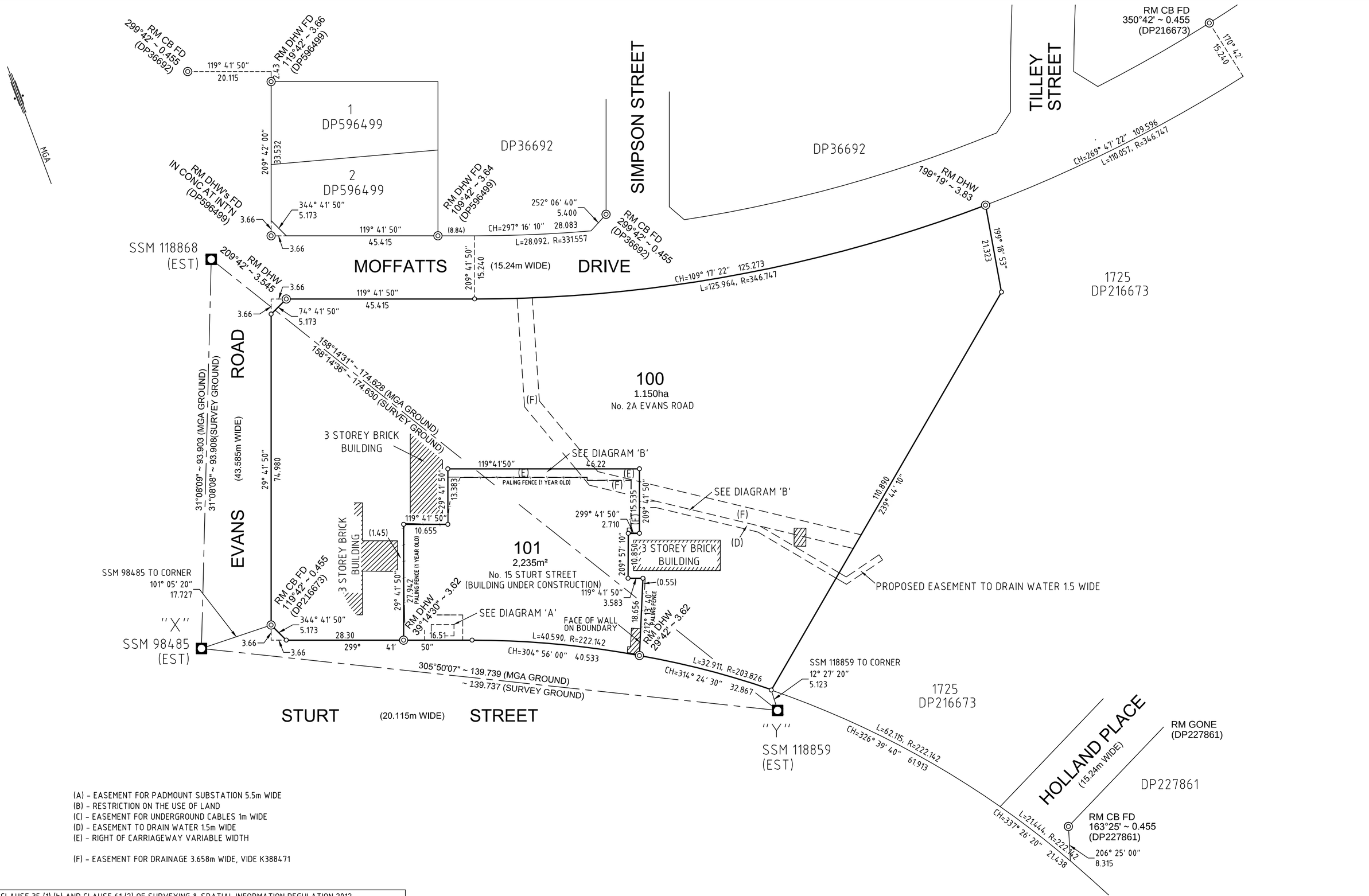
SIGNED BY ME, STEPHEN JOHN RUGLESS AS A DELAGATE OF THE NEW SOUTH WALES LAND AND HOUSING CORPORATION AND I HEREBY CERTIFY THAT I HAVE NO NOTICE OF REVOCATION OF SUCH DELEGATION.)

……

STEPHEN JOHN RUGLESS

If space is insufficient use additional annexure sheet

Surveyor's Reference: 110092DP02



(A) – EASEMENT FOR PADMOUNT SUBSTATION 5.5m WIDE
(B) – RESTRICTION ON THE USE OF LAND
(C) – EASEMENT FOR UNDERGROUND CABLES 1m WIDE
(D) – EASEMENT TO DRAIN WATER 1.5m WIDE
(E) – RIGHT OF CARRIAGEWAY VARIABLE WIDTH

(F) – EASEMENT FOR DRAINAGE 3.658m WIDE, VIDE K388471

CLAUSE 35 (1) (b) AND CLAUSE 61 (2) OF SURVEYING & SPATIAL INFORMATION REGULATION 2012

MARK	MGA EASTING	MGA NORTHING	ORDER	CLASS	HEIGHT	CLASS	METHOD	ORIGIN
SSM 98485	318 984.125	6 258 664.492	B	U	–	–	CADASTRAL TRAVERSE	SCIMS
SSM 118859	319 097.411	6 258 582.681	B	U	–	–	CADASTRAL TRAVERSE	SCIMS
SSM 118867	319 032.679	6 258 744.867	B	U	–	–	CADASTRAL TRAVERSE	SCIMS

COMBINED SCALE FACTOR 0.999995 ZONE 56

M.G.A CO-ORDINATES ADOPTED FROM S.C.I.M.S AS AT 25 AUGUST 2014

Surveyor : SCOTT RAYMOND ALLISON
Date of Survey : 15/08/2014
Surveyor's Ref : 110092DP02

PLAN OF **SUBDIVISION OF LOT 1724 IN DP216673**

LGA: PARRAMATTA
Locality : TELOPEA
Subdivision No:
Lengths are in metres. Reduction Ratio 1: 600

Registered

DP

00 10 20 30 40 50 Table of mm 90 100 110 120 130 140

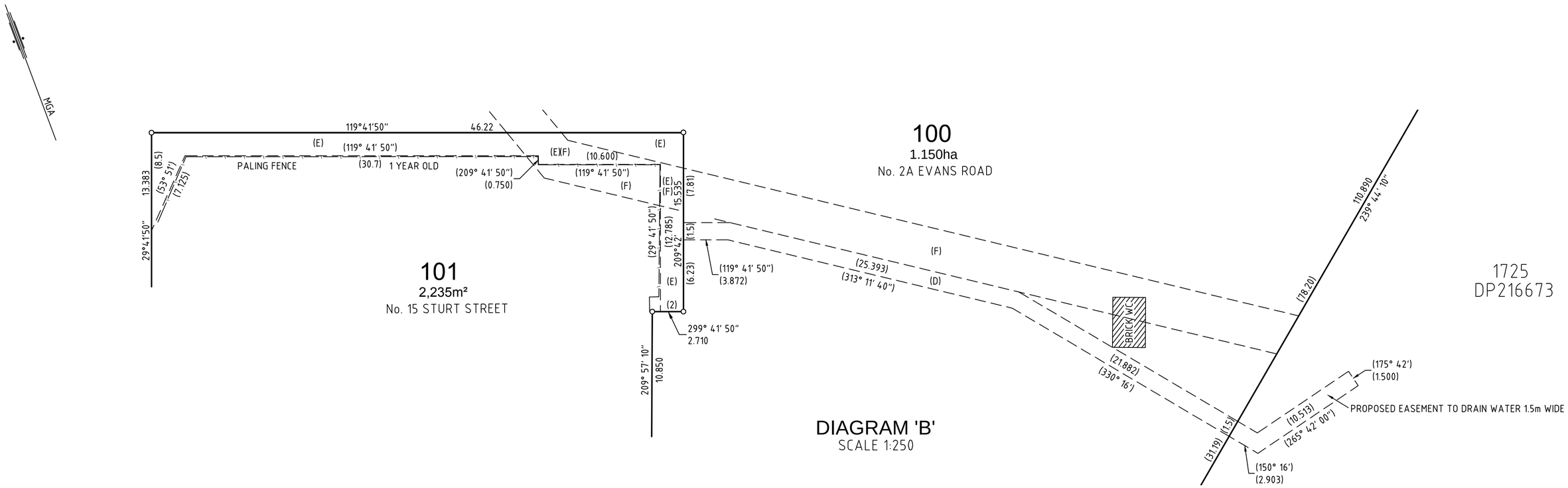


DIAGRAM 'B'
SCALE 1:250

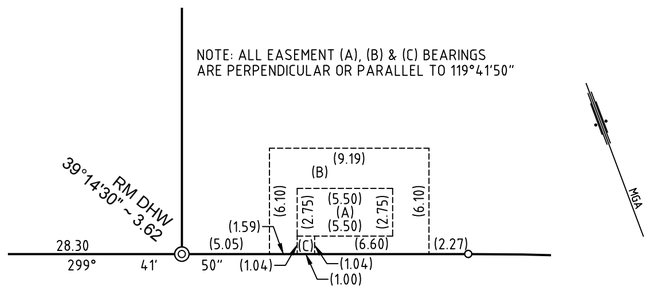


DIAGRAM 'A'
SCALE 1:250

(A) - EASEMENT FOR PADMOUNT SUBSTATION 5.5m WIDE
(B) - RESTRICTION ON THE USE OF LAND
(C) - EASEMENT FOR UNDERGROUND CABLES 1m WIDE
(D) - EASEMENT TO DRAIN WATER 1.5m WIDE
(E) - RIGHT OF CARRIAGEWAY VARIABLE WIDTH

(F) - EASEMENT FOR DRAINAGE 3.658m WIDE, VIDE K388471

Surveyor : SCOTT RAYMOND ALLISON Date of Survey : 15/08/2014 Surveyor's Ref : 110092DP02	PLAN OF **SUBDIVISION OF LOT 1724 IN DP216673**	LGA: PARRAMATTA Locality : TELOPEA Subdivision No: Lengths are in metres. Reduction Ratio 1: 600	Registered	DP

00 | 10 | 20 | 30 | 40 | 50 | Table of mm | 90 | 100 | 110 | 120 | 130 | 140

APPENDIX D:

Alternative (Fire) Solution Report

Defire
Innovative fire safety

Australia's leading fire safety engineering consultancy

Alternative solution report

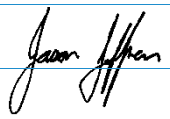
Department of Family and Community Services

13-17 Sturt Street, 2A Evans Road, Telopea

SY140409

Revision R1.0 | 16 October 2014

Amendment schedule

Version	Date				
R1.0	16/10/2014	Reason for issue	Report issued to Department of Family and Community Services.		
			Prepared by	Reviewed by	Approved by
		Name	Quentin Li	Aaron Li	Jason Jeffress
		Signature			
		Reason for issue			
			Prepared by	Reviewed by	Approved by
		Name			
		Signature			
		Reason for issue			
			Prepared by	Reviewed by	Approved by
		Name			
		Signature			
		Reason for issue			
			Prepared by	Reviewed by	Approved by
		Name			
		Signature			

Executive summary

This alternative solution report documents the findings of a fire safety engineering assessment undertaken to determine whether the proposed subdivision of 2A Evans Road, Telopea, complies with the relevant performance requirements of the National Construction Code Series 2014 Volume One – Building Code of Australia (BCA). Defire undertook the assessment in accordance with the International Fire Engineering Guidelines (IFEG) at the request of the Department of Family and Community Services (FACS).

This project comprises four buildings on the same allotment of 2A Evans Road. The following buildings are covered by this alternative solution report:

- 13 Sturt Street, Telopea
- 15 Sturt Street, Telopea
- 17 Sturt Street, Telopea
- 2A Evans Road, Telopea

The three buildings located at 13 and 17 Sturt Street, and 2A Evans Road, are three storey residential buildings owned and operated by the Department of FACS. 15 Sturt Street is a newer seven storey residential building located above a common single storey basement carpark, and is proposed to be separated from the other buildings by subdivision boundaries.

The design of the building includes areas which do not comply with the deemed-to-satisfy (DTS) provisions of the BCA. Table 1 describes the BCA requirements associated with the alternative solutions.

No	Description of alternative solutions	DTS provision	Performance requirements (A0.10)	Method of meeting performance requirements	Assessment method
1.	Openings on the residential levels that located within 3m of the site boundaries are not protected in accordance with clause C3.4 of the BCA	Clauses C3.2 and C3.4	CP2	Complies with performance requirements A0.5(b)(i)	Verification method CV1 A0.9(b)(i)
2.	Carpark louvre openings located within 3m of the site boundary are not proposed to be protected.	Clauses C3.2 and C3.4	CP2	Complies with performance requirements A0.5(b)(i)	Verification method A0.9(b)(ii)

Table 1 BCA requirements associated with the alternative solutions

The building at 15 Sturt Street has been the subject of previous fire safety engineering assessments by Defire. The assessments documented within this report are not considered to impact upon and be affected by the findings of the previous alternative solution reports.

The fire safety engineering assessment undertaken found that the design of the building achieves compliance with the relevant performance requirements of the BCA, subject to the following recommendations:

- This report and the fire safety measures listed in section 5 must be implemented into the design and identified on the fire safety schedule for the building. They must be maintained and certified in accordance with the Environmental Planning and Assessment Regulations 2000 and relevant Australian standards.
- If there are building alterations or additions, a change in use or changes to the fire safety system in the future, a reassessment will be needed to verify consistency with the assessment contained in this report.

Contents

1. Introduction

This alternative solution report documents the findings of a fire safety engineering assessment undertaken to determine whether the proposed subdivision of 2A Evans Road, Telopea, complies with the relevant performance requirements of the National Construction Code Series 2014 Volume One – BCA[1]. Defire undertook the assessment in accordance with the IFEG[2] at the request of the Department of FACS.

2. Fire engineering brief

The purpose of the fire engineering brief (FEB) is to consult with the relevant stakeholders to define the scope of the project, to agree upon the objectives, fire safety measures, methods of analysis and acceptance criteria for the alternative solutions. The IFEG states that the scope of the project and the method by which it will receive regulatory approval dictates the extent of the FEB process required.

The proposed alternative solution is considered to be a simple departure from the deemed-to-satisfy (DTS) provisions of the BCA. On this basis, the FEB was conducted by way of discussions and correspondence with Rohan Defries of Defire, Paul Hunt and Kristie Vaughan of the Department of FACS. The following key points were discussed:

- Parts of the buildings on 13, 15 and 17 Sturt Street, and 2A Evans Road are located within 3m of the proposed subdivision boundaries.
- Openings W36, W37 and W38 in the northern elevation of 13 Sturt Street that are located 2.6m perpendicular from the proposed subdivision boundaries are not required to be protected.
- Louvre openings in the carpark within 3m of the proposed subdivision boundaries are not required to be protected.

At the conclusion of the discussion it was agreed that the proposed design and alternative solutions were suitable for detailed analysis. The relevant stakeholders identified for this project are listed in Table 2.

Name	Role	Organisation	Contact details
Paul Hunt	Client	Department of FACS	02 8753 9083
Kristie Vaughan	Senior Planner	Department of FACS	02 9354 1845
Quentin Li	Fire safety engineer	Defire	02 9211 4333
Jason Jeffress	Accredited fire safety engineer C10 – BPB 197	Defire	02 9211 4333

Table 2 Stakeholders

[1] National Construction Code Series 2014, Volume One – Building Code of Australia, Australian Building Codes Board, Australia.
[2] International Fire Engineering Guidelines – Edition 2005, Australian Building Codes Board, Australia.

3. Description of the building and alternative solutions

3.1 Building description

This project comprises four buildings on the same allotment of 2A Evans Road. The following buildings are covered by this alternative solution report:

- 13 Sturt Street, Telopea
- 15 Sturt Street, Telopea
- 17 Sturt Street, Telopea
- 2A Evans Road, Telopea

The three buildings located at 13 and 17 Sturt Street, and 2A Evans Road, are three storey residential buildings owned and operated by the Department of FACS. 15 Sturt Street is a newer seven storey residential building located above a common single storey basement carpark, and is proposed to be separated from the other buildings by subdivision boundaries as shown in Figure 1.

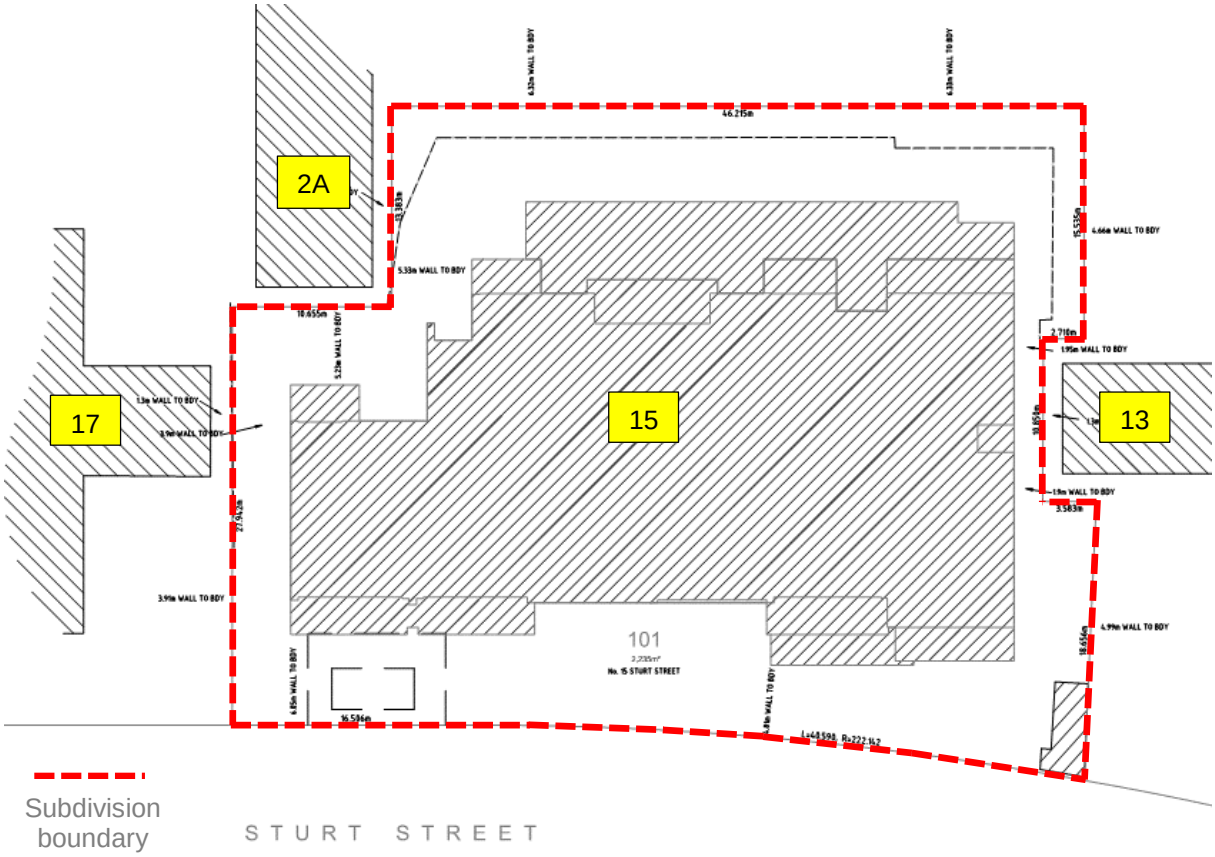


Figure 1 Building locations and proposed subdivision boundaries

A description of the main characteristics of the buildings for the purpose of determining compliance with the BCA is given in Table 3. The proposed use and classification of the buildings or part in accordance with clause A3.2 of the BCA is described in Table 4.

Characteristic	BCA clause	15 Sturt Street	13, 17 Sturt Street & 2A Evans Road
		Description	
Effective height	A1.1	Less than 25m	Less than 12m
Type of construction required	C1.1	Type A	Type A
Rise in storeys	C1.2	Six	Three
Levels contained	-	Seven	Three

Table 3 Main building characteristics

Building	Part of building	Use	Classification (A3.2)
15 Sturt Street	Basement	Carpark	Class 7a
	Ground floor to level 5	Residential	Class 2
13, 17 Sturt Street & 2A Evans Road	Ground floor to level 2	Residential	Class 2

Table 4 Use and classification

3.2 Occupant characteristics

The characteristics of the occupants expected to be in the building are listed in Table 5.

Characteristic	Description
Familiarity	Residential – Occupants in the residential sole-occupancy units are expected to be long-term residents who are familiar with the building layout and exit locations. Carpark – Occupants are mainly expected to be associated with the residential portion of 15 Sturt Street and be within the carpark for short periods.
Awareness	Residential – Occupants may be asleep at the time of a fire which could delay their response time for evacuation. Carpark – Occupants are expected to be awake and alert to a potential emergency event such as a fire in the building.
Mobility	Occupants are assumed to have the same level of mobility as the general population. This may include a limited proportion of mobility impaired occupants. These occupants may require crutches, a wheelchair or similar to evacuate on their own or need assistance from other occupants.
Age	Occupants of all ages may be present within the building.
Language	Although occupants may have English as their second language, they are expected to understand signs and verbal instructions in English to the degree necessary to not adversely impact upon evacuation.
Occupant load	The population has not been calculated because it is not directly used for the assessment.

Table 5 Occupant characteristics

3.3 Alternative solutions

The design of the buildings includes areas that do not comply with the DTS provisions of the BCA. We intend to use a performance-based fire safety engineering approach to develop alternative solutions to the DTS provisions of the BCA. Table 6 describes the BCA requirements associated with the alternative solutions.

No	Description of alternative solutions	DTS provision	Performance requirements (A0.10)	Method of meeting performance requirements	Assessment method
1.	Openings on the residential levels that located within 3m of the site boundaries are not protected in accordance with clause C3.4 of the BCA	Clauses C3.2 and C3.4	CP2	Complies with performance requirements A0.5(b)(i)	Verification method CV1 A0.9(b)(i)
2.	Carpark louvre openings located within 3m of the site boundary are not proposed to be protected.	Clauses C3.2 and C3.4	CP2	Complies with performance requirements A0.5(b)(i)	Verification method A0.9(b)(ii)

Table 6 BCA requirements associated with the alternative solutions

The building at 15 Sturt Street has been the subject of previous fire safety engineering assessments by Defire. Table 7 describes the BCA requirements associated with the previous alternative solutions. The assessments documented within this report are not considered to impact upon and be affected by the findings of the previous alternative solution report, with the exception of alternative solution 1 in Table 7 which has been superseded by the assessment provided in this report.

No	Description of alternative solutions	DTS provision	Performance requirements
15-17 Sturt Street, Telopea, SY100090 R1.2 dated 8 March 2012			
1.	No protection is required for openings in the external walls which are greater than 3.2m of the adjoining buildings.	Clause C3.2	CP2
2.	Travel distance to a single stair or point of choice on residential floors is up to 8m in lieu of 6m.	Clause D1.4	DP4
3.	Fire-isolated stairway 1 discharges into a covered area that is less than 3m in height and less than 1/3 perimeter.	Clause D1.7	CP2, DP5 and E2.2
4.	The fire hydrant pumpset enclosure and the fire hydrant booster assembly are located at distances from the external wall of the building less than prescribed by AS2419.1-2005.	Clause E1.3 and AS2419.1-2005	EP1.3

Table 7 Previously addressed alternative solutions

4. Scope, objective and assumptions

4.1 Scope and objective

- The scope of this report is limited to the alternative solutions described in section 3.3.
- The objective of this report is to demonstrate compliance with the fire safety aspects of the performance requirements of the BCA. Matters such as property protection (other than protection of adjoining property), business interruption, public perception, environmental impacts and broader community issues – such as loss of a major employer and impact on tourism – have not been considered as they are outside the scope of the BCA.
- This report considers single point arson as a source of ignition. Arson involving accelerants or multiple ignition sources is not considered in this assessment as it is outside the scope of the BCA.
- The scope of our works is limited to considering evacuation and fire safety issues for people with disabilities to the same degree as the DTS provisions of the BCA. Specifically, consideration of evacuation from the building by people with disabilities under the provisions of the Disability Discrimination Act 1992 is excluded.
- If there are building alterations or additions, a change in use or changes to the fire safety systems in the future, a reassessment will be needed to verify consistency with the assessment in this report.
- The data, methodologies, calculations and conclusions documented within this report specifically relate to the buildings and must not be used for any other purpose.
- The documentation that forms the basis for this report is listed within 6.6.1.
- This report has been prepared based upon information provided by others. Defire has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated into this report as a result.

4.2 Assumptions

- The existing buildings comply with the applicable building standard at the time of construction. All new works comply with the current DTS provisions of the BCA except for the specific alternative solutions described within section 3.3.
- All of the fire safety systems are assumed to be designed, installed and operate in accordance with the appropriate Australian standards, other design codes, legislation and regulations relevant to the project unless specifically stated otherwise.
- For a satisfactory level of fire safety to be achieved, regular testing and maintenance of all fire safety systems and measures, including management-in-use systems, is essential and is assumed in the conclusion of this assessment.

5. Fire safety measures

The fire safety measures required as part of the alternative solution are:

5.1 General

1. The existing buildings are understood to comply with the applicable building standards at the time of construction. All new works will comply with the current DTS provisions of the BCA unless specifically mentioned. This section does not provide a comprehensive list of fire safety measures. The fire safety measures listed within this section relate only to the alternative solutions. The fire safety measures must be read in conjunction with the applicable building standards at the time of construction and/or the DTS provisions of the BCA.
2. This report and the requirements listed in this section must be implemented into the design and identified on the fire safety schedule for the buildings. They must be maintained and certified in accordance with the Environmental Planning and Assessment Regulations 2000 and relevant Australian standards.

5.2 Protection of openings

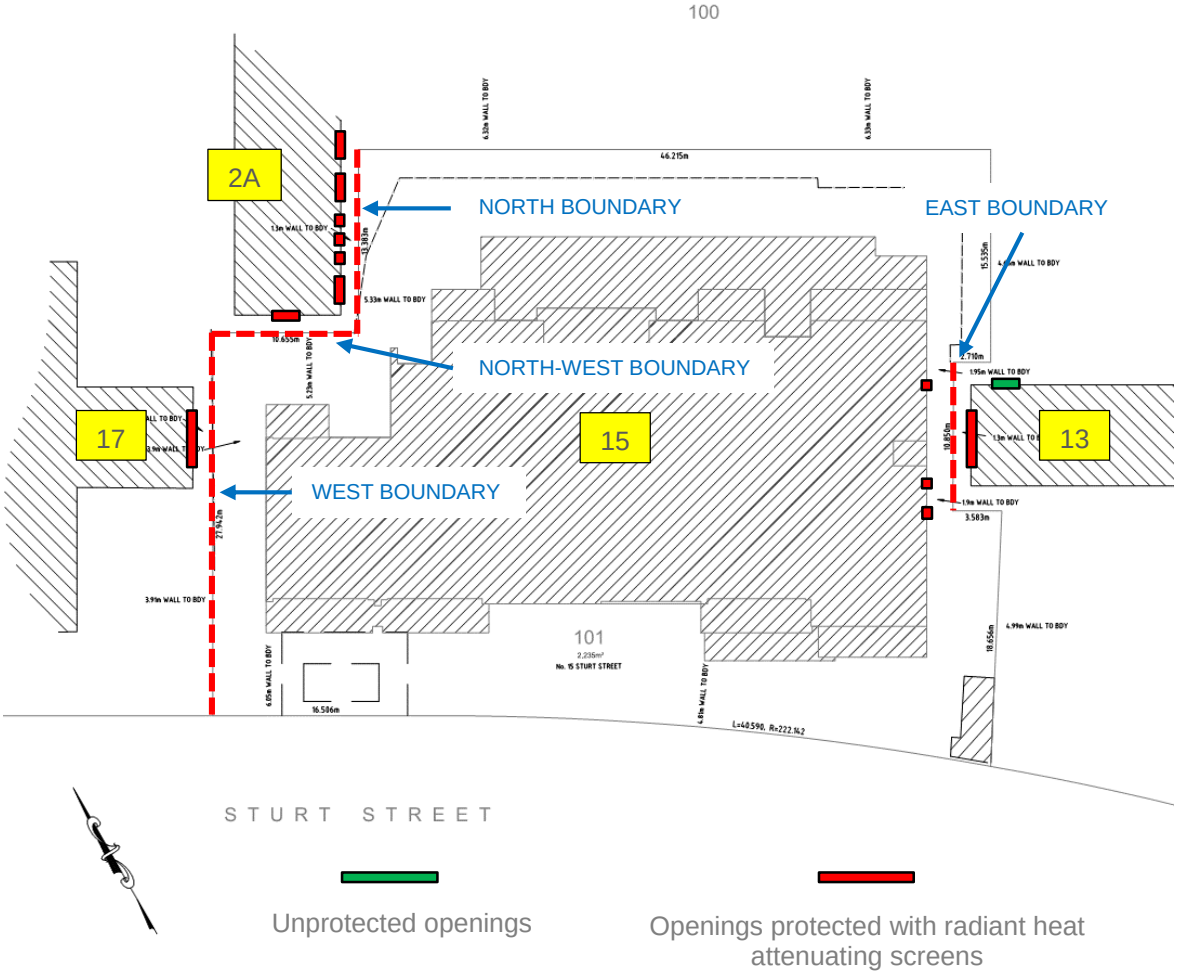


Figure 2 Openings within 3m of subdivision boundaries

3. The openings described in Table 8 and shown in Figure 3 to Figure 6 must be protected in accordance with clause C3.4 of the BCA or with Crimsafe/Centra radiant heat attenuation screens – or equivalent – with the following characteristics:

   a. Material – 304 stainless steel.

   b. Wire diameter – 0.9mm.

   c. Weave characteristics – 10x10 weave, 10 strands per inch (394 wires per metre).

   d. Opening ratio – 42%.

   e. Finish – black polyester powder coating.

   f. The screens must be mechanically fastened directly into the fire rated wall – or to 40mm x 40mm x 3mm thick steel angles which in turn are secured to the fire rated external wall – by steel screws. The steel fixing screws on every screen must go through the frame, the stainless steel mesh, the screw clamp and then into steel angle / wall. Other fixing methods must be reviewed and approved by Defire prior installation.

Building	No.	Height (m)	Width (m)	Distance of closest point to boundary (m)	Boundary exposed to
17	W1,W2,W3	1.4	2.0	1.3	West
2A, south face	W4,W5	1.4	0.95	1.3	North-west
2A, east face	W6-W11	1.4	0.95	1.3	North
2A, east face	W12-W20	1.15	0.9	1.3	North
13, west face	W21-W23	1.4	2.0	1.3	East
15	W24-W25	1.9	1.09	1.9	East
15	W26-W30	0.6	0.61	1.9	East
15	W31-W35	2.83	0.61	1.95	East
2A, east face	DRW1-DRW3	1.4	1.0	1.3	North

Table 8 Openings requiring protection with radiant heat attenuating screens

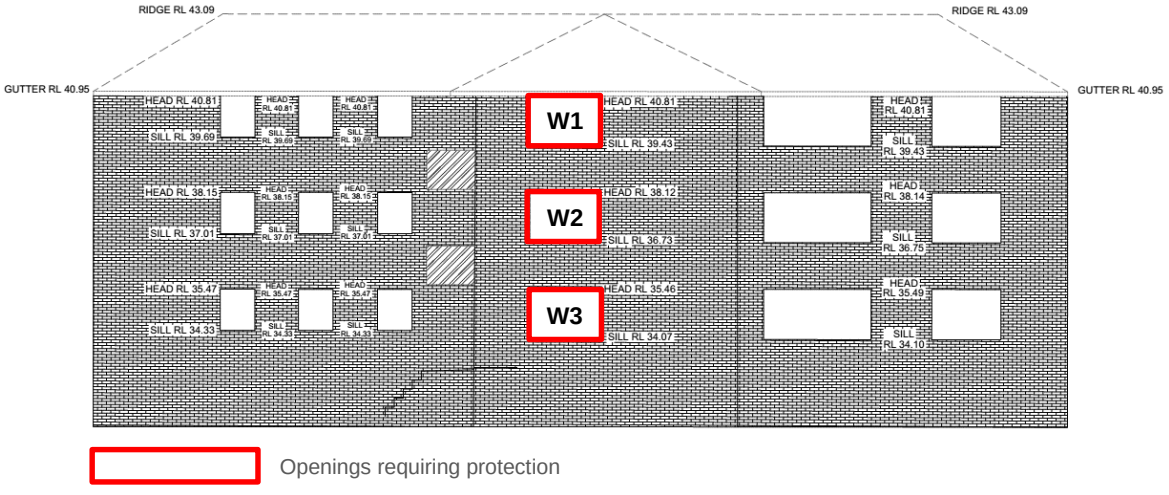


Figure 3 Openings requiring protection on 17 Sturt Street

Figure 4 Openings requiring protection on 2A Evans Road

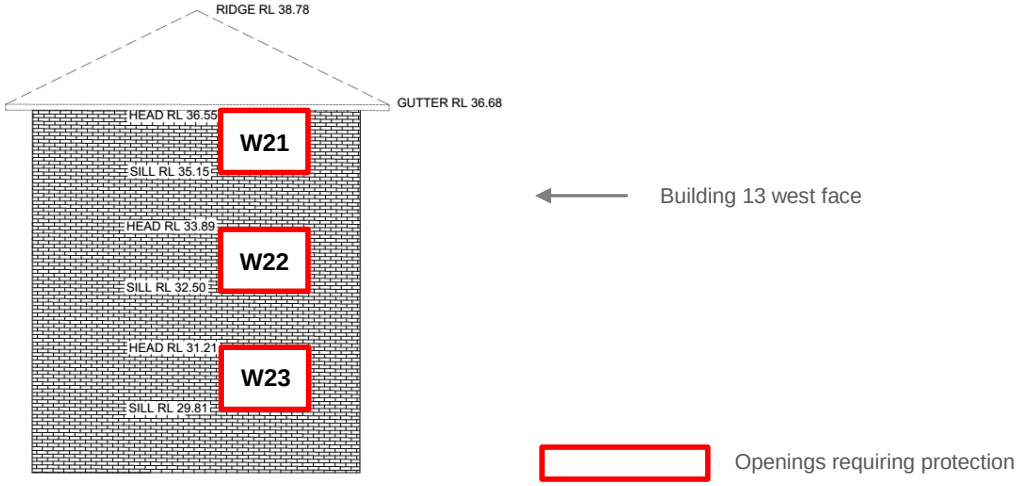


Figure 5 Openings requiring protection on 13 Sturt Street

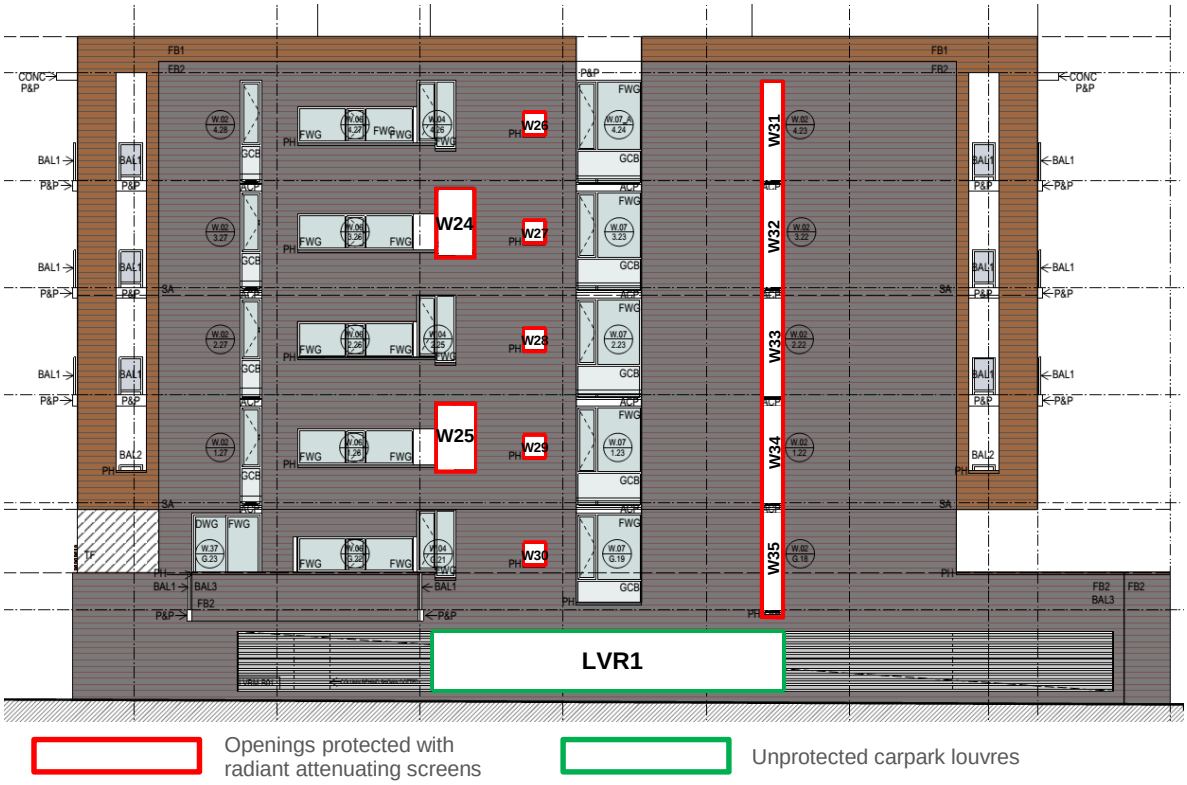


Figure 6 Openings on east elevation of 15 Sturt Street within 3m of subdivision boundary

4. Openings DR1, DR2 and DR3 on the east face of 2A Evans Road shown in Figure 4 must be protected in accordance with clause C3.4 of the BCA as follows:

   - internal or external wall-wetting sprinklers as appropriate used with doors that are self-closing or automatic closing; or
   - -/60/30 fire doors that are self-closing or automatic closing.

5. Openings W36, W37 and W38 identified in Table 9 and shown in Figure 7 that are located 2.7m away from the eastern boundary need not be protected.

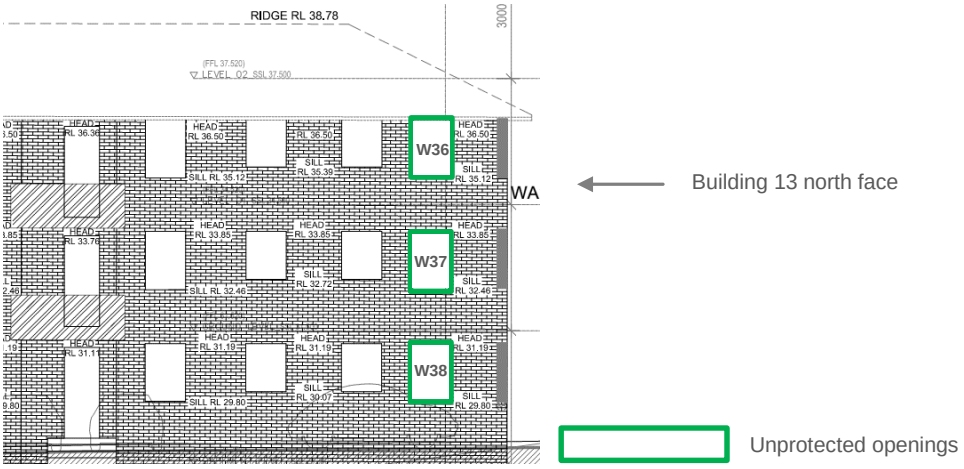


Figure 7 Unprotected openings on northern elevation of 13 Sturt Street

6. The carpark louvre opening LVR1 as shown in Figure 6 that is within 3m of the proposed subdivision boundary is not required to be protected in accordance with clause C3.4 of the BCA.

6. Alternative solution 1 – Protection of openings

6.1 Introduction

Under clause C3.2 of the BCA, any openings in the external walls of a building that are required to achieve an FRL are required to be protected in accordance with clause C3.4 of the BCA if they are located within 3m of the side allotment boundaries.

External openings within the residential levels of the four buildings that are located less than 3m from the proposed site boundary – measured parallel – described in Table 8 are proposed to be protected with radiant heat attenuation screens. Protection with radiant heat attenuation screens are not methods of protection specified within clause C3.4 of the BCA.

External openings W36, W37 and W38 on the northern elevation of 13 Sturt Street that are located at least 2.6m away from the eastern subdivision boundary – measured perpendicular – as shown in Figure 7 are not required to be protected.

This assessment was undertaken to demonstrate that the design complies with performance requirement CP2 of the BCA.

6.2 Intent of the BCA

The Guide to the BCA[3] states that the intent of clause C3.2 is 'to require any opening in external walls to be protected, only where the wall is required to have an FRL, to prevent the spread of fire from the boundary of an adjoining allotment, or one building to another building on the same allotment.' The guide expands further that 'openings in an external wall must be protected if within 3m of a side or rear boundary.'

6.3 Methodology

The assessment undertaken for the buildings was a quantitative absolute assessment involving sub-system C – fire spread and impact and control.

6.3.1 Verification method CV1

The assessment method employed to determine whether the proposed design of the buildings achieve compliance with performance requirement CP2 of the BCA is based on verification method CV1 in accordance with clause A0.9(b)(i) of the BCA. Verification method CV1 of the BCA states:

'**CV1**

Compliance with CP2 to avoid the spread of fire between buildings on adjoining allotments is verified when it is calculated that –

a. a building will not cause heat flux in excess of those set out in column 2 of table CV1 at locations within the boundaries of an adjoining property set out in column 1 of table CV1 where another building may be constructed; and

b. when located at the distances from the allotment boundary set out in column 1 of table CV1, a building is capable of withstanding the heat flux set out in column 2 of table CV1 without ignition.

Column 1	Column 2
Location	**Heat flux (kW/m^2)**
On boundary	80
1m from boundary	40
3m from boundary	20
6m from boundary	10

Table CV1'

[3] National Construction Code Series 2014, Volume One – Building Code of Australia – Guide, Australian Building Codes Board, Australia.

The assessment has been divided into two sections. The process for each component is described in sections 6.3.2 and 6.3.3.

6.3.2 Radiation emitted to adjacent properties

- Identify openings in the buildings that could act as a source of fire spread – via radiant heat – to adjacent properties.
- Establish the dimensions of the identified openings. An augmentation factor of 25% is applied to the height of the openings to account for flames emanating out of the window in accordance with Appendix B of AS 2118.2.
- Using 'Radiation' from the 'Firewind'[4] suite of computer programs, calculate the levels of radiant heat flux at the vertical plane locations identified in column 1 of table CV1 and determine whether they are less than the values nominated in column 2 of table CV1.
- The emitting radiant heat source from a flashover fire within the residential sole-occupancy units is conservatively assumed to have flame temperature of 900°C. This temperature is based upon a series of full-scale residential fire tests[5,6,7].
- The emitting radiant heat source is conservatively assumed to have a minimum emissivity of 0.9[8]. This equates to an emitted radiant heat flux in excess of the 80kW/m^2 at the boundary in table CV1.
- Develop a strategy to protect openings in areas that exceed the critical radiant heat flux levels at the locations set out in column 1 of table CV1 of the BCA where another building may be constructed.

6.3.3 Radiation received from adjacent properties

- Establish the level of radiant heat flux required to be withstood by the openings that are within 3m of a fire-source feature using verification method CV1 of the BCA.
- Clause C3.2(b)(i) of the BCA does not require openings to be protected if they are 3m or more from a fire source feature (FSF). At a distance of 3m from the boundary, verification method CV1 requires openings to be capable of withstanding a heat flux of 20kW/m^2. On this basis it is concluded that openings receiving a heat flux of 20kW/m^2 or less do not require protection.
- Develop a strategy to protect openings that receive more than the critical level of radiant heat flux of 20kW/m^2.
- Piloted ignition is prevented when openings are protected with radiant heat attenuating screens.
- The critical level of radiant heat received when openings are protected with radiant heat attenuating screens is therefore 25kW/m^2, which is the critical value for non-piloted ignition of lightweight furnishings[9].

6.4 Acceptance criteria

The acceptance criteria for the assessment are to demonstrate that:

- Areas on the adjoining property where another building may be constructed receive not more than the critical radiant heat flux levels set out in table CV1 of the BCA.
- Openings within the subject building receive not more than the critical level of radiant heat flux of 20kW/m^2 from a credible design fire on an adjoining property.

[4] Firewind, Version 3.6, Fire Modelling & Computing, Wahroonga, NSW.
[5] Report of Test FR 3995, 14 July 1994, Santa Ana Fire Department Experiment, NIST.
[6] Report of Test FR 4009, May 1998, Full-Scale House Fire Experiment for InterFIRE VR 6.
[7] Full-Scale Room Fire Test – Report No. NIST GCR 97-716, June 1997, NIST.
[8] Buchanan AH, 2001, Structural design for fire safety, John Wiley & Sons, England, p 52.
[9] Grubits SJ, NBTC Technical Record 517, Department of Housing and Construction, Chatswood, NSW.

- Openings protected with radiant heat attenuating screens within the subject building receive not more than the critical level of radiant heat flux of 25kW/m^2 from a credible design fire on an adjoining property.

6.5 Fire hazards

The fire hazard to be assessed is the impact of a fire within a residential unit or adjacent allotment on fire spread to or from the boundary via the openings in the external wall. The use of the building, quantity, size and location of openings contribute to the levels of radiant heat emitted and received by the building.

6.6 Assessment

6.6.1 Potential radiant heat sources

The location, size and orientation of openings within the building used to calculate the radiant heat flux emitted for the various fire scenarios are identified in Table 9.

Building	Opening	Height (m)	Adjusted height (+25%) (m)	Width (m)	Distance of closest point to boundary (m)	Boundary exposed to
17	W1,W2,W3	1.4	1.75	2.0	1.3	West
2A, south face	W4,W5	1.4	1.75	0.95	1.3	North-west
2A, east face	W6-W11	1.4	1.75	0.95	1.3	North
2A, east face	W12-W20	1.15	1.44	0.9	1.3	North
13, west face	W21-W23	1.4	1.75	2.0	1.3	East
15	W24-W25	1.9	2.38	1.09	1.9	East
15	W26-W30	0.6	0.75	0.61	1.9	East
15	W31-W35	2.83	3.54	0.61	1.95	East
13, north face	W36-W38	1.4	1.75	0.95	2.7	East
2A, east face	DRW1-DRW3	1.4	1.75	1.0	1.3	North
2A, east face	DR1-DR3	2.1	2.63	0.9	1.3	North

Table 9 Potential radiant heat sources

6.6.2 Fire scenarios to be evaluated

Table 10 summarises the openings to be evaluated and the associated credible design fire scenarios assessed to determine the potential for fire spread from the buildings. The scenarios are considered to be representative of the openings for the purposes of determining the maximum radiant heat flux levels emitted at the locations within the boundaries of the adjoining properties set out in column 1 of table CV1 where another building may be constructed.

The fire scenarios assessed are considered to represent the worst case scenarios for fire spread to and from the openings of all four buildings. It is noted that openings located more than 3m of the site boundaries within the same unit to be addressed in fire scenario 1 and 3 have also been included in the assessment.

Fire scenario 4 is considered to be representative of the scenario for fire spread from the west façade of 13 Sturt Street as the number, size and distance of openings from the site boundaries are identical.

Fire scenario	Building	Description of fire scenario	Identified openings	Associated boundary
1	15 Sturt Street	Fully developed fire within Unit 9 on level 1	W25, W29	East
2	2A Evans Road	Fully developed fire within one unit on ground floor	W10, W11, W18, W19, W20	North
3	13 Sturt Street	Fully developed fire within one unit on ground floor	W38	East
4	17 Sturt Street	Fully developed fire within one unit on ground floor	W3	West

Table 10 Fire scenarios

6.6.3 Calculation of radiant heat emitted to adjacent properties

The radiant heat levels emitted onto adjacent properties were calculated using program 'Radiation' of the 'Firewind' suite of computer programs at the locations identified in column 1 of table CV1.

Table 11 contains a summary of the level of radiant heat flux emitted from the identified credible design fire scenarios for the buildings. This is reported in terms of heat flux received at various locations identified within column 1 of table CV1. The output data has been included in Appendix B. The assessment indicates that the heat fluxes emitted by the identified openings to the adjacent properties are less than the values listed in column 2 of table CV1 of the BCA. The proposed design of the buildings are considered to achieve the criteria for part (a) of verification method CV1.

Scenario	Boundary	On boundary (kW/m^2)	1m from boundary (kW/m^2)	3m from boundary (kW/m^2)	6m from boundary (kW/m^2)
Maximum heat flux permitted by verification method CV1		**80**	**40**	**20**	**10**
1	East	26.78	16.59	8.29	3.88
2	North	26.57	14.94	7.07	3.26
3	East	2.86	<10	<10	<10
4	West	37.90	16.68	5.48	1.98

Table 11 Radiant heat emitted from openings at locations nominated by column 1 of table CV1 of the BCA

6.7 Assessment of radiant heat received from adjacent properties

6.7.1 Openings protected with radiant heat attenuation screens

The worst case scenario is a fire within the unit of 2A Evans Road as the setback of the unprotected openings to the site boundary is closest compared to all of the other fire scenarios.

The specific radiant heat flux levels received at the opening are summarised in Table 12, with the calculations and output data attached in Appendix C. Without protection the radiant heat flux level received is $36.05kW/m^2$. When the opening is protected with a radiant heat attenuating screen, the radiant heat flux level received at the opening is $22.5kW/m^2$. The radiant heat attenuating screen reduces the radiation below $25kW/m^2$, which is the critical value for non-piloted ignition of lightweight furnishings set out as acceptance criteria for this assessment. It is therefore shown that the proposed design of the building achieves the criteria for part (b) of verification method CV1 of the BCA, since piloted ignition is prevented when openings are protected with radiant heat attenuating screens.

Distance from boundary at closest point to fire source feature (m)	Radiant heat received at openings (kW/m^2)	Radiant heat received when screen is fitted over exposed opening (kW/m^2)
1.3	36.05	**22.5**

Table 12 Radiant heat received at openings

6.7.2 Openings located perpendicular to fire source feature

The specific radiant heat flux levels received at the identified openings are summarised in Table 13, with the calculations and output data attached in Appendix C. The radiant heat flux levels received by all openings identified in Table 13 are below $20kW/m^2$ when the openings are located 2.6m or further away from the boundary. It is therefore considered that the proposed design of the building achieves the criteria for part (b) of verification method CV1 of the BCA.

Scenario	Distance from boundary at closest point to fire source feature (m)	Radiant heat received at openings (kW/m^2)
3	2.7	**18.36**

Table 13 Radiant heat received at unprotected openings located perpendicular to a fire source feature

6.8 Conclusion

The assessment demonstrates that the nominated protection of the openings within 3m of the allotment boundaries provides adequate protection from fire spread to and from adjacent properties. The proposed design of the building is therefore considered to achieve compliance with performance requirement CP2 of the BCA, subject to compliance with the fire safety measures given in section 5.

7. Alternative solution 2 – Protection of carpark louvres

7.1 Introduction

Under clause C3.2 of the BCA, any openings in the external walls of a building that are required to achieve an FRL are required to be protected in accordance with clause C3.4 of the BCA if they are located within 3m of the side allotment boundaries.

The carpark louvre opening on the eastern elevation of 15 Sturt Street is located approximately 1.9m from the proposed subdivision boundary and is not proposed to be protected. The location of the carpark louvre is illustrated in Figure 8.

This assessment was undertaken to demonstrate that the design complies with performance requirement CP2 of the BCA.

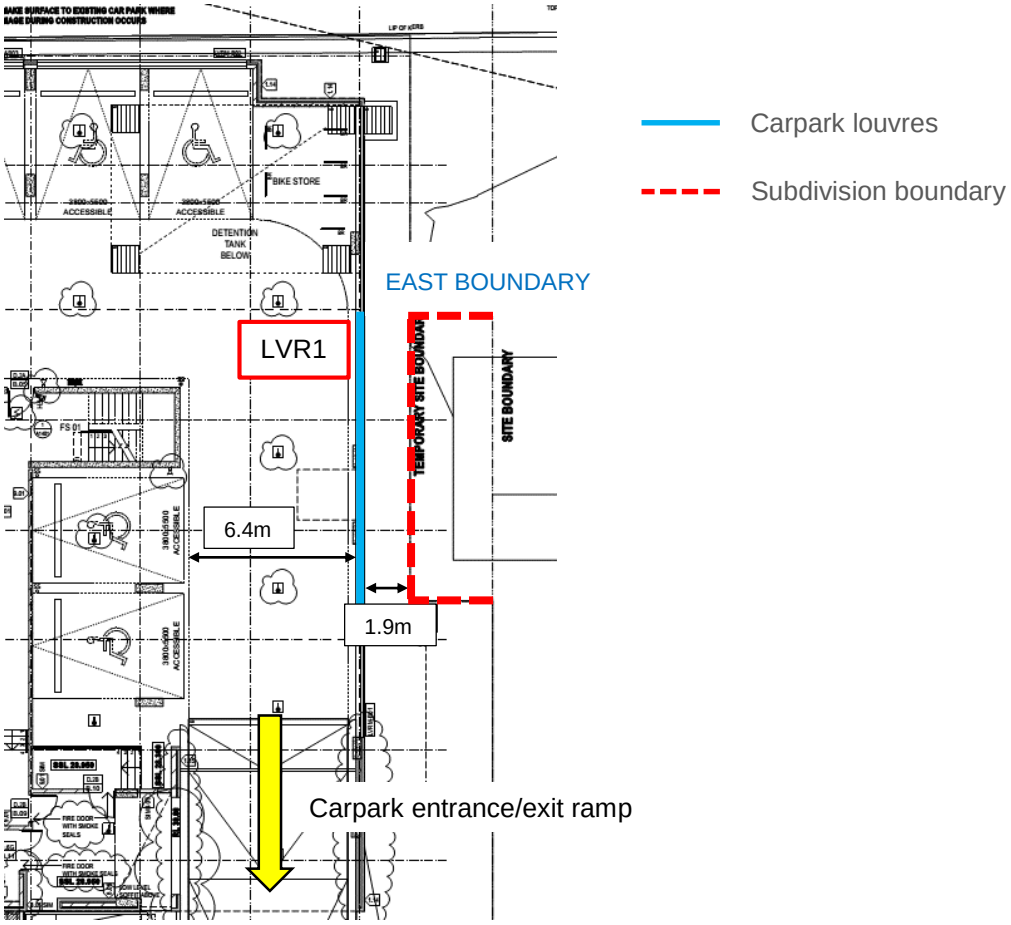


Figure 8 Carpark floor plan of 15 Sturt Street

7.2 Intent of the BCA

Refer to section 6.2.

7.3 Methodology

The assessment undertaken for the building was a qualitative absolute assessment involving subsystem C – Fire spread and impact and control.

7.4 Acceptance criteria

The acceptance criterion for the assessment is to demonstrate that the risk of fire spread between the proposed subdivision boundaries and the exposed carpark louvre on the eastern elevation is mitigated to the degree necessary in consideration of the use of the carpark and low fire load associated with the driveway adjacent to the louvres.

7.5 Fire hazards

The fire hazard to be assessed is the impact of the exposed carpark louvres on fire spread to and from the proposed subdivision boundaries. The use and layout of the carpark contribute to its potential for fire spread.

The unprotected carpark louvre represents a low fire hazard in terms of the risk of fire spread to and from the site boundary. This is due to the low fire load expected to be found along the driveway given that vehicles are unlikely to be parked on the driveway and therefore is expected to be free of any significant combustibles for the majority of the time.

7.6 Assessment

7.6.1 Fire spread to adjacent properties

The carpark louvres on the east elevation are located 1.9m from the proposed eastern subdivision boundary. The exposed louvre is the primary source of ventilation for the basement level carpark. Adjacent to the louvres is a 6.4m wide driveway which serves as the sole entry and exit route for residing vehicles – the principle fire load within a carpark – effectively restricting the storage of combustibles near the openings. Consequently, it is expected that the driveway is limited or free of combustibles that may contribute to a significant fire load. The risk of ignition of a vehicle or combustibles on the driveway and the spread of fire to adjacent property is considered to be minimal, and thus no protection is required for the carpark louvre.

It should also be noted that in the unlikely event of a car fire occurring along the driveway, the risk of fire spread to adjacent property is considered to be at least equivalent to a scenario where a car is stopped directly outside the opening – not within the building – where no protection would be required.

7.6.2 Fire spread from adjacent properties

As mentioned in section 7.6.1, the driveway directly adjacent to the carpark louvres is expected to contain limited or no combustibles as it serves as a vehicle thoroughfare. In the event of a fire on the adjacent property, any vehicles on the ramp would not remain stationary and are expected to continue to enter or exit the carpark to move away from the fire. This means that it is unlikely for combustibles to be on the ramp which could facilitate fire spread from a fire originating from the adjacent property. The closest permanent source of combustible that could facilitate fire spread is a vehicle occupying a parking spacing located approximately 8.3m from the allotment boundary. This distance is significantly greater than a DTS complying design where openings that are setback 6m or further away from openings in another building need not be protected. For these reasons the risk of fire spread from adjacent buildings is considered to be mitigated.

7.7 Conclusion

The assessment undertaken for the proposed design demonstrates that the risk of fire spread between the proposed subdivision boundary and the exposed carpark louvre on the eastern elevation is mitigated to the degree necessary. The proposed design of the building is therefore considered to achieve compliance with performance requirement CP2 of the BCA, subject to compliance with the fire safety measures given in section 5.

Appendix A Drawings and information

Drawing title	Dwg no	Date	Drawn
Type BF823	BF823	24/01/1966	The Housing Commission of NSW
Basement level floor plan	A1201	08/11/2011	Turner + Associates
East elevation	A1222	24/03/2010	Turner + Associates
Level 1 floor plan	A1203	20/10/2011	Turner + Associates
Detail and levels of existing and new buildings at Moffatts – south elevation, section A-A, section C-C	110092-DT01-2	31/10/2011	Crux Surveying
Detail and levels of existing and new buildings at Moffatts – north elevation	110092-DT01-3	31/10/2011	Crux Surveying
Detail and levels of existing and new buildings at Moffatts – east elevation	110092-DT01-4	31/10/2011	Crux Surveying
Detail and levels of existing and new buildings at Moffatts – west elevation, section B-B	110092-DT01-5	31/10/2011	Crux Surveying
Plan showing the location of structures on the land in relation to the proposed subdivision boundaries	110092-ID-001	19/09/2014	Crux Surveying

Appendix B Radiant heat emitted by openings

B.1 Emissivity of flames

Emissivity is defined as the ratio of the radiant heat flux emitted by an object to that emitted by a black body at the same temperature and under the same conditions, where emissivity is a measure of the efficiency of a surface of the object as a radiator[10]. The emitting radiant heat source is conservatively assumed to have a minimum emissivity of 0.9[11].

B.2 Compartment temperatures

The emitting radiant heat source from a flashover fire within the residential sole-occupancy units is conservatively assumed to have flame temperature of 900°C. This temperature is based upon a series of full-scale residential fire tests[12,13,14].

B.3 Summary of results

Table 14 contains a summary of the level of radiant heat flux emitted from the identified credible design fire scenarios for the buildings. The emissivity of the flames has been taken into account.

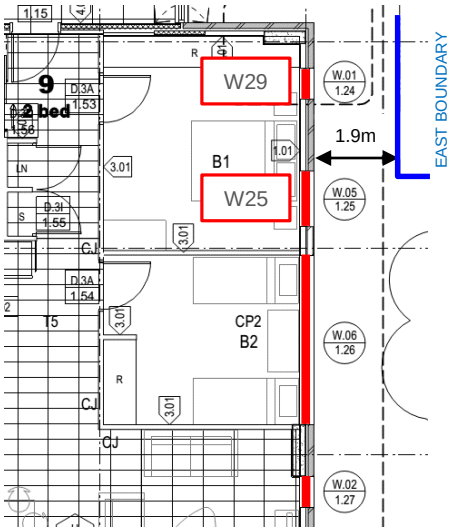
It should be noted that the size of the openings modelled may be larger than the actual opening sizes. This results in conservative results.

Scenario	Boundary	On boundary (kW/m^2)	1m from boundary (kW/m^2)	3m from boundary (kW/m^2)	6m from boundary (kW/m^2)
Maximum heat flux permitted by verification method CV1		**80**	**40**	**20**	**10**
1	East	26.78	16.59	8.29	3.88
2	North	26.57	14.94	7.07	3.26
3	East	2.86	<10	<10	<10
4	West	37.90	16.68	5.48	1.98

Table 14 Radiant heat emitted from openings at locations nominated by column 1 of table CV1 of the BCA

[10] Drysdale D, 1998, An Introduction to Fire Dynamics – Second Edition, John Wiley and Sons, England.
[11] Buchanan AH, 2001, Structural design for fire safety, John Wiley & Sons, England, p 52.
[12] Report of Test FR 3995, 14 July 1994, Santa Ana Fire Department Experiment, NIST.
[13] Report of Test FR 4009, May 1998, Full-Scale House Fire Experiment for InterFIRE VR 6.
[14] Full-Scale Room Fire Test – Report No. NIST GCR 97-716, June 1997, NIST.

B.4 Fire scenario 1 – Unit 9 on level 1 of 15 Sturt Street



Radiant heat emitter – ie openings from the fire affected unit adjacent to the affected side boundary

Subdivision boundary

B.4.1 On the boundary

Program Radiation

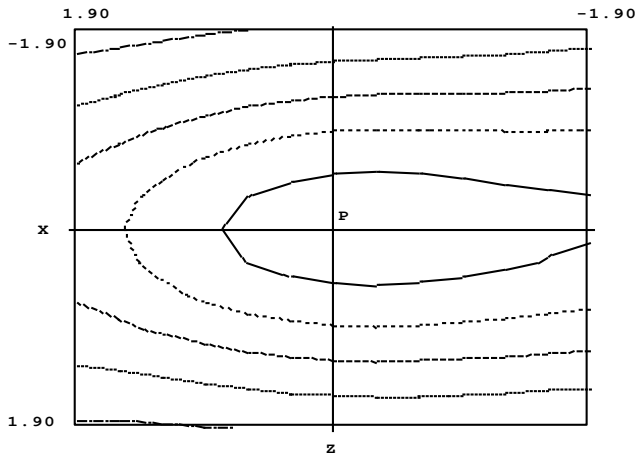
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
1.9	-0.03	-4.98	0.75	0.61	90
1.9	-0.2	-2.73	2.38	1.09	90
1.9	0	0	1.25	3.29	90
1.9	0.255	2.95	3.54	0.61	90

RADIATION MAP ZX



Radiation flow, kW/m²:

13.00
16.00
19.00
22.00
25.00

Nodal radiation data, kW/m²:

z \ x	1.90	0.95	0.00	-0.95	-1.90
-1.90	11.61	12.64	13.55	14.01	14.57
-0.95	17.35	20.07	21.83	21.95	22.03
0.00	20.51	24.53	26.78	26.44	25.31
0.95	17.84	20.15	21.75	21.54	20.70
1.90	12.54	12.85	13.44	13.43	13.03

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.1°$, $\varphi = 92.6°$

B.4.2 1m from the boundary

Program Radiation

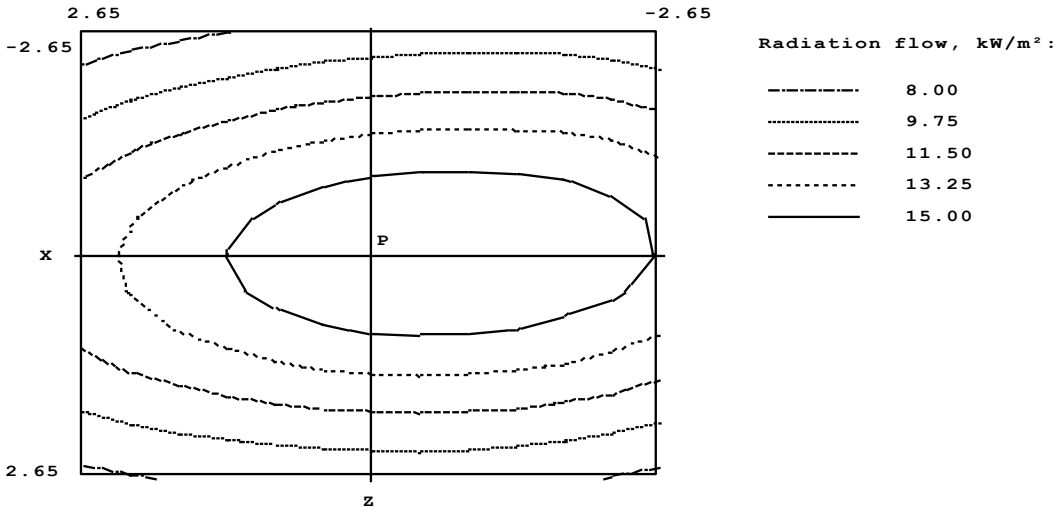
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
2.9	-0.03	-4.98	0.75	0.61	90
2.9	-0.2	-2.73	2.38	1.09	90
2.9	0	0	1.25	3.29	90
2.9	0.255	2.95	3.54	0.61	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	2.65	1.32	0.00	-1.32	-2.65
-2.65	6.931	7.988	8.657	8.849	8.274
-1.32	10.54	12.43	13.67	13.87	12.84
0.00	12.59	15.02	16.59	16.52	14.92
1.32	11.08	12.64	13.60	13.44	12.06
2.65	7.566	8.272	8.589	8.423	7.571

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.1°$, $\varphi = 92.8°$

B.4.3 3m from the boundary

Program Radiation

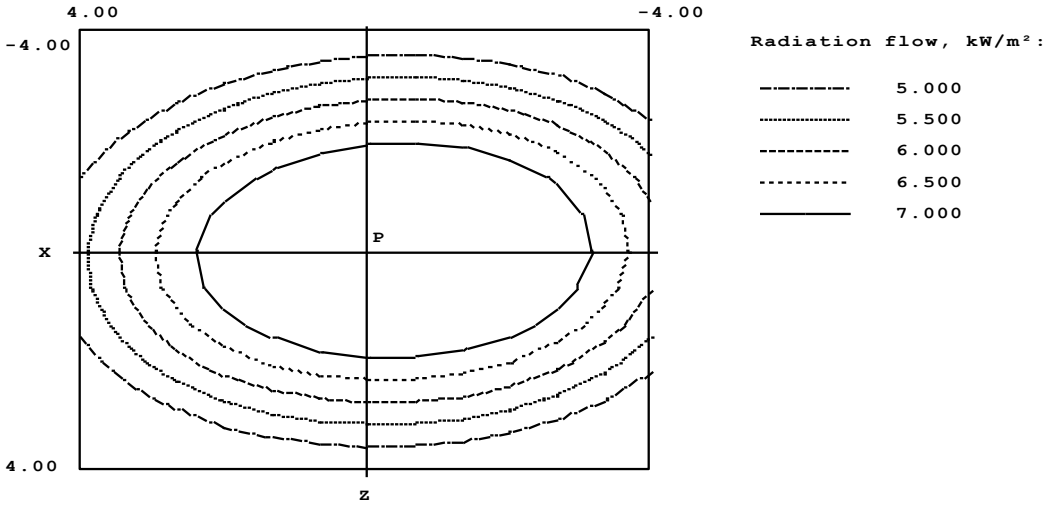
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
4.9	-0.03	-4.98	0.75	0.61	90
4.9	-0.2	-2.73	2.38	1.09	90
4.9	0	0	1.25	3.29	90
4.9	0.255	2.95	3.54	0.61	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

z \ x	4.00	2.00	0.00	-2.00	-4.00
-4.00	3.130	3.993	4.441	4.304	3.561
-2.00	4.588	6.117	6.915	6.669	5.311
0.00	5.409	7.326	8.287	7.906	6.166
2.00	4.740	6.232	6.893	6.516	5.143
4.00	3.277	4.103	4.428	4.178	3.413

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.1°$, $\varphi = 92.3°$

B.4.4 6m from the boundary

Program Radiation

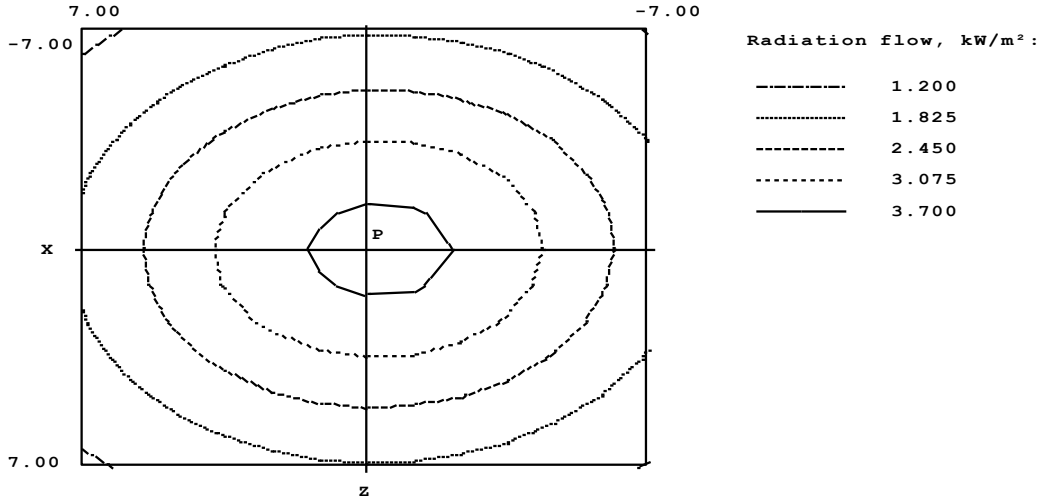
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
7.9	-0.03	-4.98	0.75	0.61	90
7.9	-0.2	-2.73	2.38	1.09	90
7.9	0	0	1.25	3.29	90
7.9	0.255	2.95	3.54	0.61	90

RADIATION MAP ZX



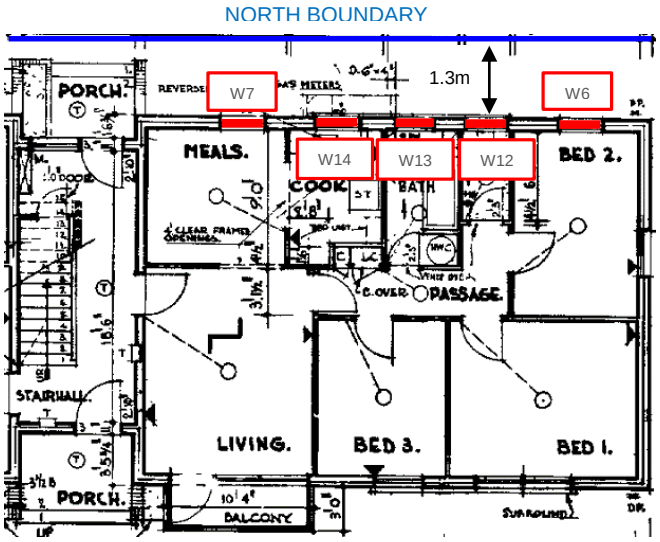
Nodal radiation data, kW/m²:

z \ x	7.00	3.50	0.00	-3.50	-7.00
-7.00	1.078	1.522	1.762	1.608	1.179
-3.50	1.616	2.527	3.058	2.711	1.805
0.00	1.920	3.156	3.880	3.373	2.141
3.50	1.643	2.561	3.055	2.674	1.779
7.00	1.100	1.545	1.762	1.585	1.158

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°,\ \varphi = 91.8°$

B.5 Fire scenario 2 – One unit on ground floor of 2A Evans Road



B.5.1 On the boundary

Program Radiation

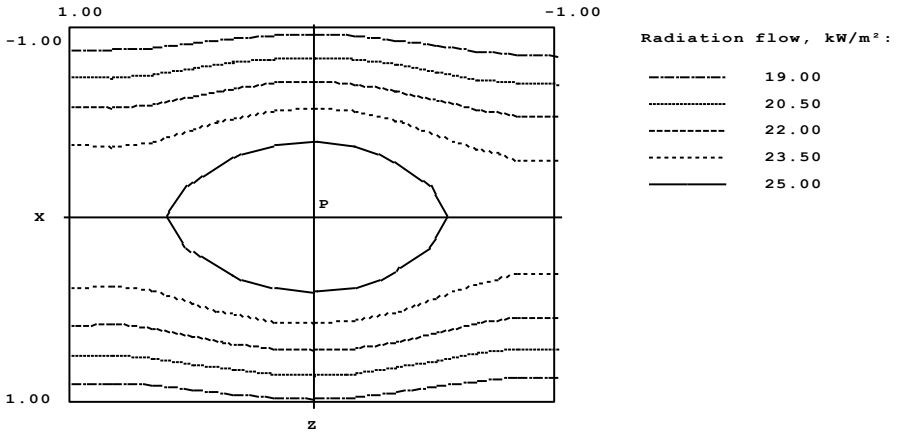
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
1.3	0.15	3.6	1.75	0.95	90
1.3	0	1.6	1.44	0.9	90
1.3	0	0	1.44	0.9	90
1.3	0	-1.6	1.44	0.9	90
1.3	0.15	-4.1	1.75	0.95	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	1.00	0.50	0.00	-0.50	-1.00
-1.00	17.74	18.08	18.57	17.93	17.36
-0.50	22.70	23.20	24.21	23.05	22.27
0.00	24.75	25.32	26.57	25.17	24.30
0.50	22.70	23.19	24.20	23.04	22.26
1.00	17.76	18.06	18.55	17.90	17.34

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 89.8°$, $\varphi = 89.3°$

B.5.2 1m from the boundary

Program Radiation

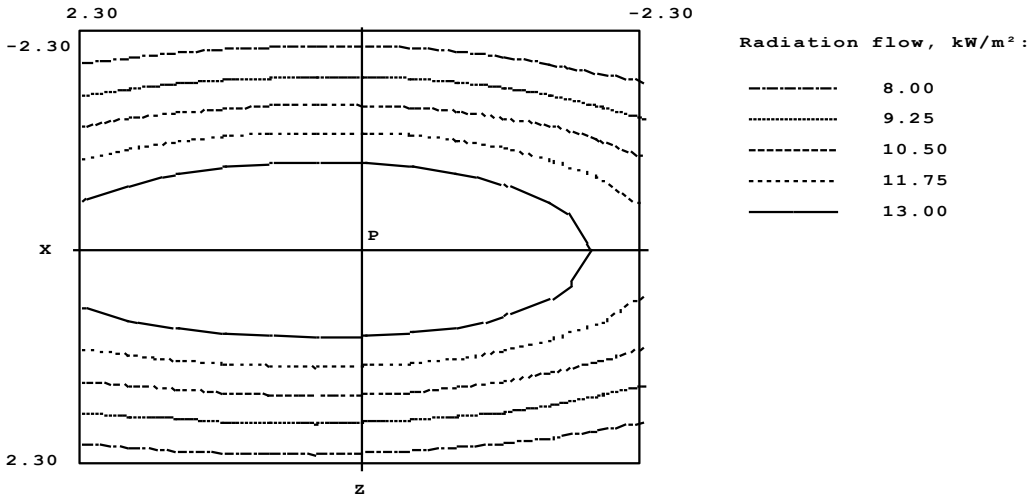
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
2.3	0.15	3.6	1.75	0.95	90
2.3	0	1.6	1.44	0.9	90
2.3	0	0	1.44	0.9	90
2.3	0	-1.6	1.44	0.9	90
2.3	0.15	-4.1	1.75	0.95	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	2.30	1.15	0.00	-1.15	-2.30
-2.30	6.782	7.278	7.384	7.039	6.326
-1.15	11.05	11.90	12.09	11.46	9.997
0.00	13.73	14.70	14.94	14.14	12.19
1.15	11.42	11.99	12.11	11.50	10.19
2.30	7.134	7.405	7.437	7.113	6.548

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 89.7°$, $\varphi = 89.0°$

B.5.3 3m from the boundary

Program Radiation

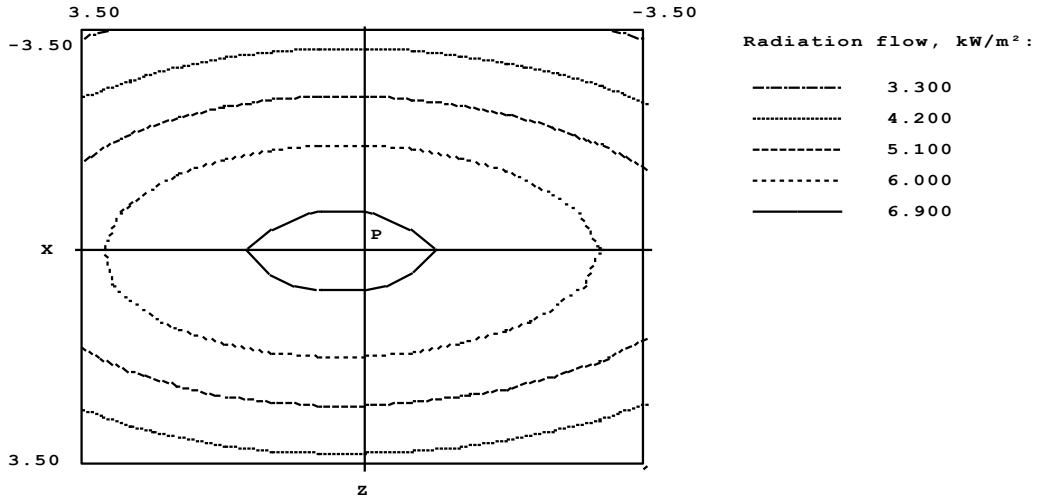
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
4.3	0.15	3.6	1.75	0.95	90
4.3	0	1.6	1.44	0.9	90
4.3	0	0	1.44	0.9	90
4.3	0	-1.6	1.44	0.9	90
4.3	0.15	-4.1	1.75	0.95	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

z \ x	3.50	1.75	0.00	-1.75	-3.50
-3.50	3.185	3.714	3.870	3.657	3.160
-1.75	4.821	5.688	5.919	5.538	4.737
0.00	5.794	6.819	7.069	6.595	5.660
1.75	4.961	5.777	5.969	5.609	4.866
3.50	3.312	3.809	3.938	3.740	3.280

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 89.5°,\ \varphi = 89.4°$

B.5.4 6m from the boundary

Program Radiation

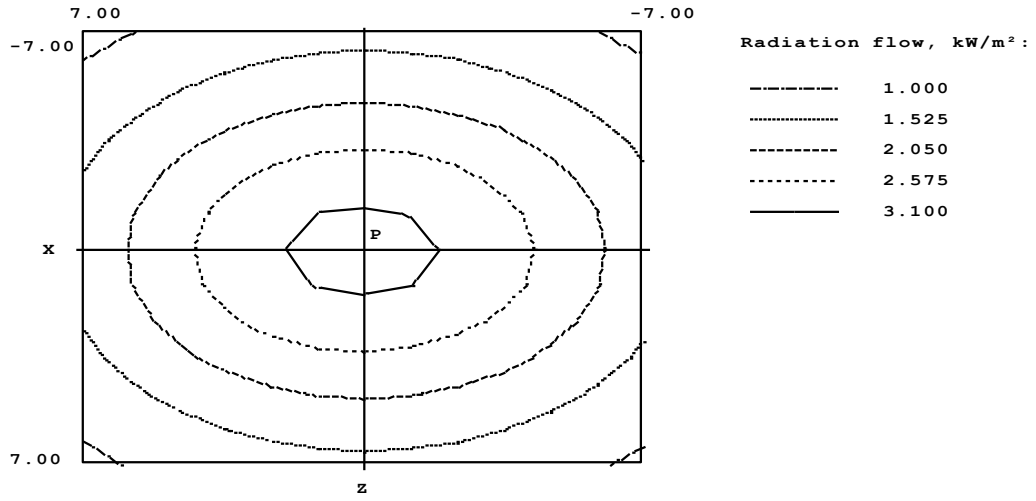
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
7.3	0.15	3.6	1.75	0.95	90
7.3	0	1.6	1.44	0.9	90
7.3	0	0	1.44	0.9	90
7.3	0	-1.6	1.44	0.9	90
7.3	0.15	-4.1	1.75	0.95	90

RADIATION MAP ZX



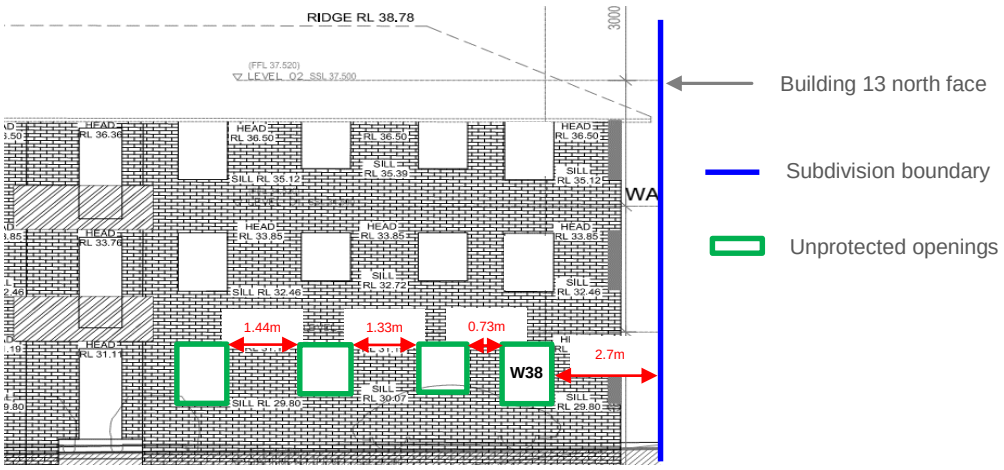
Nodal radiation data, kW/m²:

Z \ X	7.00	3.50	0.00	-3.50	-7.00
-7.00	0.869	1.206	1.356	1.214	0.887
-3.50	1.385	2.137	2.476	2.146	1.426
0.00	1.706	2.782	3.260	2.787	1.766
3.50	1.409	2.174	2.510	2.182	1.452
7.00	0.889	1.234	1.384	1.242	0.908

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 89.6°,\ \varphi = 90.1°$

B.6 Fire scenario 3 – One unit on ground floor of 13 Sturt Street



B.6.1 On the boundary

Program Radiation

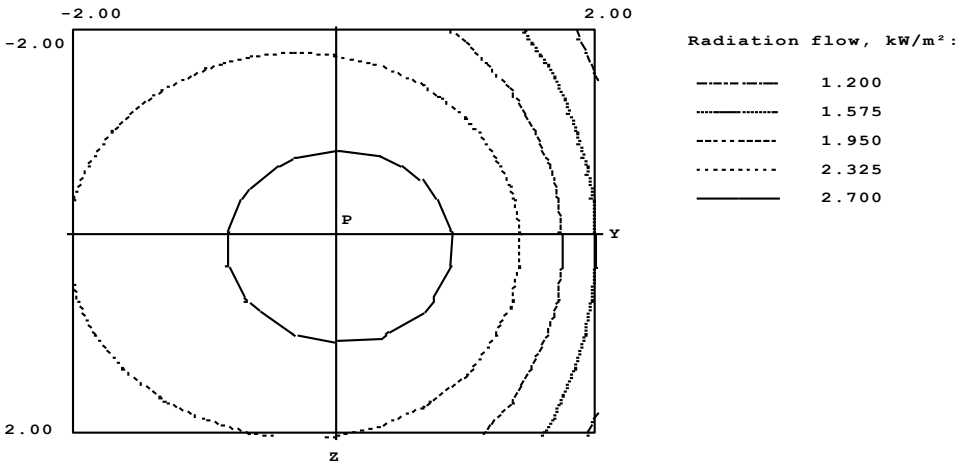
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
2.8	0.15	3.175	1.75	0.95	90
2.8	0	4.855	1.375	0.95	90
2.8	0	7.135	1.375	0.95	90
2.8	0.15	9.525	1.75	0.95	90

RADIATION MAP YZ



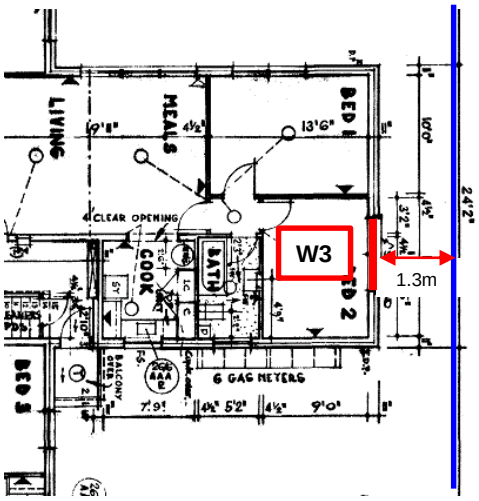
Nodal radiation data, kW/m²:

Z \ Y	-2.00	-1.00	0.00	1.00	2.00
-2.00	2.022	2.189	2.208	1.888	1.027
-1.00	2.244	2.509	2.645	2.389	1.366
0.00	2.339	2.653	2.856	2.650	1.554
1.00	2.276	2.560	2.724	2.490	1.440
2.00	2.076	2.270	2.322	2.021	1.117

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 88.7°,\ \varphi = 36.3°$

B.7 Fire scenario 4 – One unit on ground floor of 17 Sturt Street



Radiant heat emitter – ie openings from the fire affected unit adjacent to the affected side boundary

Subdivision boundary

B.7.1 On the boundary

Program Radiation

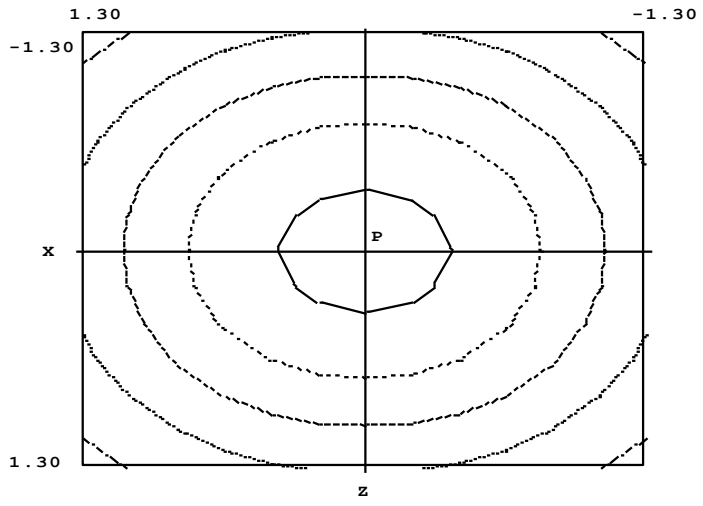
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
1.3	0	0	1.75	2	90

RADIATION MAP ZX



Radiation flow, kW/m²:

15.00
20.25
25.50
30.75
36.00

Nodal radiation data, kW/m²:

Z \ X	1.30	0.65	0.00	-0.65	-1.30
-1.30	13.17	18.49	20.70	18.49	13.17
-0.65	19.24	28.68	32.56	28.68	19.24
0.00	21.95	33.27	37.90	33.27	21.95
0.65	19.24	28.68	32.56	28.68	19.24
1.30	13.17	18.49	20.70	18.49	13.17

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°,\ \varphi = 90.0°$

B.7.2 1m from the boundary

Program Radiation

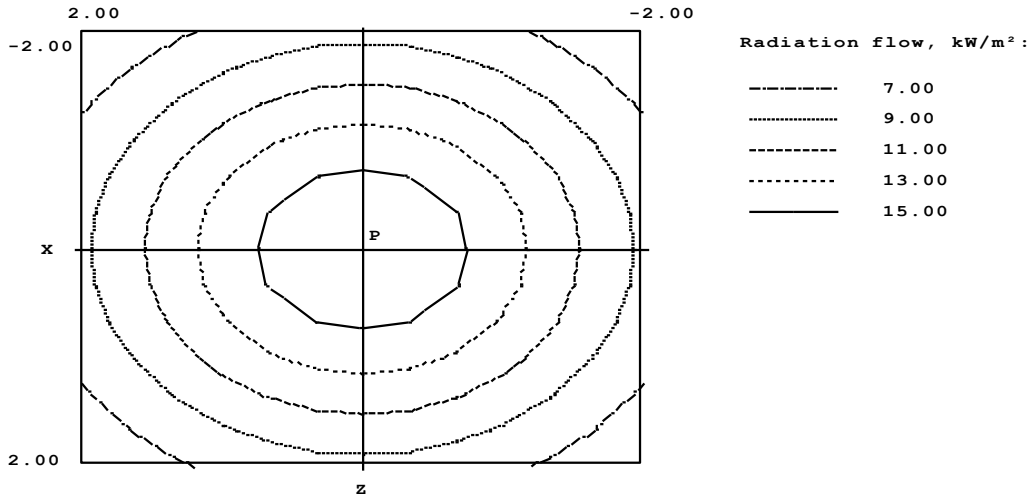
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
2.3	0	0	1.75	2	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	2.00	1.00	0.00	-1.00	-2.00
-2.00	5.199	7.386	8.425	7.386	5.199
-1.00	7.501	11.66	13.77	11.66	7.501
0.00	8.632	13.92	16.68	13.92	8.632
1.00	7.501	11.66	13.77	11.66	7.501
2.00	5.199	7.386	8.425	7.386	5.199

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°,\ \varphi = 90.0°$

B.7.3 3m from the boundary

Program Radiation

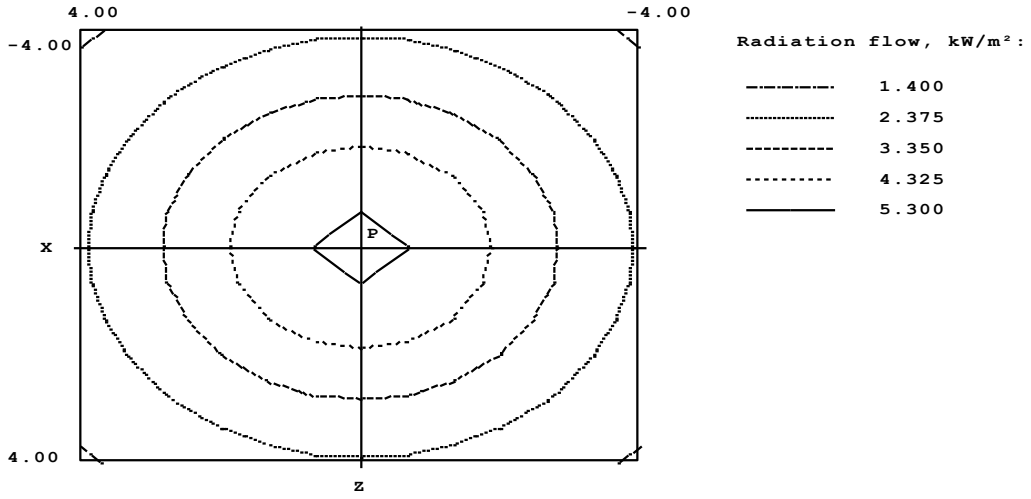
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
4.3	0	0	1.75	2	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	4.00	2.00	0.00	-2.00	-4.00
-4.00	1.298	1.936	2.269	1.936	1.298
-2.00	1.945	3.335	4.187	3.335	1.945
0.00	2.288	4.206	5.475	4.206	2.288
2.00	1.945	3.335	4.187	3.335	1.945
4.00	1.298	1.936	2.269	1.936	1.298

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°,\ \varphi = 90.0°$

B.7.4 6m from the boundary

Program Radiation

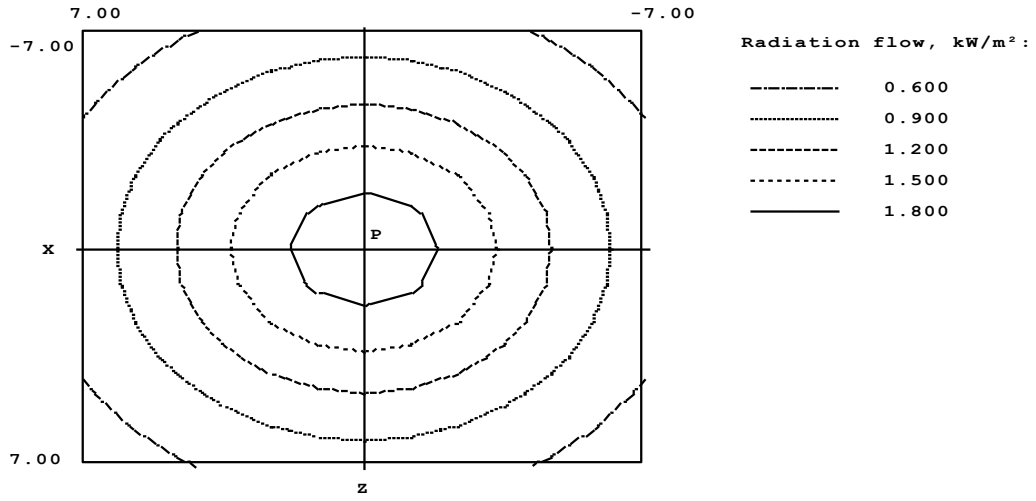
(All dimensions are in meters)

Y-sources:

Radiation temperature 900°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
7.3	0	0	1.75	2	90

RADIATION MAP ZX



Nodal radiation data, kW/m²:

Z \ X	7.00	3.50	0.00	-3.50	-7.00
-7.00	0.423	0.641	0.758	0.641	0.423
-3.50	0.642	1.139	1.463	1.139	0.642
0.00	0.760	1.466	1.977	1.466	0.760
3.50	0.642	1.139	1.463	1.139	0.642
7.00	0.423	0.641	0.758	0.641	0.423

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°,\ \varphi = 90.0°$

Appendix C Radiant heat received by openings

C.1 Openings protected with radiant heat attenuation screens

Radiant heat required to be withstood by the openings calculated in accordance with verification method CV1 (BCA)

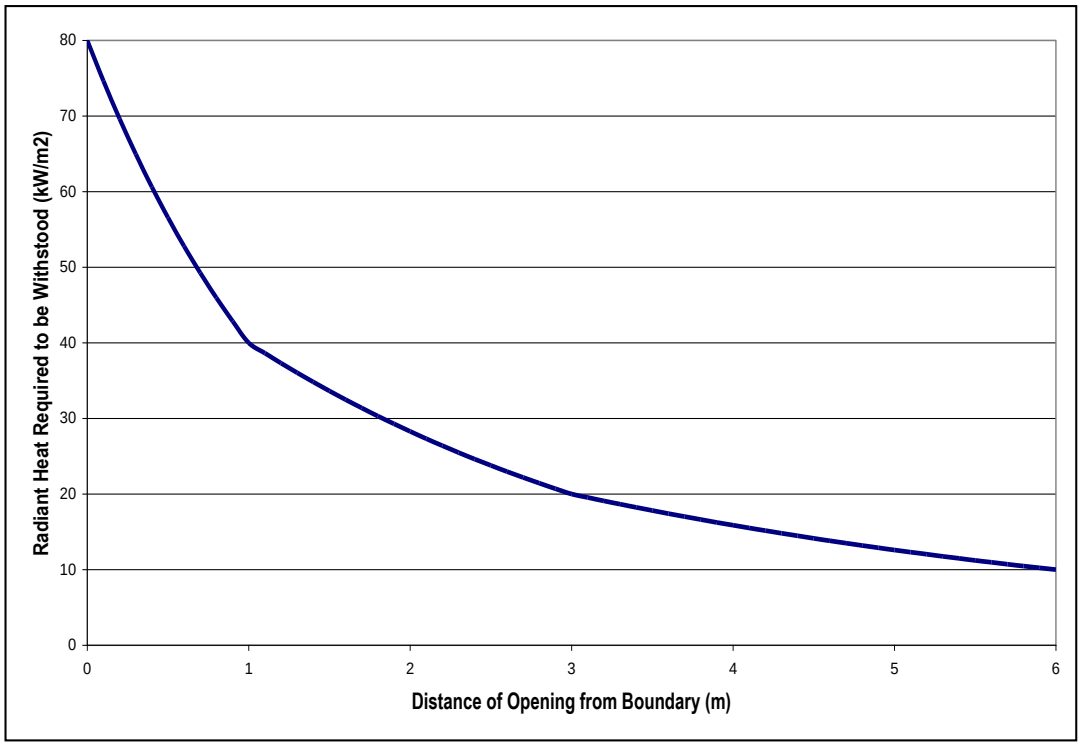
CV1

Compliance with CP2 to avoid the spread of fire between buildings on adjoining allotments is verified when it is calculated that -
(b) when located at the distances from the allotment boundary set out in column 1 of table CV1, a building is capable of withstanding the heat flux set out in column 2 of table CV1 without ignition

Table CV1

Column 1 Location	Column 2 Heat flux (kW/m^2)
On boundary	80
1m from boundary	40
3m from boundary	20
6m from boundary	10

Based on these values, radiant heat fluxes can be interpolated using a power law relationship for openings located at distances between these limits.



Distance of opening from boundary (m):	Radiant heat required to be withstood (kW/m^2):
1.3	36.05

C.1.1 Calculation of attenuation by screens

The radiant heat attenuation model predicts the amount of incident radiation attenuated by a stainless steel mesh screen based on the size and spacing of the wire. The fundamentals of the model are:

- Radiation can only be transmitted directly through the screen via openings in the mesh;
- Radiation falling onto the wire mesh is blocked and absorbed;
- The percentage of incident radiation passing through the screen is based upon the free area of the screen per square metre.
- A portion of the radiation falling on the mesh is re-radiated due to heating of the screens. The radiant heat flux (q") that is re-radiated from the screen is calculated using the Stefan-Boltzmann law[15] which is given in q" = φεσTs4

where:

q" = radiant heat flux (W/m2)

φ = configuration factor = 1

ε = emissivity (value between 0 and 1)

σ = Stefan-Boltzmann constant = 5.67×10-8W/m2K4

Ts = absolute temperature of the surface (K)

- Equation 1.

$q'' = \varphi \varepsilon \sigma T_s^4$

where:

q" = radiant heat flux (W/m^2)

φ = configuration factor = 1

ε = emissivity (value between 0 and 1)

σ = Stefan-Boltzmann constant = 5.67×10^{-8}W/m^{2}K^4

T_s = absolute temperature of the surface (K)

Equation 1 Stefan-Boltzmann law

[15] Drysdale D, 1998, An Introduction to Fire Dynamics, 2nd edition, John Wiley & Sons, England.

C.1.2 Calculation of radiation received by openings when protected with radiant heat attenuating screens

The radiant heat attenuating screen reduces the radiation below 25kW/m^2, which is the critical value for non-piloted ignition of lightweight furnishings set out as acceptance criteria for this assessment. It is therefore considered that the proposed design of the buildings achieve the criteria for part (b) of verification method CV1 of the BCA, since piloted ignition is prevented when openings are protected with radiant heat attenuating screens.

Radiant heat attenuation model

Inputs

General parameters

Received radiation:	36.05	kW/m^2
Ambient temperature:	20	°C
Heat transfer coefficient:	8	W/m^{2}K
Emissivity:	0.9	
Sprinkler protection (Y/N):	N	

Screen parameters

Warp wire diameter:	0.9	mm
Weft wire diameter:	0.9	mm
# Warp strands per inch:	10	
# Weft strands per inch:	10	

Results

Attenuation factor	0.583	
Exposed wire surface area per m^2 of screen:	1.17	m^2
Temperature:	709.0	K
Energy absorbed:	18919.0	W/m^2
Energy dissipated:	18919.0	W/m^2
Energy difference:	0.0	W/m^2
Gauze temperature:	**435.9**	**°C**
Radiant heat transmitted through screen:	**15.0**	**kW/m^2**
Radiant heat reemitted by screen:	**7.5**	**kW/m^2**
Total transmitted radiant heat:	**22.5**	**kW/m^2**

C.2 Openings located 2.7m from perpendicular FSF

C.2.1 Size of fire source feature required

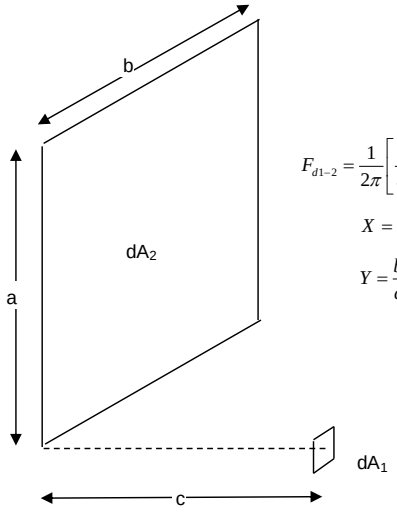
Criteria	Data	Comment
Heat flux received on boundary	80kW/m^2	In accordance with verification method CV1
Heat flux received at 3m from boundary	20 kW/m^2	In accordance with verification method CV1
Equivalent temperature to 80kW/m^2	817°C See section C.2.2	Conversion of heat flux into temperature
Width * height of worst case FSF under verification method CV1 of the BCA.	**3.1m x 3.1m** See section C.2.3	Determined based upon equations provided within chapter 1-4 of the SFPE Handbook

C.2.2 Calculation of equivalent temperature

Calculation of Equivalent Temperature			
Inputs			
Configuration factor	f	1	
Stephan Boltzman Constant	s	5.7E-08	$W/m^2 K^4$
Emmisivity	e	1	
Heat Flux	q_r	80	kW/m^2
Output			
Temperature Equivalent	**T**	**1090**	**K**
		817	**°C**

C.2.3 Calculation of size of fire source feature

Calculation of Size of FSF



$$F_{d1-2} = \frac{1}{2\pi}\left[\frac{X}{\sqrt{1+X^2}}\tan^{-1}\left(\frac{Y}{\sqrt{1+Y^2}}\right)+\frac{Y}{\sqrt{1+Y^2}}\left(\frac{X}{\sqrt{1+Y^2}}\right)\right]$$

$$X = \frac{a}{c}$$

$$Y = \frac{b}{c}$$

Inputs

Model Parameters		
Distance to Boundary	3	m
Heat Flux Required	20	kW/m^2

Outputs

Calculation Parameters			
a	1.55	X	0.516
b	1.55	Y	0.516
c	3	F_{d1-2}	0.063

Note Calculation assummes a = b for simplicity

Temperature of Fire Source Feature	**817**	**° C**
Emmisivity	**1**	
Stefan Boltzman Constant	**5.67E-11**	**kW/m^2K^4**
Final Configuration Factor	**0.25**	
Calculated Heat Flux	**20.00**	**kW/m^2**
Difference	0	

Size of Fire Source Feature Required

Width of FSF	3.10	m
Height of FSF	3.10	m

C.2.4 Opening located 2.7m away from boundary

Program Radiation

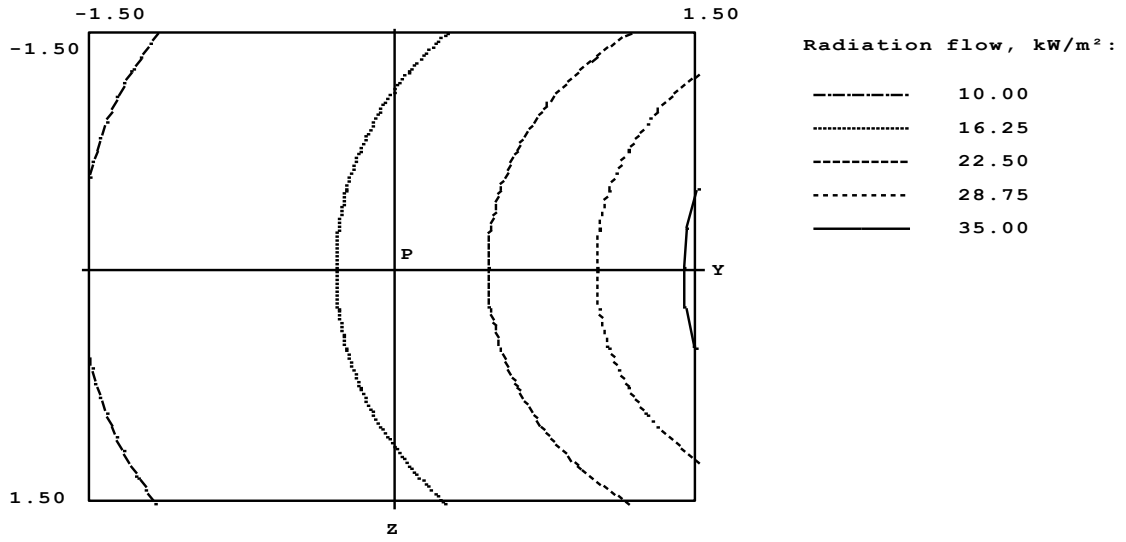
(All dimensions are in meters)

Y-sources:

Radiation temperature 817°°

Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
2.7	0	1.55	3.1	3.1	100

RADIATION MAP YZ



Nodal radiation data, kW/m²:

Z \ Y	-1.50	-0.75	0.00	0.75	1.50
-1.50	8.984	11.47	14.84	19.37	25.22
-0.75	9.870	12.94	17.40	23.96	33.65
0.00	10.19	13.49	18.36	25.63	36.19
0.75	9.870	12.94	17.40	23.96	33.65
1.50	8.984	11.47	14.84	19.37	25.22

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0°$, $\varphi = 66.8°$