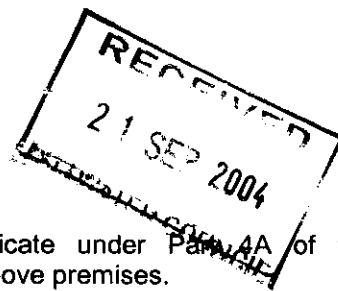


15 September 2004

The General Manager
Customer Service
Pittwater Council
PO Box 882,
Unit 1, Vuko Place
Warriewood NSW 2120

Dear Sir/Madam,

1017 BARRENJOEY RD, PALM BEACH
DEVELOPMENT APPLICATION NO. DA N1118/00
CONSTRUCTION CERTIFICATE NO. 23250/1



City Plan Services have issued a Construction Certificate under Part 4A of the Environmental Planning and Assessment Act 1979 for the above premises.

Please find enclosed the following documentation:

- Construction Certificate No. CC 23250/1
- Copy of application for Construction Certificate.
- Documentation used to determine the application for the Construction Certificate as detailed in Schedule 1 of the certificate.
- Notice of Appointment of Principal Certifying Authority.
- Cheque for Council's registration fee.

Our client has been advised of the necessity to submit to Council the notice of commencement of building works 48 hours prior to the commencement of works.

Should you need to discuss any issues, please do not hesitate to contact the Project Building Surveyor Rohan Defries on 8270-3500.

Yours Sincerely

Brendan Bennett
Director
encl

RMIC \$30 Rm 15210721/9/04

Pittwater Council

ABN: 61340837871

TAX INVOICE
OFFICIAL RECEIPT
R/152107

21/09/2004 Receipt No 152107

To CITY PLAN SERVICES PTY LTD

LEVEL 1, 364 KENT STREET
SYDNEY NSW 2000

Qty/ Applic	Reference	Amount
1017	RMIC-Rcrd	\$27.27
GL Rec	N1118/00 1017	
	BARRENJOEY RD PALM BEACH	
	GST	\$2.73
GL Rec		
	To GL Receipt:	

Total Amount:	\$30.00
Includes GST of:	\$2.73

Amounts Tendered	
Cheque	\$30.00
Total	\$30.00
Rounding	\$0.00
Change	\$0.00
Nett	\$30.00

Printed 21/09/2004 11:52:08 AM
Cashier RWild

PLANNING
ENGINEERING
SURVEYING
LANDSCAPE
URBAN DESIGN

CITY PLAN SERVICES

1017 Barrenjoey Road, Palm Beach
Construction Certificate No. 23-250/1

CONSTRUCTION CERTIFICATE NO. 23250/1

Issued under Part 4A of the Environmental Planning and Assessment Act 1979
Sections 109C and 81A(5)

APPLICANT

Name:

John David

Address:

Lot 1 Pier 8/9 Hickson Rd, Walsh Bay

Contact Details:

Phone: 8259 7388

Fax: 8259 7377

OWNER

Name:

Tony Touma

Address:

Lot 1 Pier 8/9 23 Hickson Rd, Walsh Bay

Contact Details:

Phone: 8259 7388

Fax: 8259 7377

DEVELOPMENT CONSENT

Consent Authority/Local Government Area:

Pittwater Council

Development Consent No:

DA 11033 of 2001 and DA N1118/00

(Land and Environment Court of NSW)

Date of Development Consent:

14.02.03, 13.08.04

PROPOSAL

Address of Development:

1017 Barrenjoey Rd, Palm Beach

Building Classification:

Class 2, 7a & 8

Type of Construction:

Type A and Type C

Scope of building works covered by this Notice:

modifications to an existing approval.

Value of Construction Certificate (Incl GST):

Nil additional cost

Plans and Specifications approved:

Schedule 1

Fire Safety Schedule:

Schedule 2

Exclusions:

Nil

Conditions (Clause 187 or 188 of the Environmental
Planning & Assessment Regulation 2000):

Nil

PROJECT BUILDING SURVEYOR

Please contact **Rohan Defries**
for any inquiries

CERTIFYING AUTHORITY

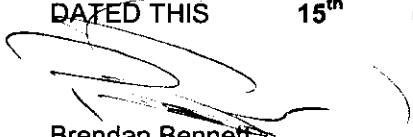
Brendan Bennett for and on behalf of
City Plan Services Pty Ltd

ACCREDITATION BODY

**Planning Institute Australia NSW Accreditation
Scheme**
Registration No. 3004

That I, Brendan Bennett, as the certifying authority, certify that the work if completed in accordance with the plans and specifications identified in Schedule 1 (with such modifications verified by the certifying authority as may be shown on that documentation) will comply with the requirements of the Environmental Planning & Assessment Regulation 2000 as referred to in section 81A(5) of the Environmental Planning and Assessment Act 1979.

DATED THIS 15th day of September 2004


Brendan Bennett
Director

NB: Prior to the commencement of work S81A (2) (b) and (c) of the Environment Planning and Assessment Act 1979 must be satisfied.

SCHEDULE 1 APPROVED PLANS AND SPECIFICATIONS

1. Endorsed architectural plans prepared by Walter Barda Design

Plan Title	Drawing No	Revision	Date
Plans – ground floor	CI 201	C	03.04
Plans – first and second floor	CI 202	C	03.04
Roof and site plan	CI 200	C	03.04
NW / SE elevations	CI 100	C	03.04
NE / SW elevations	CI 101	C	03.04
Elevations east and west	CI 102	C	03.04
Unit 4 elevations / section	CI 103	C	03.04

2. Other documents relied upon

Title	Prepared By	Reference	Date
Construction Certificate Application	City Plan Services		10.09.04
Fire engineered solution	Defire	03164 R1.2	June 2004
Compliance certificate	Steve Wise and Associates	2004/C182	13.09.04
Peer review of alternative solution report	Steve Wise and Associates	176	13.09.04
Letter re: compliance with the requirements of fire engineered solution	Defire	03164	23.08.04

SCHEDULE 2

FIRE SAFETY SCHEDULE

FIRE SAFETY MEASURES	PROPOSED STANDARD OF PERFORMANCE
Automatic fire detection and alarm system	BCA E2.2 & Spec E2.2a, & AS 1670.1-1995, AS 3786-1993
Emergency lighting	BCA E4.2, E4.4 & AS/NZS 2293.1-1998
Exit signs	BCA E4.5, E4.6. & E4.8, AS/NZS 2293.1-1998
Fire doors	BCA Spec.C3.4 & AS1905.1-1997
Fire hydrant systems	BCA E1.3 AS2419.1-1994
Fire seals protecting openings in fire resisting components of the building	BCA C3.12, C3.15, Spec. C3.15
Portable fire extinguishers	BCA E1.6 & AS2444-1995
Wall wetting sprinkler and drencher systems	C3.4
Smoke detectors and heat detectors	BCA E2.2 & Spec E2.2a AS 1670.1-1995, AS 3786-1993
Alternative Solution 1 (unprotected steel elements)	Recommendations contained in fire engineered solution report No: 03164 R1.2 dated June 2004 prepared by Defire Pty Ltd
Alternative Solution 2 (openings to carpark within 3m of boundary)	Recommendations contained in fire engineered solution report No: 03164 R1.2 dated June 2004 prepared by Defire Pty Ltd
Alternative Solution 3 (non-fire isolated stair bounding construction)	Recommendations contained in fire engineered solution report No: 03164 R1.2 dated June 2004 prepared by Defire Pty Ltd
Alternative Solution 4 (winders in lieu of landings)	Recommendations contained in fire engineered solution report No: 03164 R1.2 dated June 2004 prepared by Defire Pty Ltd

CONSTRUCTION CERTIFICATE APPLICATION

Made under the *Environmental Planning and Assessment Act 1979*

Sections 81A(2), 109C(1)(b)

IDENTIFICATION OF BUILDING

Address 1017 BARRENJOEY RD, PALM BEACH

Lot, DP/MPS etc LOT 53, DP 836320

Suburb or town PALM BEACH Post Code 2108

DESCRIPTION OF DEVELOPMENT

Detailed Description:

DEMOLITION OF EXISTING COMMERCIAL STRUCTURE &
CONSTRUCTION OF 3 RESIDENCES WITH
BASEMENT PARKING + SEPARATE COMMERCIAL
(MARINE BASED) PREMISES

APPLICANT

Name _____ Company PARKVIEW CONSTRUCTIONS

Address LOT 1 PIER 8/9 HICKSON RD

Suburb or town WALSH BAY Post Code 2000

Phone B/H 82597388 Fax No 82597377

Mobile _____ Email _____

As the applicant, I/we hereby submit this Construction Certificate Application under the Environmental Planning & Assessment Act 1979, with City Plan Services Pty Ltd.

Signature of applicant:

Sign  Date 10.09.04

CONSENT TO ALL OWNER(S)

Name TONY TALMA Company _____

Address LOT 1, PIER 8/9 23 HICKSON RD

Suburb or town WALSH BAY Post Code 2000

Phone B/H 82597388 Fax No 82597377

Mobile — Email —

As the owner of the above property:

1. I/we consent to this application; and
2. I/we appoint Brendan Bennett of City Plan Services Pty Ltd as the Principal Certifying Authority for the building work identified in this application.

Signature of Owner

Sign  Date 9/9/2004

VALUE OF WORK

Estimated Cost of work:

\$ 2,700,000

GST:

\$ 270,000

For developments over \$5 million, a Quantity Surveyors Certificate verifying the cost must be submitted on lodgement of the application.

DEVELOPMENT CONSENT

Development Consent No

No. 11033 OF 2001

Date of Determination

Date 14.02.2003

BUILDING CODE OF AUSTRALIA
BUILDING CLASSIFICATION

Nominated on the Development Consent

Class 2 + 5

RESIDENTIAL BUILDING WORK

Relevant only to residential building work

Owner-builder Permit No. _____

or

Name of Builder PARKVIEW CONSTRUCTIONS

Address LOT 1, PIER 8/9 23 HICKSON RD WAUSAH BAY 2000

Telephone 0259 7388 Fax 0259 7377

Contractor License No. 82222 C

REQUIRED ATTACHMENTS

- Note 1 details the information that must be submitted with an application for a construction certificate for proposed building works
- Note 2 details the additional information that may be submitted with an application for a construction certificate for proposed residential building work.

Schedule 1 information to be
Collected for ABS Particulars of the proposal

DESCRIPTION

What is the area of the land (m²)

1333 m²

Gross floor area of existing building (m²)

What are the current uses of all or parts of the building(s)/land?

APPROX 510 m²

(If vacant state vacant)

Location

Use

FRONT (STREET)

COMMERCIAL (ADMIN)

REAR

COMMERCIAL (WORKSHOP)

Does the site contain a dual occupancy?

NO

What is the gross floor area of the proposed addition or new building (m²)

1185.7 m²

What are the proposed uses of all parts of the building(s)/land?

Location

Use

FRONT (STREET)

COMMERCIAL

REAR

RESIDENTIAL

Number of pre-existing dwellings

NIL

Number of dwellings to be demolished

NIL

How many dwellings are proposed?

3 DWELLINGS + 1 COMMERCIAL

How many storeys will the building consist of?

3

MATERIALS TO BE USED

Walls	Code	Roof	Code
Brick veneer	12	Aluminium	70
Full brick	11	Concrete	20
Single brick	11	Concrete tile	10
Concrete block	11	Fibrous cement	30
Concrete/ masonry	20	fibreglass	80
Concrete	20	Masonry/terracotta	10
Steel	60	a shingle tiles	20
Fibrous cement	30	Slate	60
Hardiplank	30	Steel	10
Timber/weatherboard	40	Terracotta tile	10
Cladding aluminium	70	Other COPPER	80
Curtain glass	50	Unknown	90
Other			
Unknown	90		
Floor	Code	Frame	Code
Concrete	20	Timber	40
Timber	10	Steel	60
Other	80	Other	80
Unknown	90	Unknown	90

Schedule 2 – Existing Essential Fire Safety Measures
Part 1 of 2

Item No.	Existing Measure	Is this measure installed in the Building? Yes / No	If yes, enter the current standard of performance (eg: ORD 70 Clause 19.2 or BCA Clause E1.5 & AS 2118.1-1999)
1	Access Panels, doors and hoppers to fire resisting shaft		
2	Automatic fail safe devices		
3	Automatic fire detection and alarm system		
4	Automatic fire suppression system (sprinkler)		
5	Automatic fire suppression system (others – specify)		
6	Emergency lighting		
7	Emergency lifts		
8	Emergency warning and intercommunication system		
9	Exit signs		
10	Fire control centres and rooms		
11	Fire dampers		
12	Fire doors		
13	Fire hydrant systems		
14	Fire seals (protecting openings in fire resisting components of the building)		
15	Fire shutters		
16	Fire windows		
17	Hose reel system		
18	Light weight construction		
19	Mechanical air handling systems		
20	Paths of travel stairways passageways or ramps		
21	Perimeter vehicle access for emergency vehicles		
22	Portable fire extinguishers		
23	Pressurising system		
24	Required (automatic) exit doors		
25	Safety curtains in proscenium openings		
26	Smoke and Heat Vents		
27	Smoke Control System		
28	Smoke dampers		
29	Smoke detectors and heat detectors		
30	Smoke doors		
31	Solid-Core doors		
32	Stand-By Power Systems		
33	Wall wetting sprinkler and drencher systems		
34	Warning and operational signs		
35	OTHERS - Specify		

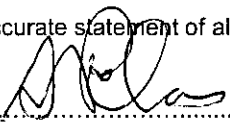
This is an accurate statement of all existing Fire Safety Measures implemented in the whole building.

Signed (Owner/ Agent) Name Date

Schedule 3 – Proposed Essential Fire Safety Measures
Part 2 of 2

Item No.	Proposed New Measure	Is this measure Installed in the Building? Yes or No	If yes, enter the current standard of performance (eg: BCA Clause E1.5 & AS2118.1-1999)
1	Access Panels, doors and hoppers to fire resisting shaft	NO	
2	Automatic fail safe devices	NO	
3	Automatic fire detection and alarm system	YES	E2.2, SPEC E2.2a AS1670 & AS3786
4	Automatic fire suppression system (sprinkler)	NO	
5	Automatic fire suppression system (others – specify)	NO	
6	Emergency lighting	YES	Part E4 & AS2293.1
7	Emergency lifts	NO	
8	Emergency warning and intercommunication system	NO	
9	Exit signs	YES	Part E.4 & AS2293.1
10	Fire control centres and rooms	NO	
11	Fire dampers	NO	
12	Fire doors	YES	AS1901.1
13	Fire hydrant systems	YES	E1.3 & AS2419.1
14	Fire seals (protecting openings in fire resisting components of the building)	YES	C3.15 & SPEC C3.15
15	Fire shutters	NO	
16	Fire windows	NO	
17	Hose reel system	NO	
18	Light weight construction	NO	
19	Mechanical air handling systems	NO	
20	Paths of travel stairways passageways or ramps	NO	
21	Perimeter vehicle access for emergency vehicles	NO	
22	Portable fire extinguishers	YES	E1.6 & AS2444
23	Pressurising system	NO	
24	Required (automatic) exit doors	NO	
25	Safety curtains in proscenium openings	NO	
26	Smoke and Heat Vents	NO	
27	Smoke Control System	NO	
28	Smoke dampers	NO	
29	Smoke detectors and heat detectors	YES	E2.2, AS3786 & AS1670
30	Smoke doors	NO	
31	Solid-Core doors	NO	
32	Stand-By Power Systems	NO	
33	Wall wetting sprinkler and drencher systems	NO	
34	Warning and operational signs	NO	
35	OTHERS - Specify		

This is an accurate statement of all proposed Fire Safety Measures to be installed/ modified in the whole building.

Signed  (Owner/ Agent) Name STEVEN NIHAY Date 10.09.04

NOTES

For Completing Construction Certificate Application

Note 1

The following information must accompany applications for a construction certificate for building and subdivision work.

Building Work

In the case of an application for a construction certificate for **building work**:

- a) Copies of compliance certificates relied upon
- b) Four (4) copies of detailed plans and specifications

The plan for the building must be drawn to a suitable scale and consist of a general plan and a block plan. The general plan of the building is to:

- show a plan of each floor section
- show a plan of each elevation of the building
- show the levels of the lowest floor and of any yard or unbuilt on area belonging to that floor and the levels of the adjacent ground
- indicate the height, design, construction and provision for fire safety and fire resistance (if any).

Where the proposed building work involves any alteration or addition to, or rebuilding of, an existing building the general plan is to be coloured or otherwise marked to the satisfaction of the certifying authority to adequately distinguish the proposed alteration, addition or rebuilding.

Where the proposed building work involves a modification to previously approved plans and specification the general plans must be coloured or otherwise marked to the satisfaction of the certifying authority to adequately distinguish the modification.

The specification is:

- to describe the construction and materials of which the building is to be built and the method of drainage, sewerage and water supply
- state whether the materials proposed to be used are new or second hand and give particulars of any second-hand and give particulars of any second-hand materials to be used.

- c) Where the application involves an alternative solution to meet the performance requirements of the BCA, the application must also be accompanied by:
 - details of the performance requirements that the alternative solution is intended to meet, and
 - details of the assessment methods used to establish compliance with those performance requirements.
- d) Evidence of any accredited component, process or design sought to be relied upon.
- e) Except in the case of an application for, or in respect of, a class 1a or class 10 building:
 - a list of any fire safety measures that are proposed to be implemented in the building or on the land on which the building is situated; and
 - if the application relates to a proposal to carry out any alteration or rebuilding of, or addition to, an existing building, a separate list of such of those measures as are currently implemented in the building or on the land on which the building is situated.

The list must describe the extent, capacity and basis of design of each of the measures concerned.

Note 2

Home Building Act Requirements

In the case of an application for a construction certificate for residential building work (within the meaning of the *Home Building Act 1989*) attach the following:

- a) In the case of work by a licensee under that Act:
 - (i) a statement detailing the licensee's name and contractor licence number, and
 - (ii) documentary evidence that the licensee has complied with the applicable requirements of that Act*,
or
- b) In the case of work done by any other person:
 - (i) a statement detailing the person's name and owner-builder permit number, or
 - (ii) a declaration signed by the owner of the land, to the effect that the reasonable market cost of the labour and materials involved in the work is less than the amount prescribed for the purposes of the definition of **owner-builder work** in section 29 of that Act.
 - (iii)

*A certificate purporting to be issued by an approved insurer under Part 6 of the *Home Building Act 1989* to the effect that a person is the holder of an insurance contract issued for the purposes of that Part, is sufficient evidence that the person has complied with the requirements of that Part.

FACSIMILE

DEFIRE Pty. Limited

ABN. 30 099 090 089

Telephone 02 9211 4333

Facsimile 02 9211 4366

Suite 3, Level 4, 83-97 Kippax Street Surry Hills NSW 2010

P.O. BOX 2046 Strawberry Hills NSW 2010



TO:	Waller Barda	COMPANY:	Walter Barda Architecture
FAX:	(02) 9360 2324	PAGES:	Page 1 of 1
CC:	Steven Nilhas, Parkview Construc. Rohan Defries, City Plan Services	FAX:	(02) 8259 7377 (02) 8270 3501
FROM:	Micael Lundqvist	DATE:	23-08-2004
RE:	1017 Barrenjoey Road, Palm Beach	REF No:	03164

Walter,

As describe in our fax (29/04/2004) and discussed over the phone last week the bounding walls at Units 1 & 2 entries could be constructed of translucent glass blocks with a fire rating of not less than -/60/-.

The glass blocks are expected to significantly reduce the radiant heat flux onto the evacuation path in the stair. However, in the event of a fully developed flashover fire the heat flux in the stair could exceed 10kW/m².

As mentioned in the previous fax a localised heat detector is therefore required in the entry area inside the lower sole-occupancy unit that has to be passed by evacuating occupants. The heat detector must be linked to an evacuation alarm to provide occupants in both SOUs within the building with early warning in the event of a fire.

As discussed wall-wetting sprinklers are not considered to be required for this alternative as occupant are expected to be able to evacuate the building before a flashover fire would occur. This is subject to approval by the certifying authority and potential peer reviewer.

If you have any further questions call me on 9211 4333 or 0409 246 666.

Regards,

Micael Lundqvist
Senior Fire Safety Engineer



FIRE SAFETY ENGINEERS
BUILDING CODE CONSULTANTS

File 2004/C182

Monday, 13 September 2004

John David
Parkview Constructions Pty Ltd
Lot 1, Pier 8/9
23 Hickson Road
WALSH BAY NSW

**RE: Peer Review of Defire Pty Ltd Alternative Solution Report 03164 R1.2
1017 Barrenjoey Road, Palm Beach, NSW**

1.0 INTRODUCTION

A peer review of the "Alternative Solution Report" (herein called the Report) for the proposed residential development and boat storage facility at 1017 Barrenjoey Road, Palm Beach, NSW has been completed. This review relates to Report No. 03164 R1.2 by Defire Pty Ltd, dated June 2004.

The attached Compliance Certificate is issued as per the requirements of Part 4A of the Environmental Planning and Assessment Act 1979.

Prior to issuing a certificate, the Accredited Certifier, Fire Safety Engineering must be satisfied that the analysis proposed meets the relevant provisions of the Building Code of Australia (BCA).

This peer review has been undertaken at the request of Parkview Constructions Pty Ltd to provide a Compliance Certificate for the solution proposed in Section 12 of the Report - Fire Safety Measures.

2.0 SCOPE

The scope of this peer review is limited to assessing the methodology used and the resultant conclusions contained within the Report related to the ability of the design to provide for effective fire resistance levels and protection of openings as well as egress via the non-fire-isolated stairway.

3.0 COMMENTS

The Report provides assessment of the following non-compliances to the Deemed-to-Satisfy (DTS) requirements of the BCA.

Assessment 1: Table 3 of Specification C1.1 of the BCA requires loadbearing internal beams, trusses and the like to achieve a Fire Resistance Level (FRL). The second floor (top level) contains loadbearing structural elements that support the roof which do not achieve any FRL. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(ii). The relevant Performance Requirements are CP1 and CP2.

Assessment 2: Openings from the carpark are within 3 metres of the south-eastern boundary and are not protected in accordance with Clauses C3.2 and C3.4 of the BCA. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(i). The relevant Performance Requirement is CP2.

Assessment 3: The design of the bounding construction of units 1 & 2 to the non-fire-isolated stairway incorporates glazed elements which are proposed to be sprinkler protected. BCA Clause C3.11 does not allow for glazing in openings in required bounding construction. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(ii). The relevant Performance Requirement is CP2.

Assessment 4: The non-fire-isolated stairway has winders in lieu of a landing providing access and egress from Unit 2 which is not permitted under BCA Clause D2.13. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(ii) and the Assessment Method A0.9(c). The relevant Performance Requirement is DP2.

The following general comment is made:

- The point related to glazing in Section 12 contains typographical errors. These errors are not considered to change the intent of the requirement, therefore no action is recommended.

The attached Compliance Certificate states that the concept design related to the above non-compliances has been completed and complies with the *Fire Safety Engineering Guidelines* and the Assessment and Verification Methods of the BCA.

The analyses were conducted in accordance with the procedures for both an Evaluation Extent 1 (Single Sub-system) and an Evaluation Extent 2 (Multiple Sub-systems) as outlined in the *Fire Safety Engineering Guidelines* ⁽¹⁾.

4.0 CONCLUSIONS

The Report demonstrates that Performance Requirements CP1, CP2 and DP2 of the BCA are met through Assessment Methods A0.9(b)(i), A0.9(b)(ii) and A0.9(c).

Stephen Wise & Associates Pty Ltd, supports the concept, structure and outcomes of the Alternative Solution Report No. 03164 R1.2 for 1017 Barrenjoey Road, Palm Beach, NSW.

The Compliance Certificate for the concept design is attached.

The Certificate states that the design achieves compliance with Performance Requirements CP1, CP2 and DP2 of the BCA subject to the requirements in the Fire Safety Measures, Section 12 of the Report, being implemented.

If you require any further information, please call on the numbers provided.

Yours sincerely,



Stephen Wise
Fire Safety Engineer
BSAP Registration No: 6493

¹ *Fire Safety Engineering Guidelines* - Australian Building Codes Board - Edition 2001 - November 2001 - p. 1.2 - 13



COMPLIANCE CERTIFICATE – ENVIRONMENTAL PLANNING & ASSESSMENT

Part 4A

Compliance Certificate

Issued under the Environmental Planning and Assessment Act 1979
Section 109C (1) (a)

Certificate

applicant

name
address
contact no (phone/fax)

John David
Parkview Constructions Pty Ltd
Lot 1, Pier B/9
23 Hickson Road
WALSH BAY NSW

Development consent no or complying development certificate

(where in force)
development consent no/CDC no
date of determination

DA Number Land and Environment Court Appeal No 11033 of 2001
Dated 14 February 2003, and S96 N1118/00, dated 13 August 2004

construction certificate

(where in force)
certificate no
date of issue

Description of development

The proposed development at 1017 Barranjoey Road, Palm Beach has a
rise in storeys of 3 and incorporates residential, carparking and boat
storage facilities.

Subject land

address

1017 Barranjoey Road
PALM BEACH NSW 2108

lot, DM/MPS etc

type of certificate

Fire Safety Engineering Certificate

☒ specified proposal has been completed and complies with the Fire Safety Engineering Guidelines⁽¹⁾ and the Building Code of Australia (BCA).

give details of the specified aspects of development (eg footings, road construction, drainage system) and detail the plans and specifications the work relates to

This Compliance Certificate relates to Report No. 03164 R1.2, by
Defire Pty Ltd, dated June 2004. This report assesses the ability of
the design to provide for effective fire resistance levels and protection
of openings as well as egress via the non-fire-isolated stairway. The
report has been undertaken using methodologies described in the Fire
Safety Engineering Guidelines and the Assessment and Verification
Methods nominated in the BCA.

give details of the specific condition(s) of development consent or complying development certificate and detail the matter the condition relates to and the standards/instruments that the matter is required to comply with
give details of the classification of the building in accordance with the BCA (eg class 1 (a))

☐ Condition(s) has/have been completed with
N/a

☐ Classification of building or proposed building
Class 2, 7a & 8

¹ Fire Safety Engineering Guidelines – Australian Building Codes Board – Edition 2001 - November 2001

give details of the development and specified aspect of the development and the prescribed requirements it complies with

☐ Specified aspect of development complies with prescribed requirements

The Defire Report provides assessment of the following non-compliances to the Deemed-to-Satisfy (DTS) requirements of the BCA:

Assessment 1: Table 3 of Specification C1.1 of the BCA requires loadbearing internal beams, trusses and the like to achieve an Fire Resistance Level (FRL). The second floor (top level) contains loadbearing structural elements that support the roof which do not achieve any FRL. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(ii). The relevant Performance Requirements are CP1 and CP2.

Assessment 2: Openings from the carpark are within 3 metres of the south-eastern boundary and are not protected in accordance with Clauses C3.2 and C3.4 of the BCA. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(i). The relevant Performance Requirement is CP2.

Assessment 3: The design of the bounding construction of units 1 & 2 to the non-fire-isolated stairway incorporates glazed elements which are proposed to be sprinkler protected. BCA Clause C3.11 does not allow for glazing in openings in required bounding construction. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(i) and the Assessment Method A0.9(b)(ii). The relevant Performance Requirement is CP2.

Assessment 4: The non-fire-isolated stairway has winders in lieu of a landing providing access and egress from Unit 2 which is not permitted under BCA Clause D2.13. The Method of Meeting Performance Requirements nominated in the Report is A0.5(b)(ii) and the Assessment Method A0.9(c). The relevant Performance Requirement is DP2.

This Compliance Certificate states that the concept design has been completed and complies with Fire Safety Engineering Guidelines and the Assessment and Verification Methods of the BCA.

The analyses were conducted in accordance with the procedures for both an Evaluation Extent 1 (Single Sub-system) and an Evaluation Extent 2 (Multiple Sub-systems) as outlined in the Fire Safety Engineering Guidelines.

This Certificate states that the design achieves compliance with Performance Requirements CP1, CP2 and DP2 of the BCA subject to the requirements in the Fire Safety Measures, Section 12 of the Report, being implemented.

inspection date
date of inspection of building/subdivision of works

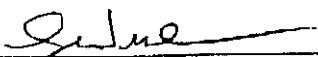
N/a

certificate

I, Stephen John Wise certify that:

- the nominated "Alternative Solution Report" has been completed and complies with the methodologies of the Fire Engineering Guidelines and the Assessment Methods described in the BCA.
- the building or proposed building designed constructed or adapted for use for the purpose of: Residential & Boat Storage Development.
- the above described aspect of development complies with the prescribed requirement referred to above.

signature
date of issue
certificate no


13 September 2004
176

plan(s) approved
list plans where relevant

N/a

certifying authority
name of certifying authority if accredited
certifier
accreditation no
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Stephen John Wise
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- * For the purposes of notifying a council under Part 8, Division 1, Clause 138 of the Regulation of the issue of compliance certificate, an accreditation certificate must forward all sections of this form, including all attachments to the relevant council where they have not been previously forwarded to the council.

Alternative Solution Report

1017 Barrenjoey Road Palm Beach

Report No. 03164 R1.2 dated June 2004

DEFIRE Pty. Ltd.

ABN: 30 099 090 089

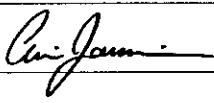
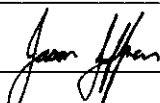
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I. AMENDMENT SCHEDULE

Version	Date	Information relating to Report		
R1.0	12/5/04	Reason for Issue	Draft report issued to the design team for comment.	
			Prepared by	Verified by
		Name	Micael Lundqvist	
		Signature		
R1.1	25/5/04	Reason for Issue	Revised draft report issued to the design team for comment.	
			Prepared by	Verified by
		Name	Chris Jamieson	
		Signature		
R1.2	25/06/04	Reason for Issue	Final report issued to Client, Certifier and Peer Reviewer.	
			Prepared by	Verified by
		Name	Chris Jamieson	Jason Jeffress
		Signature		
		Reason for Issue		
			Prepared by	Verified by
		Name		
		Signature		

II. EXECUTIVE SUMMARY

This alternative solution report documents the findings of a fire safety engineering assessment aimed at determining whether the proposed development at 1017 Barrenjoey Road, Palm Beach, achieves compliance with Performance Requirements CP1, CP2 and DP2 of the Building Code of Australia (BCA). Defire undertook the assessment at the request of Parkview Constructions P/L.

The design of the building includes areas which do not comply with the Deemed-to-Satisfy (DTS) provisions of the BCA. It is intended to apply a performance-based fire safety engineering approach to develop alternative solutions to the DTS provisions of the BCA related to the following areas:

- Second Floor contains unprotected structural steel elements that will not achieve the fire resistance levels specified by Specification C1.1 of the BCA.
- Openings in the Ground Floor carpark within 3 metres of the allotment boundaries which are not proposed to be protected in accordance with Clause C3.2 and C3.4 of the BCA.
- Design of the non fire-isolated stair serving Units 1 and 2 results in a non-compliance with the requirements for bounding construction specified by Clause C3.11 of the BCA.
- The required non fire-isolated exit serving Unit 1 on the Second Floor contains winders in lieu of landings as required by Clause D2.13 of the BCA.

This fire safety engineering assessment was undertaken to demonstrate that the design of the proposed development achieves compliance with the relevant Performance Requirements of the BCA in lieu of compliance with the DTS provisions.

The fire safety engineering assessment undertaken found that the design of the subject building achieves compliance with Performance Requirement CP1, CP2 and DP2 of the BCA, subject to the following recommendations:

- The provisions listed in **Section 12 – Fire Safety Measures** are to be strictly adhered to. The requirements listed in that Section are Essential Services and as such all fire safety systems should be identified as requiring maintenance and certification at appropriate intervals relative to their Australian Standard and the Environmental Planning and Assessment Regulations, 2000.
- A reassessment will be needed to verify consistency with the assessment contained within this report should a change in use, building alterations or additions occur in the future.

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1. Introduction

This alternative solution report documents the findings of a fire safety engineering assessment aimed at determining whether the proposed development at 1017 Barrenjoey Road, Palm Beach, achieves compliance with Performance Requirements CP1, CP2 and DP2 of the Building Code of Australia (BCA). Defire undertook the assessment at the request of Parkview Constructions P/L.

2. Fire Safety Engineering Brief

An informal Fire Safety Engineering Brief (FSEB) was held over the phone between Rohan Defries of City Plan Services and Micael Lundqvist of Defire Pty Limited on the 10-05-2004 in regard to the project. The FSEB was conducted with the relevant stakeholders involved in the formal approval process to identify the potential fire hazards and define the fire safety problems in qualitative terms, suitable for a detailed assessment and quantification.

At the conclusion of the meeting it was agreed that a formal FSEB meeting was not required and that the proposed design and alternative solution is suitable for detailed assessment and quantification based upon the identified essential information given in Sections 3, 4, 5 and 6. All parties agreed that the alternative solution report should be submitted to all relevant stakeholders identified in Table 2-1 for further comment following the detailed analysis and quantification.

Name	Role	Company	Telephone	Facsimile
Steven Nihás	Builder	Parkview Constructions	(02) 8259 7388	(02) 8259 7377
Walter Barda	Architect	Walter Barda Architects	(02) 9360 2340	(02) 9360 2324
Rohan Defries / Brendan Bennett	Project Certifier	City Plan Services	(02) 8270 3500	(02) 8270 3501
Ian Hayles	Structural Engineer	GHD	(02) 9239 7100	(02) 9239 7199
Micael Lundqvist	Fire Safety Engineer	Defire	(02) 9211 4333	(02) 9211 4366

Table 2-1 Key Stakeholders

3. Building Description

3.1 Building Characteristics

The proposed building has a rise in storeys of three comprising residential (Class 2) sole-occupancy units (SOU), car parking (Class 7a) and boat storage facilities (Class 8). The Ground Floor includes the bottom level of Unit 3, car parking and the boat storage area. Levels 2 and 3 contain the single level Units 1 and 2 and the upper two levels of Unit 3.

The SOU's on the upper levels of the building are served by a non fire-isolated stair. Based on the number of storeys contained and the classification of the top-most storey (Class 2) the building is required to be of Type A construction.

Adjacent to the main building is a small two-storey commercial/retail building above a basement level which is understood to be located not less than 6 metres from the main building and is subsequently classified as a separate building of Type C construction.

3.2 Alternative Solutions

The design of the building includes areas which do not comply with the Deemed-to-Satisfy (DTS) provisions of the BCA. It is intended to apply a performance-based fire safety engineering approach to develop alternative solutions to the DTS provisions of the BCA related to the following areas:

- Second Floor contains unprotected structural steel elements that will not achieve the fire resistance levels specified by Specification C1.1 of the BCA.
- Openings in the Ground Floor carpark within 3 metres of the allotment boundaries which are not proposed to be protected in accordance with Clause C3.2 and C3.4 of the BCA.
- Design of the non fire-isolated stair serving Units 1 and 2 results in a non-compliance with the requirements for bounding construction specified by Clause C3.11 of the BCA.
- The required non fire-isolated exit serving Unit 1 on the Second Floor contains winders in lieu of landings as required by Clause D2.13 of the BCA.

This fire safety engineering assessment was undertaken to demonstrate that the design of the proposed development achieves compliance with the relevant Performance Requirements of the BCA in lieu of compliance with the DTS provisions.

4. Scope, Limitations and Assumptions

4.1 Scope and Limitations

1. The scope of this Alternative Solution is limited to an assessment of the non-compliances with the DTS provisions of the BCA identified in Section 5.
2. The scope of the assessment is limited to compliance with 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, impact on tourism etc.) have not been considered, since they are outside the scope of the BCA.
3. The scope of this alternative solution report considers single point arson as a source of ignition. Arson involving accelerants and/or multiple ignition sources is not considered in this assessment, since it is outside the scope of the BCA.
4. The scope of this alternative solution report is limited to consideration of egress and fire safety issues for people with disabilities to the same degree as the DTS provisions of the BCA.
5. A reassessment will be needed to verify consistency with the assessment contained within this report, should a change in use, building alterations or additions, changes to the fire safety systems occur in the future.
6. The data, methodologies, calculations and conclusions documented within this alternative solution report specifically relate to the subject building and must not be used for any other purpose.
7. The documentation that forms the basis for this assessment is listed within Appendix A.

4.2 Assumptions

1. The building complies with the DTS provisions of the BCA except for the specific issues identified within Section 5.
2. As the building is similar in all respects to a DTS complying building, all of the fire safety systems are assumed to operate as designed unless specifically stated otherwise.

5. BCA Requirements Associated with the Alternative Solution

Table 5-1 outlines the BCA requirements associated with the alternative solution aimed at satisfying the relevant Performance Requirements.

Alt Sol	Description of Alternative Solution	DTS Provision	Performance Requirements	Method of Meeting Performance Requirements (A0.5)	Assessment Method (A0.9)
1.	Unprotected steel structure on Second Floor	Clause C1.1 and Specification C1.1	CP1 and CP2	A0.5(b)(i)	A0.9(b)(ii)
2.	Protection of openings within 3 metres of the allotment boundary.	Clause C3.2 and C3.4	CP2	A0.5(b)(i)	A0.9(b)(i)
3.	Bounding construction of Units 1 and 2.	Clause C3.11	CP2	A0.5(b)(i)	A0.9(b)(ii)
4.	Single stair with winders in lieu of landings.	Clause D2.13	DP2	A0.5(b)(ii)	A0.9(c)

Table 5-1 BCA Requirements Associated with the Alternative Solution

6. Evaluation Extent

A fire safety engineering assessment carried out in accordance with the Fire Safety Engineering Guidelines - Edition 2001⁽¹⁾ can generally be categorised into three different extents of evaluation – Extent 1, 2 and 3. The difference in the extents of evaluation lies with the number of sub-systems involved in the assessment. An Evaluation Extent 1 does not involve more than one sub-system. An Evaluation Extent 2 involves more than one sub-system, but not all six. An Evaluation Extent 3 involves all six sub-systems. All evaluation extents could involve either comparative or absolute types of assessments. The fire safety sub-systems specified by the Guidelines are as follows:



Sub-system A
Fire Initiation and Development and Control



Sub-system B
Smoke Development and Spread and Control



Sub-system C
Fire Spread and Impact and Control



Sub-system D
Fire Detection, Warning and Suppression



Sub-system E
Occupant Evacuation and Control



Sub-system F
Fire Brigade Intervention

The evaluation extents associated with each of issues assessed is identified within the methodology section of the respective alternative solutions.

¹ Australian Building Codes Board, *Fire Safety Engineering Guidelines – Edition 2001*, Australian Building Codes Board, November 2001.

7. Alternative Solution 1 – Unprotected Steel Structure on Second Floor

7.1 Introduction

The Second Floor load bearing roof structure is proposed to include unprotected structural steel elements that will not achieve the required Fire Resistance Levels (FRL) required by Specification C1.1 of the BCA. It is noted that the roof does not require an FRL under the Deemed-to-Satisfy (DTS) provisions of the BCA. Accordingly, an alternative solution has been formulated to demonstrate compliance with Performance Requirement CP1 and CP2 of the BCA.

7.2 Methodology

The assessment undertaken for the subject building is a qualitative absolute Evaluation Extent 2 involving the following sub-system(s):

- Sub-system C – Fire Spread and Impact and Control
- Sub-system E – Occupant Evacuation and Control
- Sub-system F – Fire Brigade Intervention

7.3 Objectives of Section C of the BCA

To make an assessment of whether the design of the building achieves compliance with Performance Requirements CP1 and CP2, the objectives of the BCA in relation to fire resistance must first be understood. The objective of Section C of the BCA (as stated by Object C01 of the BCA) is to:

- (a) safeguard people from illness or injury due to a fire in a building; and*
- (b) safeguard occupants from illness or injury while evacuating a building during a fire; and*
- (c) facilitate the activities of emergency services personnel; and*
- (d) avoid the spread of fire between buildings; and*
- (e) protect other property from physical damage caused by structural failure of a building as a result of fire.*

The objective of the Section C of the BCA is elaborated further by the Guide to the BCA which states:

Basis of Objective

This Objective is based on the belief that a building should:

- provide people with an environment which, during a fire, will minimise the risk of them suffering illness or injury;*
- provide people with an evacuation route which will minimise the risk of them suffering illness or injury while escaping a fire;*
- facilitate the role of emergency services personnel, such as the fire brigade, if it becomes necessary for them to undertake such operations as fire-fighting and search and rescue;*
- assist in minimising the risk of fire spreading from one building to another; and*

- not have a structural failure during a fire that results in damage to another building, allotment or road.

Spread of Fire

There is a continuing debate regarding the means by which the BCA should minimise the risk of fire spreading from one building to another. Should the greater degree of fire protection be in the building on fire, or should it be in the building at potential risk of the fire spreading?

Generally, the BCA provisions aim to minimise the spread of fire from the building on fire, but there are some provisions that limit the spread of fire from an adjacent building.

Consequently, CO1(d) states that the spread of fire is to be avoided 'between buildings' — that is, in either direction.

Protection of Other Property

The BCA is principally designed to maximise (within reasonable bounds) the safety, health and amenity of people in and around buildings. Protection of property, either the subject building or what is termed 'other property', is not generally a primary aim of the BCA — although it may sometimes be a consequence of the provisions of the BCA.

However, there are some exceptions to this rule, and the inclusion of 'other property' in CO1(e) is one of these. In this context, a building is expected to maintain the level of structural sufficiency necessary to prevent it causing damage to any other property as a result of fire. The reason CO1(e) concerns itself with the protection of other property is primarily because fire from a building should not pose a serious risk to the health, safety and amenity of the public or occupants of another building.

7.4 Assessment

7.4.1 Performance of Unprotected Steel Exposed to Fire

To undertake an assessment of the unprotected structural steel elements on the Second Floor, the performance of structural steel when exposed to fire must be understood. The design of structural steel under fire conditions is based upon the critical steel temperature concept. This is a comparison of the yield strength and loading at normal conditions and the yield strength and loading conditions in fire conditions.

The change in yield strength at elevated temperature has been experimentally investigated. An approximation of this test data has been included in many national standards such as AS 4100 (structural steel) and AS 3600 (reinforcing and pre-stressing steel)^[2]. The relationships stated in the standards are reproduced in Equation 7-1 and Figure 7-1.

$$\begin{aligned}k_{y,T} &= (905 - T) / 690 && \text{structural steel} \\k_{y,T} &= (720 - T) / 470 && \text{reinforcing steel} \\k_{y,T} &= (700 - T) / 550 && \text{prestressing steel}\end{aligned}$$

where :

T = Temperature (°C)

$k_{y,T}$ = Ratio of yield strength at elevated temperature to yield strength at 20°C

Equation 7-1 Relationship between yield stress ratio and temperature as specified in AS 4100 and AS 3600

² Buchanan, A.H., *Structural Design for Fire Safety*, John Wiley & Sons, 2001, pp198

The relationships show that the yield strength of steel sections when exposed to fire conditions does not reduce until the steel temperature reaches 215°C. At temperatures in excess of 215°C, the load-bearing capacity of structural steel begins to diminish. Once temperatures within a fire compartment reach approximately 500°C and above, many steel sections lose their ability to support their design loads and are considered to have failed.

Given that the structural steel columns within the subject building are not protected with any passive construction and the building is not protected with an automatic sprinkler system, a fire within the building may cause the SOU of fire origin to reach temperatures in the order of 600-1000°C, either locally in the region of flaming or the entire compartment, should flashover occur.

Temperatures between 600-1000°C are expected to cause failure of the unprotected steel structure within the SOU of fire origin. Consequently, this assessment was undertaken to examine the impact should the roof steel structure fail and be unable to support its design load.

Input was sought from the Project Structural Engineer, Ian Hayles of GHD Pty Ltd, who has assessed the proposed unprotected steel roof structure and determined that the unprotected steel elements can maintain their load bearing capacity at steel temperatures up to 750°C (limiting steel temperature). A copy of the correspondence from Ian Hayles, GHD P/L, is provided in Appendix B.

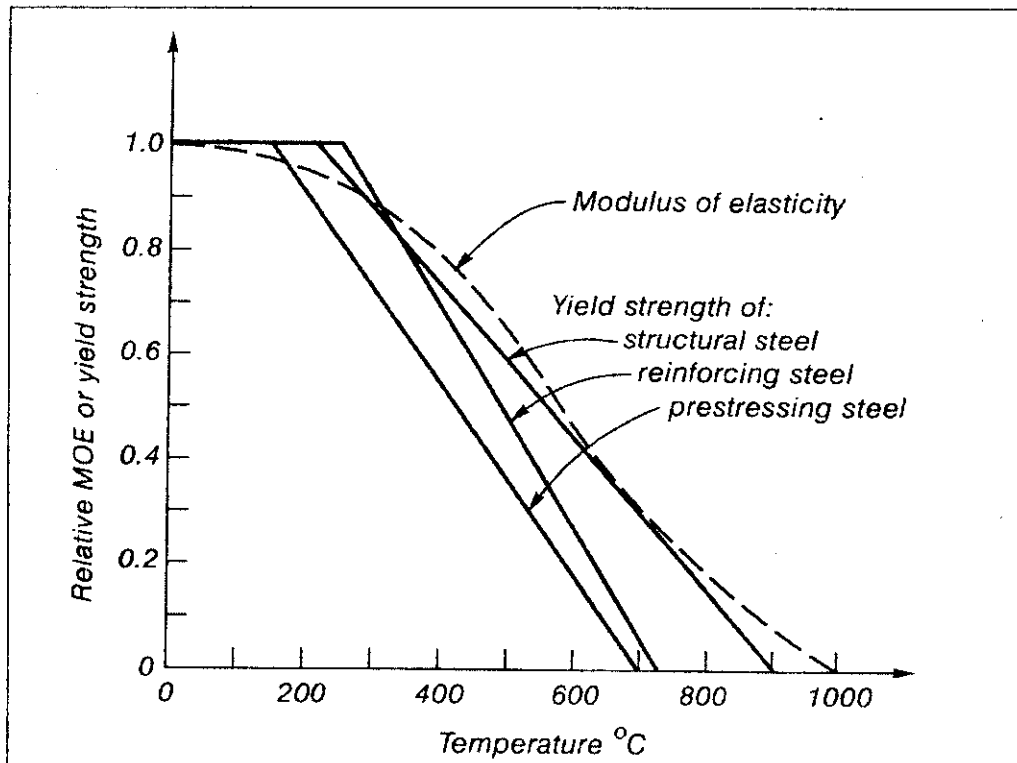


Figure 7-1 Design curves for reduction in yield strength of steel with temperature

7.4.2 Fire Resistance of Structural Elements

7.4.2.1 Occupant Life-safety

The first three points of Objective C01 of the BCA relate to the ability of the structure to remain intact for sufficient time for safe evacuation of the building to occur and the emergency services personnel to undertake their operations. The failure of heavily loaded unprotected steel

columns during fire conditions may lead to a serious structural failure within the building, which could represent a serious life-safety risk to any person within the building.

The subject building is designed with sufficient structural redundancy so that the failure of the unprotected roof steel structure will not "*compromise the structural stability or the fire separation of the storeys below*" [3]. The structural redundancy incorporated into the subject building design means that in the event of a fire in either of the SOU's on the Second Floor, the failure of the steel roof structure will not cause failure of the remainder of the building structure, including fire-rated floor slabs and external walls required to achieve an FRL.

This level of structural redundancy is considered to address the primary aim of Objective C01 which is to safeguard against the collapse of the building structure in the event of a fire and protect occupants of the building from the affects of structural failure due to a fire. This is particularly relevant to occupants who are remote from the SOU of fire origin who could potentially be unaware of a fire.

Occupants in the SOU of fire origin are anticipated to evacuate well before the roof steel structure could fail due to fire. Furthermore, temperatures that could cause failure of the steel structure are well in excess of the life-safety criteria for occupants given in Chapter 4 of the *Fire Engineering Guidelines*⁴ (See Table 7-1) given that the limiting steel temperature has been calculated to be 750°C (See Section 7.4.1).

No.	Tenability Criteria	Limiting Value	Comment
1	Hot Layer Height	2.1 m	If the hot layer below 2.1m tenability Criteria 3, 4 and 5 become the controlling factors.
2	Heat Radiation	2.5kW/m ²	@ 2.1m above floor level See Note 1.
3	Convected Heat	60°C	60°C as recommended by the Fire Engineering Guidelines for humid air/smoke
4	Visibility	10m	@ 2.0m above floor level
5	Toxicity	N/A	

Table 7-1 Tenability Acceptance Criteria

Note 1: For smaller enclosures of relatively low height, the heat radiation limit of 2.5kW/m² occurs when the hot layer reaches approximately 180 - 200°C. A hot layer temperature of 200°C is adopted as the limiting value for heat radiation for this assessment.

In consideration of the factors discussed above, the unprotected steel structure is not considered to increase the risk to life of occupants in the subject building.

7.4.2.2 Fire Brigade Intervention

The objective of CO1 also includes protection of fire-fighters during search and rescue activities and fire brigade intervention as attending fire-fighters could be injured by collapsing building elements.

In terms the life-safety of emergency personnel within the SOU of fire origin, temperatures that could cause structural failure of the roof structure are well in excess of the criteria for fire-

³ Advice Provided by Project Structural Engineer, Ian Hayles, GDH Pty Ltd, 03 June 2004. Correspondence attached in Appendix C.

⁴ *Fire Engineering Guidelines* 1996 - Fire Code Reform Centre Ltd - 1st Edition - March 1996 -- p. 4-7

fighters in full turnout gear based on the recommendations in the Fire Brigade Intervention Model (FBIM) ^[5] as described in Table 7-2.

No.	Tenability Criteria	Limiting Value	Comment
6	Heat Radiation	4.5 kW/m ²	@ 1.5 metres above floor level See Note 1.

Table 7-2 Tenability Criteria for Fire-Fighters

Note 2: For smaller enclosures of relatively low height, the heat radiation limit of 4.5kW/m² occurs when the hot layer reaches approximately 250-300°C. A hot layer temperature of 300°C is adopted as the limiting value for heat radiation for this assessment.

Emergency personnel are not considered to be placed under any additional threat as a result of the unprotected steel structure due to the following factors:

- Potential structural failure is understood to be localised to the fire area (i.e. area with temperatures in excess of 750°C) and progressive collapse will not occur;
- It is understood that failure of the steel structure on the top storey will not compromise the structural stability or the fire separation of the storeys below or the fire-rated external walls;
- It is understood that in the event of failure any collapse will be inwards preventing structural elements failing of the side of the building potentially injuring emergency services personnel ^[6]; and

7.4.3 Spread of Fire and Protection of Other Property

The remaining points of Objective C01 of the BCA relate to avoiding damage to surrounding properties, either through external spread of fire or damage caused by structural collapse. These points of the objective are based upon the design of the building as a whole. External spread of fire is based on the separation between buildings and the size of the openings. Damage due to collapse is caused by structural failure of building elements because of excessive heating.

The Second Floor of the building complies with the DTS provisions of the BCA (including the requirements of Section C) with the exception of the requirement for the steel structure supporting the roof to achieve an FRL of 60/-/. It is noted that the roof itself is not required to achieve an FRL under the DTS provisions of the BCA as the building is three-storeys.

The remainder of the external wall structure and the openings comply with the requirements of Section C of the BCA and as such will resist the spread of fire from adjacent properties to the degree required by the DTS provisions of the BCA.

7.5 Conclusion

The assessment of the subject building found that the unprotected steel roof structure on the Second Floor is not expected to impact upon the life-safety of occupants or emergency service personnel, or the likelihood of damage to the surrounding properties due to fire spread or structural collapse to the degree required by Objective C01 of the BCA. The design of the

⁵ Fire Brigade Intervention Model (FBIM), Australasian Fire Authorities Council, Australia 1997

⁶ Advice Provided by Project Structural Engineer, Ian Hayles, GDH Pty Ltd, 03 June 2004. Correspondence attached in Appendix C.

building is therefore considered to achieve compliance with Performance Requirements CP1 and CP2 of the BCA.

7.6 Compliance with the Performance Requirements

A summary of the assessment demonstrating compliance with the relevant Performance Requirements of the BCA is listed below:

CP1 *A building must have elements which will, to the degree necessary, maintain structural stability during a fire appropriate to-*

Criteria	Compliance
a) the function or use of the building; and	The relevant area of the building is residential (Class 2).
b) the fire load; and	The fire load in the SOU's is expected to be approximately 400-600MJ/m ² , which is constant with a residential use.
c) the potential fire intensity; and	A fully developed fire has been considered in the assessment.
d) the fire hazard; and	The fire hazard assessed is structural failure and fire spread.
e) the height of the building; and	The building has three storeys above ground.
f) its proximity to other property; and	The external wall structure on the Second Floor and openings comply with the requirements of Section C of the BCA and so will resist the spread of fire from adjacent properties to the degree required by the DTS provisions of the BCA.
g) any active fire safety systems installed in the building; and	The SOU's are provided with smoke alarms.
h) the size of any fire compartment; and	Equivalent to a DTS design solution.
i) other elements they support; and	The unprotected steel structure supporting the roof must not support any other loadbearing elements.
j) fire brigade intervention; and	The assessment has demonstrated that the critical temperature for fire brigade intervention is expected to be reached well before structural failure would be expected to occur.
k) the evacuation time	The assessment has demonstrated that the critical temperature for occupant egress is expected to be reached well before structural failure would be expected to occur.

CP2 (a) A building must have elements which will, to the degree necessary, avoid the spread of fire-

- i) to exits; and
- ii) to sole-occupancy units and public corridors; and
- iii) between buildings; and
- iv) in a building,

(b) Avoidance of the spread of fire referred to in (a) must be appropriate to-

Criteria	Compliance
i) the function or use of the building; and	The relevant area of the building is residential (Class 2).
ii) the fire load; and	The fire load in the SOU's is expected to be approximately 400-600MJ/m ² , which is constant with a residential use.
iii) the potential fire intensity; and	A fully developed fire has been considered in the assessment.
iv) the fire hazard; and	The fire hazard assessed is structural failure and fire spread.
v) the height of the building; and	The building has three storeys above ground.
vi) its proximity to other property; and	The external wall structure on the Second Floor and openings comply with the requirements of Section C of the BCA and so will resist the spread of fire from adjacent properties to the degree required by the deemed-to-satisfy provisions of the BCA.
vii) any active fire safety systems installed in the building; and	The SOU's are provided with smoke alarms.
viii) the size of any fire compartment; and	The sole occupancy units form individual fire compartments.
ix) other elements they support; and	The unprotected steel structure supporting the roof must not support any other loadbearing elements.
x) fire brigade intervention; and	The assessment has demonstrated that the critical temperature for fire brigade intervention is expected to be reached well before structural failure would be expected to occur.
xi) the evacuation time	The assessment has demonstrated that the critical temperature for occupant egress is expected to be reached well before structural failure would be expected to occur.

8. Alternative Solution 2 – Protection of Openings

8.1 Introduction

The proposed design includes louvred ventilation openings in the ground floor carpark within 3 metres of the South Eastern allotment boundary which are not proposed to be protected in accordance with Clause C3.2 and C3.4 of the BCA. Accordingly, an alternative solution has been formulated to demonstrate compliance with Performance Requirement CP2 of the BCA.

8.2 Intent of the BCA

To make an assessment of whether the design achieves compliance with Performance Requirement CP2 of the BCA, the intent of the Clause C3.2 must first be understood. The Guide to the BCA says 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.”*

8.3 Methodology

8.3.1 Evaluation Extent

The assessment undertaken for the subject building is a quantitative absolute Evaluation Extent 2 involving the following sub-system(s):

- Sub-system C – Fire Spread and Impact and Control
- Sub-system D – Fire Detection, Warning and Suppression

The methodology used to determine whether the building meets the requirements of Verification Method CV1 of the BCA has been divided into two sections for the assessment. The process for each component is described within Sections 8.3.2 and 8.3.3.

8.3.2 Radiation Emitted to Adjacent Properties

- Identify the openings in the subject building that could act as a source of fire spread (via radiant heat) to the 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 the AS218.2.
- 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.
- Develop a strategy to protect openings that emit more than 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.

8.3.3 Radiation Received from Adjacent Properties

- Establish the level of radiant heat flux required to be withstood by the openings that are within 3 metres of a FSF using Verification Method CV1 of the BCA.

Develop a strategy to protect openings that receive more than the critical level of radiant heat flux of 20kW/m^2 .

Clause C3.4 of the BCA does not require openings to be protected if they are 3 metres or more from a FSF. At a distance of 3 metres from the boundary, Verification Method CV1 requires openings to be capable of withstanding a heat flux of 20kW/m^2 . It is therefore concluded that openings receiving a heat flux of 20kW/m^2 or less do not require protection.

8.4 Assessment of Radiant Heat Emitted to Adjacent Properties

8.4.1 Potential Radiant Heat Sources

The dimensions and location of the openings used to calculate the radiant heat flux emitted for the fire scenarios listed in Table 8-1. To ensure a conservative analysis, these dimensions may be larger than the actual design.

Description of opening	Height (mm)	Adjusted Height (mm)	Width (mm)	Closest point of boundary to opening (mm)	Direction opening faces	Exposed boundary
2x Carpark ventilation openings	800	1000	2000	1400	South East	South East

Table 8-1 Dimensions and Location of Subject Opening

8.4.2 Fire Scenarios

Table 8-2 identifies the openings to be evaluated and the associated credible worst case fire scenarios assessed to determine the potential for fire spread from the subject building. These scenarios are considered to be representative of the subject openings for the purposes of determining the maximum radiant heat flux levels emitted at the location within the boundary of the adjoining property set out in Column 1 of Table CV1 where another building may be constructed.

Fire Scenario	Description of Scenario	Identified Opening	Associated Boundary
1	Fully developed fire (temperature 1000°C) adjacent to the subject openings.	2x carpark ventilation openings	South East

Table 8-2 Worst Case Fire Scenario

8.4.3 Radiant Heat Emitted to Adjacent Properties

The radiant heat levels emitted onto adjacent properties were calculated at the vertical plane locations identified in Column 1 of Table CV1. These calculations ignore the provision of the louvres and any associated benefit in terms of attenuation of the radiant heat emitted to the adjacent properties.

Table 8-3 contains a summary of the level of radiant heat flux emitted from the identified credible worst case fire scenario for the subject building. This is reported in terms of the heat flux received at the various locations identified within Column 1 of Table CV1. The output data has been included in Appendix C. 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 subject building is considered to achieve the criteria for Part (a) of Verification Method CV1 of the BCA

Scenario	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	34.4	14.4	4.7	1.7

Table 8-3 Radiant Heat Emitted from Opening at the Locations Nominated by Column 1 of Table CV1

8.5 Assessment of Radiant Heat Received from Adjacent Properties

The effect of the louvres must be assessed to determine whether the proposed protection method will achieve the criteria specified in Part (b) of Verification Method CV1 of the BCA. The louvres will act as a non-translucent barrier preventing the direct transmission of incident radiation from the allotment boundary into the subject building. The louvres required as part of this assessment must be designed to block radiation from all angles (i.e. you cannot see through them from any angle). Examples of the louvre designs are shown in Figure 8-1.

The louvres can be manufactured from aluminium or steel. However, if aluminium louvres are selected they will require wall-wetting sprinkler protection to the external face of the louvres. When the sprinklers operate, they will cool the external surfaces of the aluminium louvres. The presence of this water is expected to act as a buffer between the incident radiation and the louvre to limit the temperature of the louvres to approximately 100°C (being the boiling point of water) and maintain their structural stability.

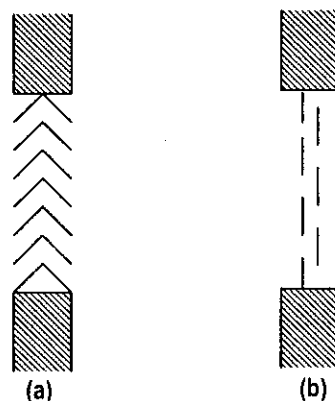


Figure 8-1 Example of louvre

Any radiant heat transfer through the subject openings will be the result of incident radiation heating the louvres above ambient conditions and causing them to act as a secondary source of radiant heat.

The level of radiant heat transferred from the surface of the louvre blades is a function of the temperature of the louvres. As the louvre elevates in temperature it will radiate heat both towards the opening and back towards the allotment boundary. The level of radiation emitted in both directions can be expected to be approximately 50% of the incident radiation from the

allotment boundary. This is a conservative calculation method as it ignores any heat losses likely to occur as a result of convective cooling or sprinklers if present.

Column 2 of Table CV1 nominates the radiant heat flux levels that openings must be capable of withstanding at various distances from the boundary. Based on these values, radiant heat fluxes can be interpolated using a power law relationship for openings located at distances between those given values. Using this relationship, the radiant heat flux received by the identified openings was calculated to be **35kW/m²** (See Appendix E for calculation output).

Assuming 50% of the incident radiant heat flux is re-emitted from the louvre in either direction the maximum radiant heat flux into the carpark is **17.5 kW/m²** ($35 \div 2$), which is less than the critical level of 20 kW/m². It is therefore considered that the proposed design of the subject building achieves the criteria for Part (b) of Verification Method CV1 of the BCA.

8.6 Conclusion

The fire safety engineering assessment undertaken for the proposed development demonstrates that the design meets the criteria specified within Parts (a) and (b) of Verification method CV1 of the BCA. It is therefore concluded that the proposed design of the building achieves compliance with Performance Requirement CP2, subject to the recommendations given in Section 12.

8.7 Compliance with the Performance Requirements

A summary of the assessment demonstrating compliance with the relevant Performance Requirements of the BCA is listed below:

- CP2** (a) A building must have elements which will, to the degree necessary, avoid the spread of fire-
- i) to exits; and
 - ii) to sole-occupancy units and public corridors; and
 - iii) between buildings; and
 - iv) in a building,
- (b) Avoidance of the spread of fire referred to in (a) must be appropriate to-

Criteria	Compliance
i) the function or use of the building; and	The subject building is a residential (Class 2) development with an associated carpark. This assessment relates only to the carpark.
ii) the fire load; and	Equivalent to complying design. The fire load in a carpark is expected to be low.
iii) the potential fire intensity; and	A fully developed fire was assumed for the assessment.
iv) the fire hazard; and	The fire hazard associated with the proximity of the subject openings to the boundary has been addressed by the provision of louvres shielding the openings. The assessment demonstrates that these louvres will limit the amount of radiant heat transmitted through the opening in accordance with the requirements of Verification Method CV1 of the BCA.
v) the height of the building; and	The subject building has a rise in storeys of three.
vi) its proximity to other property; and	The openings located 1.4 metres from the south eastern boundary have been shown to reduce the risk of fire spread between buildings on adjoining allotment/s to the degree necessary when protected with louvres.
vii) any active fire safety systems installed in the building; and	There are no active systems proposed in relation to this alternative solution. (Sprinklers if aluminium louvres are proposed).
viii) the size of any fire compartment; and	Equivalent to complying design.
ix) other elements they support; and	Equivalent to complying design.
x) fire brigade intervention; and	Fire Brigade Intervention has been conservatively ignored for the purposes of this assessment.
xi) the evacuation time	This assessment is not considered to be affected by the evacuation time.

9. Alternative Solution 3 – Bounding Construction of SOU

9.1 Introduction

The design of the bounding construction of Units 1 and 2 incorporates glazed walls and solid core doors between the Sole-Occupancy Units (SOU's) and the required non fire-isolated stair. The provision of glazing and solid core doors as part of the bounding construction does not comply with the construction requirements for the bounding construction of Class 2 SOU's for Type A construction as specified by Clause C3.11 of the BCA.

It is proposed to protect the glazed walls and the solid core doors with wall-wetting sprinklers that provide full coverage to the glazing and doors. Although the proposed protection does not comply with Clause C3.11 of the BCA, it is considered necessary to maintain the integrity of the bounding construction of the unit to the degree necessary to achieve compliance with Performance Requirement CP2 of the BCA.

9.2 Methodology

The assessment undertaken for the subject building is a qualitative absolute Evaluation Extent 2 involving the following sub-system(s):

- Sub-system C – Fire Spread and Impact and Control
- Sub-system D – Fire Detection, Warning and Suppression
- Sub-system E – Occupant Evacuation and Control

9.3 Intent of the BCA

To make an assessment of whether the design achieves compliance with Performance Requirement CP2 of the BCA, the intent of the Clause C3.11 of the BCA must first be understood.

The Guide to the BCA says that the intent of Clause C3.11 is *"to maintain the performance of a wall bounding any sole occupancy unit or public corridor in Class 2 or Class 3 buildings, and any sole occupancy unit in a class 4 part."*⁷

The purpose of maintaining the performance of the wall is considered to be to protect the egress route from heat and smoke to allow occupants to evacuate the building.

9.4 Assessment

9.4.1 Identification of Fire Scenarios

In order to assess the performance of the proposed design in relation to the intent of the BCA the affect of relevant fire scenarios must be examined in terms of the potential consequences to occupants evacuating through the non fire-isolated stair. The following three potential fire scenarios are considered relevant:

- 1) A fire within Unit 1.
- 2) A fire within Unit 2.
- 3) A fire within the non fire-isolated stair.

⁷ Guide to the BCA, Australian Building Code Board – Page 141

Fire scenarios 1 and 2 are considered to present a similar risk to occupant within the non fire-isolated stair and can therefore be assessed as one scenario "Fire within SOU".

A fire within the non fire-isolated stair is considered unlikely as the area is a circulation space with limited fire load. However, in the event of a fire within the stair occupants could be trapped in their SOU and required to wait for fire brigade assistance.

9.4.2 Requirements for Bounding Construction

To provide adequate fire resistance of the glazed walls and the solid core entry doors, the following additional measures must be incorporated into the design.

- Glazing must be 10mm toughened glass fixed in a steel or aluminium frame.
Toughened glass was chosen as it is more resilient to temperature differentials than standard float glass. Toughened glass can withstand a temperature differential of approximately 240°C before failure, whereas standard float glass will fail with a temperature differential of approximately 80°C [8].
- The doors are understood to be self-closing solid core doors in accordance with Clause C3.11 of the BCA.
- Wall-wetting sprinklers must be positioned on both sides of the walls and doors to provide full coverage to all portions of the glazing and doors.
Both sides of the walls and doors must be protected to account for the possibility of a fire within the non fire-isolated stair.
- The wall-wetting sprinklers must be designed in general accordance with AS2118.2 with the following exceptions a minimum flow rate of 60 L/min per metre width of glazing.
- If the glazed wall includes any mullions with a depth in excess of 25mm multiple sprinkler heads will be provided to achieve adequate coverage.

9.4.3 Performance of Glazed Separation

In the event of a growing fire next to the glazed walls (or the solid core doors), the heat from the fire and smoke may cause heating of the glazed walls until the glass breaks due to excessive temperature differentials in the glass.

By protecting the glazed walls with wall-wetting sprinklers which provide a continuous film of water across the surface of the glass the temperature rise of the glass is reduced to stop the failure of the glazing which would otherwise occur.

The wall-wetting sprinklers are also expected to prevent excessive charring or ignition of the solid core doors enhancing their fire resisting performance.

Tests have been performed in Canada on glazing protected by wall-wetting sprinklers that is subjected to a standard furnace fire [9]. The results of these experiments are summarised in Table 9-1.

⁸ Fire Protection of Windows Using Sprinklers, Construction Technology Update No 12, NRC-CNRC, Canada 1997

⁹ Richardson, I. K., Glazing in Fire-Resistant Wall Assemblies, CBD-248, National Research Council Canada, April 1988

Glass Type	Dimensions (mm)	Wall-Wetting Sprinkler Activation Time (s)	Water Flow per metre width (L/min/m)	Duration before Failure (min)
Single pane of toughened glass in Steel Frame	1105x1516	16	72-100	140
Single pane of toughened glass in Steel Frame	1105x1516	63	90	120
Single pane of toughened glass in Steel Frame	1105x1516	59	90	120
Single pane of toughened glass in Steel Frame	1105x1516	N/A	N/A	6.5
Single pane of toughened glass in Steel Frame	1105x1516	N/A	N/A	5.0
Single pane of toughened glass in Aluminium Frame	1680x2590	34	60-68	120

Table 9-1 Behaviour of toughened glass assemblies subjected to a standard fire

9.4.4 Radiant Heat Exposure to Evacuating Occupants

A fire within a residential SOU can be conservatively assumed to have a flame temperature of 900°C. This temperature is based upon a series of full-scale residential fire tests ^[10], ^[11] & ^[12]. This equates to a radiant heat intensity of 107kW/m² (see Appendix F).

It can be assumed that up to 90 %of the radiant heat is attenuated by the wall-wetting sprinklers and glazing ^[13] which reduces the heat flux on the non fire exposed side to approximately 10.7kW/m². This in turn equates to an equivalent temperature of 386°C (see Appendix F) at the face of the Glass.

Assuming occupants require a 1 metre wide path of travel to descend the stair past the exposed openings, the worst case location in terms of radiant heat exposure will occur at point (X) as illustrated in Figure 9-1. The radiant heat received at point (X) is approximately 10kW/m² (See Appendix F).

The acceptance criteria used to determine whether the occupants are exposed to conditions that could be considered unsafe for evacuation are consistent with tests that have been conducted relating to the tolerance time of humans when exposed to fire. A summary of the test data is presented in Table 9-2.

Radiation Intensity	Tolerance Time
< 2.5 kW/m ²	> 5 minutes
2.5 kW/m ²	30 seconds
10 kW/m ²	4 seconds

Table 9-2 Criteria for radiant heat exposure

¹⁰ Report of Test FR 3995, Santa Ana Fire Department Experiment at 1315 South Bristol, NIST, July 14, 1994.

¹¹ Report of Test FR 4009, Full-Scale House Fire Experiment for InterFIRE VR May 6, 1998.

¹² Full-scale Room Fire Test – Report No. NIST GCR 97-716, NIST, June, 1997.

¹³ Richardson, I. K., *Glazing in Fire-Resistant Wall Assemblies*, CBD-248, National Research Council Canada, April 1988

Given the localised area of the potentially radiating wall surface occupants would be expected to quickly travel past the affected area, hence a radiant heat of 10kW/m^2 can be considered acceptable.

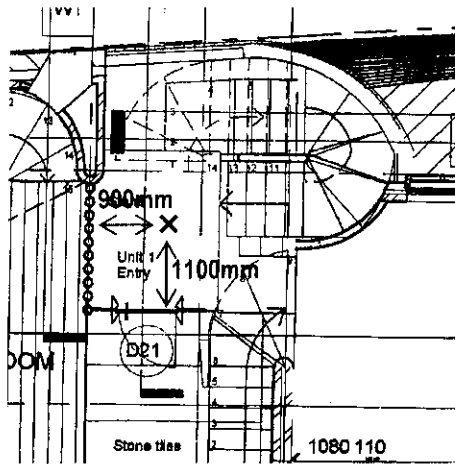


Figure 9-1 Worst case radiant heat location

9.5 Conclusion

The test results summarised in Section 9.4.3 demonstrate that through the use of wall-wetting sprinklers designed to ensure that the glass is provided with a continuous film of water across the entire glazed surface dramatically increases the resistance of the glazing when exposed to fire and adequately reduces the heat flux on the non-fire exposed side allowing occupant to evacuate past the localised area.

9.6 Compliance with the Performance Requirements

A summary of the assessment demonstrating compliance with the relevant Performance Requirements of the BCA is listed below:

- CP2** (a) A building must have elements which will, to the degree necessary, avoid the spread of fire-
- i) to exits; and
 - ii) to sole-occupancy units and public corridors; and
 - iii) between buildings; and
 - iv) in a building,
- (b) Avoidance of the spread of fire referred to in (a) must be appropriate to-

Criteria	Compliance
i) the function or use of the building; and	The relevant area of the building is residential (Class 2).
ii) the fire load; and	The fire load in the SOU's is expected to be approximately 400-600MJ/m ² .
iii) the potential fire intensity; and	A fully developed fire has been considered in the assessment.
iv) the fire hazard; and	The fire hazard assessed is fire spread and it affect on evacuating occupants.
v) the height of the building; and	The building has three storeys above ground.
vi) its proximity to other property; and	The assessment contained within Section 8 demonstrates that openings within 3m of the allotment boundaries comply with Performance Requirement CP2.
vii) any active fire safety systems installed in the building; and	Wall-wetting sprinklers must be installed to protect the glazed walls and solid core doors.
viii) the size of any fire compartment; and	Equivalent to a DTS design solution. Each sole occupancy unit forms a separate fire compartment.
ix) other elements they support; and	The assessed glazed walls must not support other loadbearing elements.
x) fire brigade intervention; and	Fire brigade intervention is considered adequately facilitated by the provision of wall-wetting sprinklers to the glazed walls and solid core doors.
xi) the evacuation time	The glazed walls and solid core doors protected with wall-wetting sprinklers are expected to maintain their integrity for the duration of the evacuation process.

10. Alternative Solution 4 – Winders in Required Exit Stair

10.1 Introduction

Access and egress to Units 1 and 2 within the subject building is provided by a non fire-isolated stairway which discharges into the entry lobby at Ground Level. This non fire-isolated stair is divided into two separate flights. The first flight is constructed between the Ground Floor and the lobby at the First Floor that provides access to Unit 1. The second is constructed between the First Floor and the lobby at the Second Floor. The portion of the stair between the First and Second Floors has been constructed with winders in lieu of landings which leads to a non-compliance with Clause D2.13 of the BCA.

Although the part of the required non-fire-isolated exit providing access to and egress from Unit 2 is not designed in accordance with Clause D2.13 of the BCA, the design is considered to achieve compliance with Performance Requirement DP2 of the BCA.

10.2 Methodology

The assessment undertaken for the subject building is a qualitative comparative Evaluation Extent 1 involving Sub-system E – Occupant Evacuation and Control.

10.3 Intent of the BCA

To make an assessment of whether the design achieves compliance with Performance Requirement DP2 of the BCA, the intent of the Clause D2.13 must first be understood. The Guide to the BCA says that the intent of Clause D2.13 is *"to enable the safe movement of people using stairwells."*^[14]

10.4 Assessment

10.4.1 Introduction

In order to demonstrate that the subject building is at least equivalent to a DTS complying building solution it is necessary to establish a base case similar to the subject building that complies with all the relevant DTS Provisions.

Establishing a base case allows for a clear comparison to be made between the subject building and a building complying with the DTS provisions of the BCA to determine whether it is equivalent in terms of evacuation safety in the event of a fire. The base case for the comparison is established within Section 10.4.2.

Demonstrating equivalence with the DTS provisions of the BCA is one method of achieving compliance with the Performance Requirements of the BCA under Clause A0.5(b)(ii).

10.4.2 Base Case Building Solution

The base case that will be used for comparison is a sole-occupancy unit identical to Unit 2 within the subject building with the exception that an internal stairway is provided down to the First Floor level where the non fire-isolated stair can be accessed. The design of the internal stair is assumed to be identical to the upper flight of the proposed non fire-isolated stair serving

¹⁴ Guide to the BCA, Australian Building Codes Board – Page 127

Unit 2 in the subject building. The design of the subject building in comparison to the base case building is illustrated in Figure 10-1.

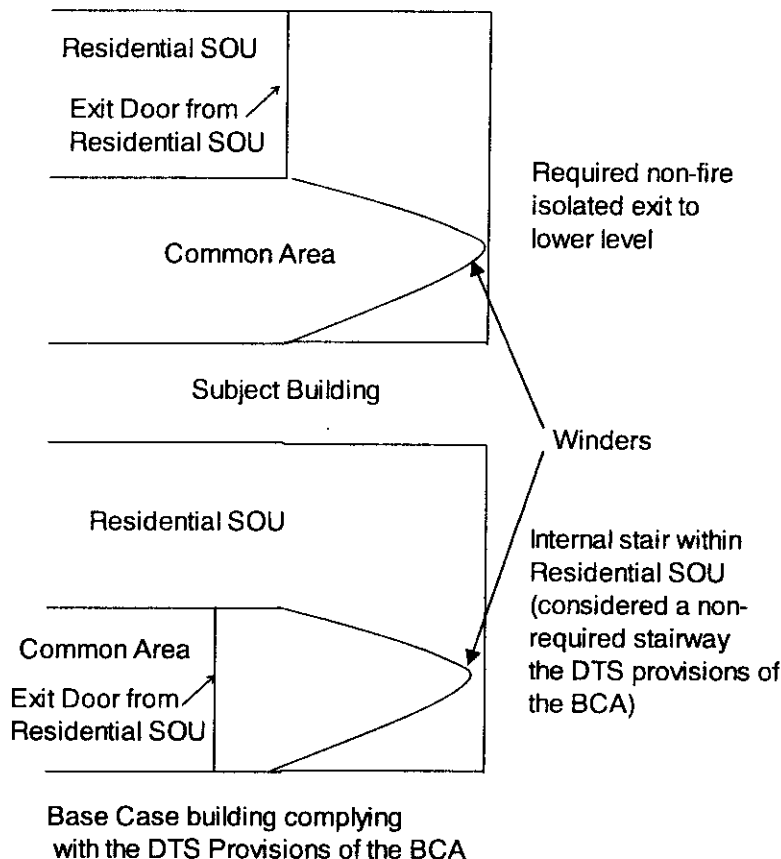


Figure 10-1 Comparison of Design of Base Case and Subject Buildings

The internal stair within the base case building is considered a non-required stairway in terms of the DTS provisions of the BCA and complies with the requirements of goings and riser as specified under Clause C2.13(i) of the BCA.

10.4.3 Comparison of Base Case and Subject Building Design

In order to determine whether the design of the non fire-isolated stairway serving Unit 2 achieves compliance with the Performance Requirements of the BCA, its design must be compared to the design of the internal stairway within the base case building that complies with the DTS provisions of the BCA. For this comparison it is important to understand why the DTS provisions of the BCA prevent the use of winders in a required exit.

The use of a winder means that the going is not consistent across the width of the tread. This has two impacts on the use of the stairwell;

- 1) The width of the going changes the usable width of the stair tread creating a difficulty in balancing on the narrowest portion of the going.
- 2) The speed of travel down the stair is reduced due to the need to constantly alter direction, and the additional caution required to negotiate the goings.

These factors will tend to slow the evacuation of occupants, especially in cases where a large population is expected to negotiate the stairwell as a means of egress.

Larger populations are likely to be present in high- and mid-rise residential apartment buildings where occupants of multiple SOU's are expected to use the required stair to evacuate. The relevant part of the subject stair is not expected to be used by occupants other than those in Unit 2 and their guests (i.e. a single SOU with limited number of occupants as expected for an internal non-required stair).

The design and use of the stair in the base case and subject buildings is identical. The only difference between the two designs is the placement of the entry door to the SOU. In the subject building the entry door is placed at the top of the stair flight meaning that the stairwell is located in a common area and considered a required exit under the DTS provisions of the BCA. In the base case building the entry door is located at the bottom of the stair flight meaning that the stairwell is located within the SOU and hence considered a non-required exit under the DTS provisions of the BCA.

As both stair designs will serve a single SOU, with an identical population expected to use the stair, it is considered that the performance of the stairs and the safety of the occupants using the stair is equivalent.

10.5 Conclusion

The design of the subject building and the base case building have been shown to be at least equivalent in terms of the ability of the stair design to allow occupants to safely negotiate the stair.

Demonstrating equivalence with the DTS provisions of the BCA is one means of achieving compliance with the Performance Requirements in accordance with Clause A0.5 of the BCA. Consequently, the design of the subject building is considered to achieve compliance with Performance Requirement DP2 of the BCA, subject to the Recommendations in Section 12.

10.6 Compliance with the Performance Requirements

A summary of the assessment demonstrating compliance with the relevant Performance Requirements of the BCA is listed below:

DP2 So that people can move safely to and within a building, it must have-

Criteria	Compliance
(a) walking surfaces with safe gradients; and	Stairways will be designed to comply with DTS provisions of the BCA with the exception of the flights serving Unit 2 which has been demonstrated to be equivalent to a DTS complying building solution.
(b) any doors installed to avoid the risk of occupants-	
(i) having their egress impeded; or	Doors installed in the stair are understood to comply with the DTS Provisions of the BCA.
(ii) being trapped in the building; and	Doors installed in the stair are understood to comply with the DTS Provisions of the BCA.
(c) any stairways and ramps with-	
(i) slip-resistant walking surfaces on (A) ramps; and (B) stairway treads or near the edge of the nosing; and	The walking surfaces in the stair are understood to comply with the DTS Provisions of the BCA.
(ii) suitable handrails where necessary to assist and provide stability to people using the	Handrails installed in the stair are understood to comply with the DTS Provisions of the BCA.
(iii) suitable landings to avoid undue fatigue;	The relevant part of the stair connects a single level and serves Unit 2 only with a limited number of occupants. The performance of this part of the stair has been demonstrated to be equivalent to a DTS complying building solution.
(iv) landings where a door opens from or onto the stairway or ramp so that the door does not create an obstruction; and	The landings in front of doors are understood to comply with the DTS Provisions of the BCA.
(v) in the case of a stairway, suitable safe passage in relation to the nature, volume and frequency of likely usage.	The relevant part of the stair connects a single level and serves Unit 2 only with a limited number of occupants. The performance of this part of the stair has been demonstrated to be equivalent to a DTS complying building solution.

11. Summary of Alternative Solutions

The fire safety engineering assessment undertaken found that the design of the subject building achieves compliance with Performance Requirement CP1, CP2 and DP2 of the BCA, subject to the following recommendations:

- The provisions listed in **Section 12 – Fire Safety Measures** are to be strictly adhered to. The requirements listed in that Section are Essential Services and as such all fire safety systems should be identified as requiring maintenance and certification at appropriate intervals relative to their Australian Standard and the Environmental Planning and Assessment Regulations, 2000.
- A reassessment will be needed to verify consistency with the assessment contained within this report should a change in use, building alterations or additions occur in the future.

12. Fire Safety Measures

The following fire safety measures are required for the subject building as a result of the fire safety engineering assessment to achieve compliance with the Performance Requirements of the BCA:

1. The design is assumed to comply with the DTS Provisions of the BCA except for those issues listed in Section 5 unless specifically mentioned or addressed by a separate assessment listed in this report. It is not the intent of this section to provide a comprehensive list of fire safety measures required by the DTS provisions of the BCA. The fire safety measures listed within this section relate only to the critical measures associated with the alternative solution. The fire safety measures should be read in conjunction with the DTS provisions of the BCA where not specifically mentioned.
2. Second Floor unprotected steel roof structure must be designed such that;
 - the critical steel temperature for the fire load case is not less than 750°C for any loadbearing structural member;
 - potential structural failure must be localised to the fire area (i.e. area with temperatures in excess of 750°C) and progressive collapse must not occur; as a result of failure of the steel members in the local fire area;
 - failure of the steel structure on the top storey must not compromise the structural stability or the fire separation of the storeys below or the fire-rated external walls; and
 - in the event of failure any collapse must be inwards preventing structural elements failing of the side of the building potentially injuring emergency services personnel.

It is noted that these requirements were confirmed by the structural engineer for the project GHD in a letter prepared by Ian Hayes on 03 June 2004.

3. The ventilation openings in the ground floor carpark within 3 metres of the South Eastern allotment boundary must have non-translucent louvres designed to block radiation from all angles (i.e. you cannot see through them from any angle). The louvres can be manufactured from aluminium or steel, however, if aluminium louvres are selected they will require external wall-wetting sprinkler protection to the external face of the louvres in accordance with AS 2118.2. Example of the louvre designs are shown in Figure 12-1.

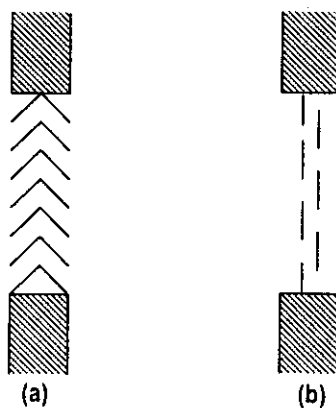


Figure 12-1 Example of louvre

The glazed walls and the solid core entry doors the following additional measures must be incorporated into the design.

- Glazing must be 10mm toughened glass fixed in a steel or aluminium frame.
 - The doors are understood to be self-closing solid core doors in accordance with Clause C3.11 of the BCA.
 - Wall-wetting sprinklers must be positioned on both sides of the walls and doors to provide full coverage to all portions of the glazing and doors.
 - The wall-wetting sprinklers must be designed in general accordance with AS2118.2 with a minimum flow rate of 60 L/min per metre width of glazing.
 - If the glazed wall includes any mullions with a depth in excess of 25mm multiple sprinkler heads will be required to achieve adequate coverage.
4. The portion of the required non fire-isolated stair between the First and Second Floor serving Unit 2 must comply with all requirements of an internal non-required stair, including walking surfaces, gradients, handrails and landings in front of doors.
5. The recommendations within this report should be considered as Essential Fire Safety Measures that are identified on the fire safety schedule for this development, and as such all of the fire safety systems should be identified as requiring maintenance and certification at appropriate intervals.

13. References

- Australian Building Codes Board, *Building Code of Australia 1996 - Volume 1*, Australian Building Codes Board, including Amendments 1 – 13.
- Australian Building Codes Board, *Fire Safety Engineering Guidelines – Edition 2001*, Australian Building Codes Board, November 2001.
- Australian Building Codes Board, *Guide to the BCA 2004*, Australian Building Codes Board.
- Fire Code Reform Centre, *Fire Engineering Guidelines First Edition*, Fire Code Reform Centre, Sydney, March 1996.
- Fire Brigade Intervention Model, Australasian Fire Authorities Council, Australia 1997.
- Buchanan, A.H., *Structural Design for Fire Safety*, John Wiley & Sons, 2001.
- Richardson, I. K., *Glazing in Fire-Resistant Wall Assemblies*, CBD-248, National Research Council Canada, April 1988.
- *Fire Protection of Windows Using Sprinklers*, Construction Technology Update No 12, NRC-CNRC, Canada 1997.

Appendix A Drawings and Information

Drawing Title	Dwg. No.	Date	Drawn By
Plans – Ground	CI 201 – c	03.04	Walter Barda Architects
Plans – First & Second Floor	CI 202 – c	03.04	Walter Barda Architects
NW/SE Elevations	CI 100 – c	03.04	Walter Barda Architects
NE/SW Elevations	CI 101 – c	03.04	Walter Barda Architects



Please call Ian Hayles for further information

Yours faithfully
GHD Pty Ltd

A handwritten signature in black ink, appearing to read "Ian Hayles".

Ian Hayles
SE (Civil) APE And CPEng (Aust) NPE
Structural Engineer

02 9239 7207

23/11/2003 10:20:00

2

Appendix C Failure Mechanism of Steel Roof Structure



MANAGEMENT
ENGINEERING
ENVIRONMENT

ENTERED

03 June 2004

Defire Pty Limited
PO Box 2046
Strawberry Hills NSW 2012

Our ref: 21/11767/103538
Your ref:

Attn: Michael Lunquist

Dear Michael

1017 Barrenjoey Road Palm Beach Alternative Fire Solutions

Further to your Defire report fax of 29 April 2004 and GHD's previous report on limiting steel temperatures (dated 2 April 2004) we comment as follows.

Item 3 of Defire report states "Second Floor contains unprotected structural steel elements that will not achieve the fire resistance levels specified by Specification C1.1 of the BCA" and requests statements from a structural engineer on

1. Localised Failure

The potential structural failure, of the steel roof elements, due to fire, is considered to be localised to the fire area (where temperatures are in excess of the limiting fire temperature of 750°). This assessment is based on the design of the roof, which is a framework supported on steel columns and fixed to the reinforced concrete structure below and on two sides to the reinforced concrete roof. It is considered to be restrained by these elements to prevent it from falling outside the building line. However local failure at the fire source may also result in deformation of the steelwork in other areas.

2. Structural Stability

The failure of the steel structure on the top storey is not considered to compromise the structural stability or the fire separation of the storeys below.

3. Safety of Evacuating Occupants or Emergency Services Personnel

In the event of failure of the steel structure by a "normal fire event" (excludes explosions, bombs etc), it is likely that collapse would be inwards due to the restraint of the concrete roof, thus safeguarding evacuating occupants or emergency services personnel.

Please call Ian Hayles for further information.

Yours faithfully

GHD Pty Ltd

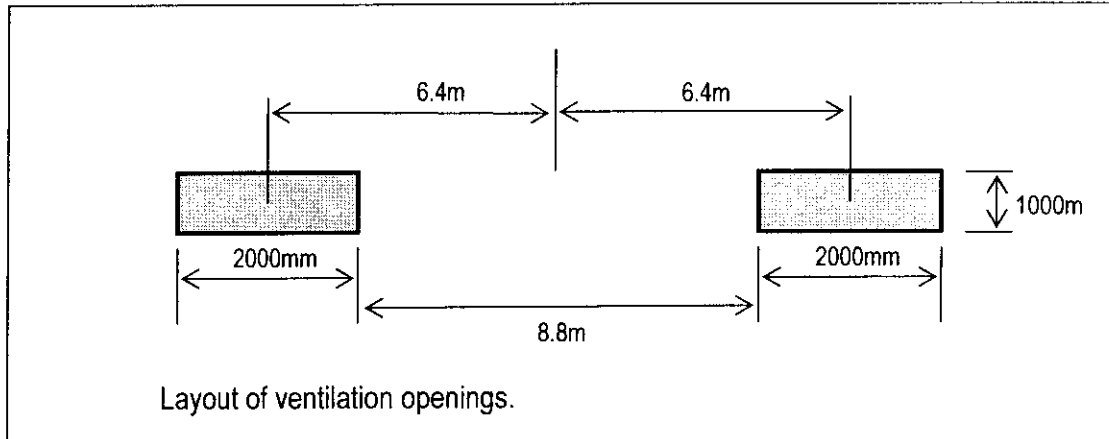
Ian Hayles
Structural Engineer
02 9239 7207

GHD Pty Ltd
ABN 39 008 488 373

10 Bond Street
Sydney NSW 2000
Australia

T 61 2 9239 7100
F 61 2 9239 7199
E sydmil@ghd.com.au
W www.ghd.com.au

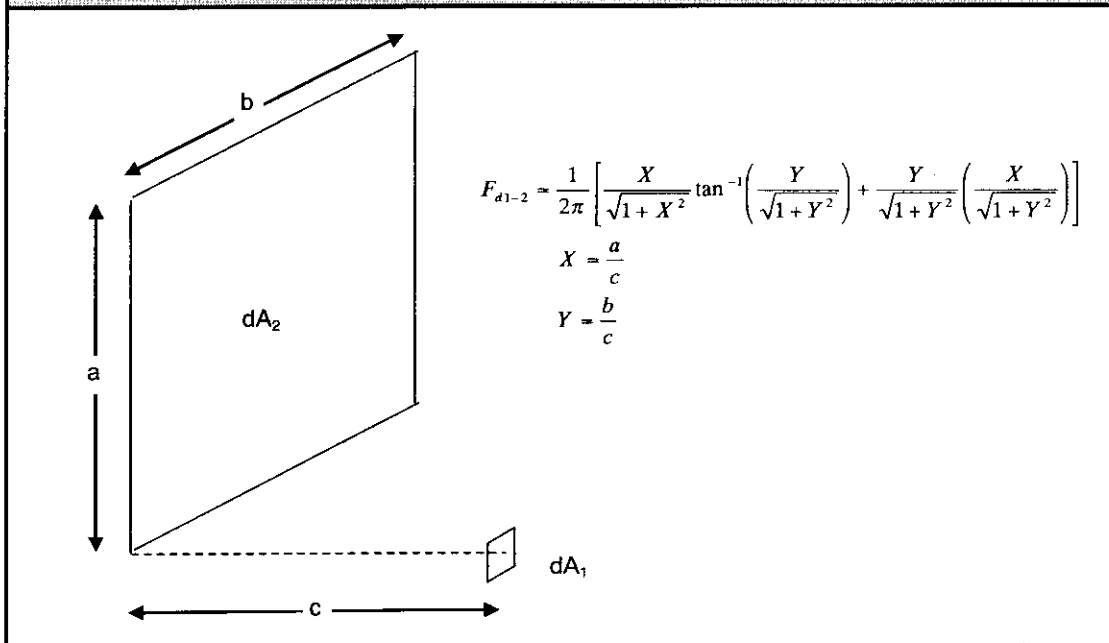
Appendix D Radiant Heat Emitted to the Boundary



Given the distance between the openings, the worst case location for radiant heat will be directly in front of the openings. The additional radiant heat from the other opening is insignificant considering the distance between the openings and can be ignored given the conservatism in the assumed fire temperature (1000°C) and emissivity (1.0).

View factor theory

Maximum Radiation received at Window, Parallel to Boundary



Radiation at Boundary

Inputs			
Fire Source Feature Dimensions			
Height		1	m
Width		2	m
Distance to Boundary		1.4	m
Temperature of Fire Source Feature		1000	° C
Emmissivity		1	
Stefan Boltzman Constant		5.67E-11	kW/m²K⁴
Outputs			
Calculation Parameters			
a	0.50	X	0.357
b	1.00	Y	0.714
c	1.4	F ₀₁₋₂	0.058
Final Configuration Factor			0.23
Maximum Heat Flux			34.37 kW/m²

Radiation at 1m past the Boundary

Inputs			
Fire Source Feature Dimensions			
Height		1	m
Width		2	m
Distance to Boundary		2.4	m
Temperature of Fire Source Feature		1000	° C
Emmissivity		1	
Stefan Boltzman Constant		5.67E-11	kW/m²K⁴
Outputs			
Calculation Parameters			
a	0.50	X	0.208
b	1.00	Y	0.417
c	2.4	F ₀₁₋₂	0.024
Final Configuration Factor			0.10
Maximum Heat Flux			14.37 kW/m²

Radiation at 3m past the Boundary

Inputs			
Fire Source Feature Dimensions			
Height		1	m
Width		2	m
Distance to Boundary		4.4	m
Temperature of Fire Source Feature		1000	° C
Emmissivity		1	
Stefan Boltzman Constant		5.67E-11	kW/m ² K ⁴
Outputs			
Calculation Parameters			
a	0.50	X	0.114
b	1.00	Y	0.227
c	4.4	F _{d1-2}	0.008
Final Configuration Factor			0.03
Maximum Heat Flux			4.68 kW/m ²

Radiation at 6m past the Boundary

Inputs			
Fire Source Feature Dimensions			
Height		1	m
Width		2	m
Distance to Boundary		7.4	m
Temperature of Fire Source Feature		1000	° C
Emmissivity		1	
Stefan Boltzman Constant		5.67E-11	kW/m ² K ⁴
Outputs			
Calculation Parameters			
a	0.50	X	0.068
b	1.00	Y	0.135
c	7.4	F _{d1-2}	0.003
Final Configuration Factor			0.01
Maximum Heat Flux			1.70 kW/m ²

Appendix E Radiant Heat Received from the Boundary

Radiant Heat Required to be Withstood by the Openings Calculated in Accordance with Verification Method CV1 (BCA)

CV1

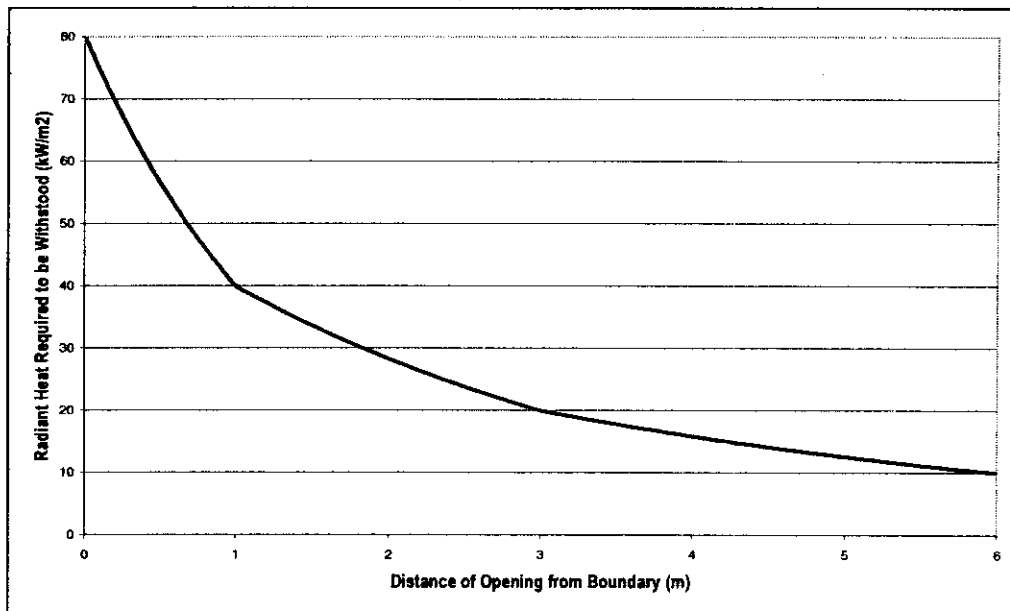
Compliance with CP2 to avoid the spread of fire between buildings on adjoining allotments is verified when it is calculated that -

(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):
1.4	34.82

Appendix F Radiant Heat Exposure

Radiant heat at 900°C

Calculation of Equivalent Radiant Heat Flux			
Inputs			
Configuration factor	8	1	
Stephan Boltzman Constant	8	5.67E-08	W/m ² K ⁴
Emmisivity	8	1	
Temperature	T	900.0	°C
Output			
Heat Flux Equivalent	q _r	107398.26	W/m ²
		107.40	kW/m ²

Temperature at 10.7kW/m²

Calculation of Equivalent Temperature			
Inputs			
Configuration factor	/	1	
Stephan Boltzman Constant	/	5.67E-08	W/m ² K ⁴
Emmisivity	/	1	
Heat Flux	q _r	10.7	kW/m ²
Output			
Temperature Equivalent	T	659.10	K
		385.95	°C

Maximum radiant heat received by evacuating occupants

Program Radiation

(All dimensions are in meters)

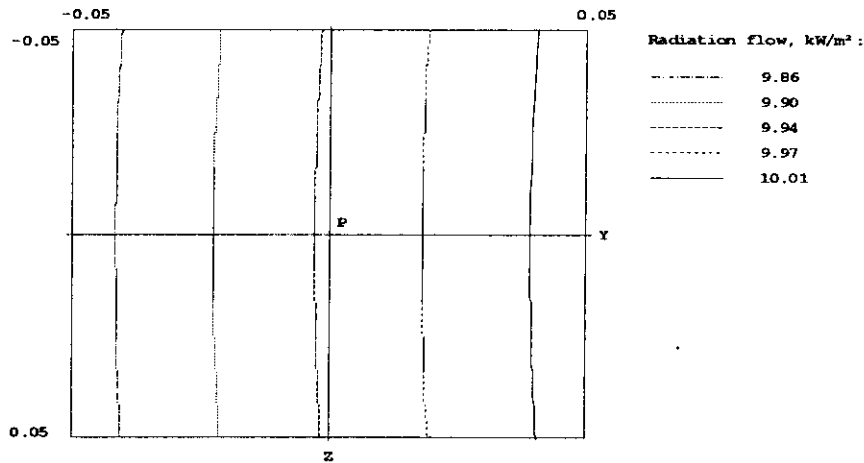
X-sources:

Radiation temperature 386°					
Distance	Offset		Size of source		Opening
X	Yx	Zx	Y	Z	%
0.8	0.2	0	1.8	2.7	100

Y-sources:

Radiation temperature 386°					
Distance	Offset		Size of source		Opening
Y	Zy	Xy	Z	X	%
1.1	0	0.1	2.7	1.8	100

RADIATION MAP YZ



Nodal radiation data, kW/m²:

Z \ Y	-0.05	-0.02	0.00	0.02	0.05
-0.05	9.840	9.890	9.938	9.983	10.03
-0.02	9.842	9.892	9.940	9.985	10.03
0.00	9.843	9.893	9.940	9.986	10.03
0.02	9.842	9.892	9.940	9.985	10.03
0.05	9.840	9.890	9.938	9.983	10.03

Orientation of maximum radiation flow

at point P(0,0,0): $\theta = 90.0^\circ$, $\varphi = 41.0^\circ$

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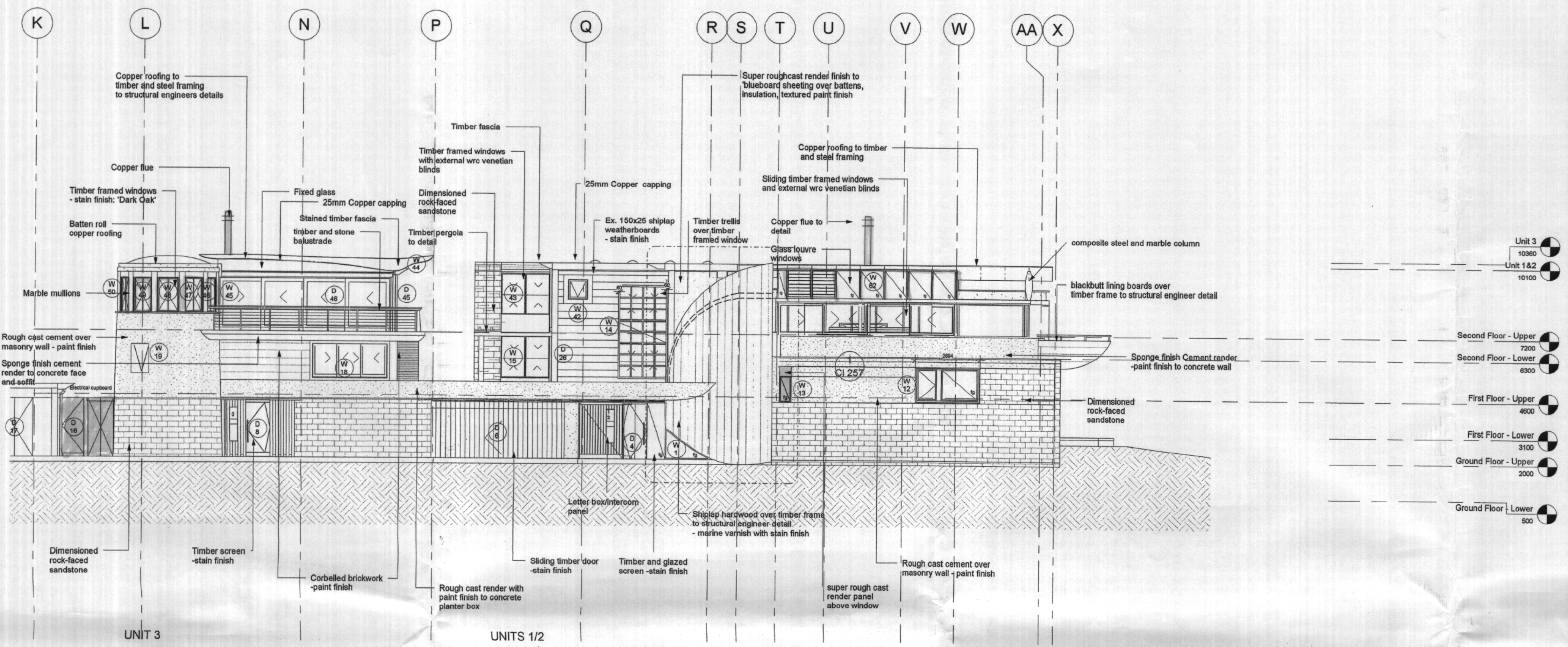
Fire Consultant
Defire Pty Limited

Client
Parkview Constructions Pty Ltd

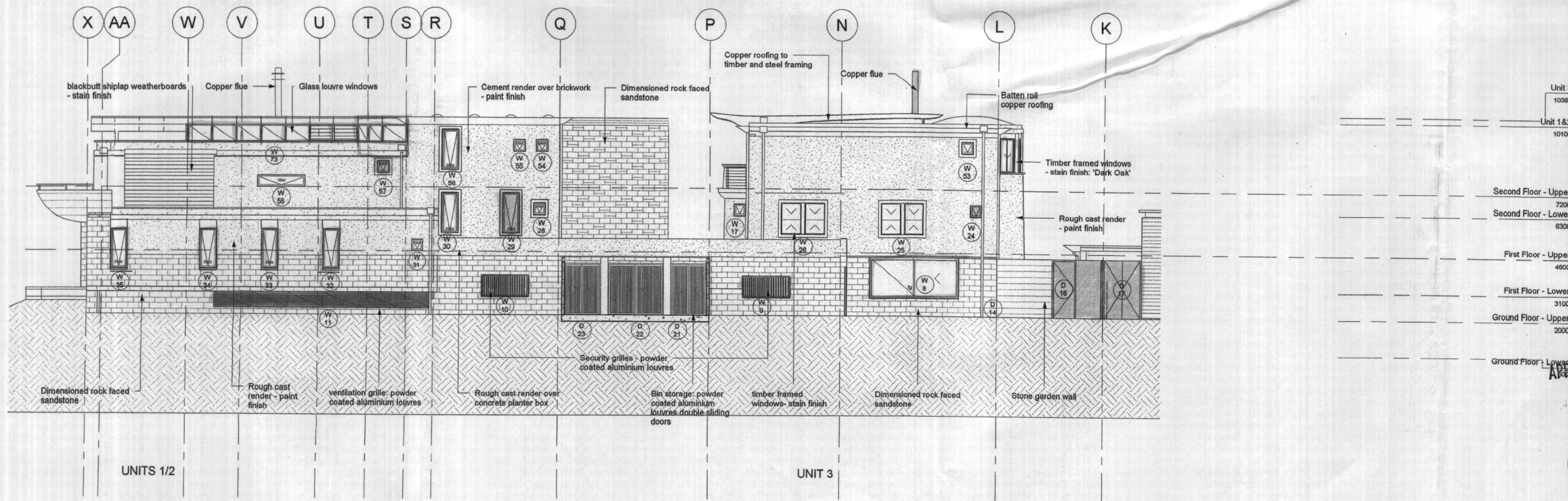
Hydraulic Consultant
Neville Brown & Associates

GHD
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Electrical

Interior Consultant
Marchese & Partners



3 North West Elevation
1 : 100



4 South East Elevation
1 : 100

AMENDMENTS

UNIT 1 (GROUND FLOOR)
-Additional ventilation grille to 5th wall of Basement for plant room requirements.
-Place double sliding doors X3 to bin storage area.
UNIT 3 (GROUND FLOOR)
-Change fence to Unit 3 to be installed.
-Reduce length of sliding door to Auxiliary room.
-Replace door on S/E boundary to Auxiliary room with window.
UNIT 1 (FIRST FLOOR)
-Replace window in study with double door.
-Replace window in S/E wall.
-Reconfigure interior walls.
UNIT 2 (SECOND FLOOR)
-Add new glass window in NWV wall at first floor stairs.
-Reconfigure interior walls.
-Add a glass roof adjacent to dining room.
-Reconfigure floor slab and staircase to include laundry and powder room.
-Add skylights to roof above hallway.
-Delete entry to roof above staircase.
-Reposition of windows to S/E boundary.
-Reconfigure copper roof.
UNIT 3 (FIRST/SECOND FLOOR)
-Reconfigure copper roof.
-Reconfigure window position in S/E wall.
-Reconfigure and add window in NWV wall.
-Extend deck toward kitchen at living room.
-Add window to bed 2 in suite.
-Change window type to Unit 3 casquette.
UNIT 4 (FIRST/SECOND FLOOR)
-Reconfigure window length on NWV elevation.
-New pipe modified.
-Reconfigure office windows.

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23250/1 15 SEP 2004
Certifying Authority: Brendan Bennett
Accreditation No: PIA3004

The Boatshed
1017 Barrenjoey Rd
Palm Beach

NW/ SE Elevations

Project Number		C	
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Drawn by		Designed	
Drafting Check		Designed Check	
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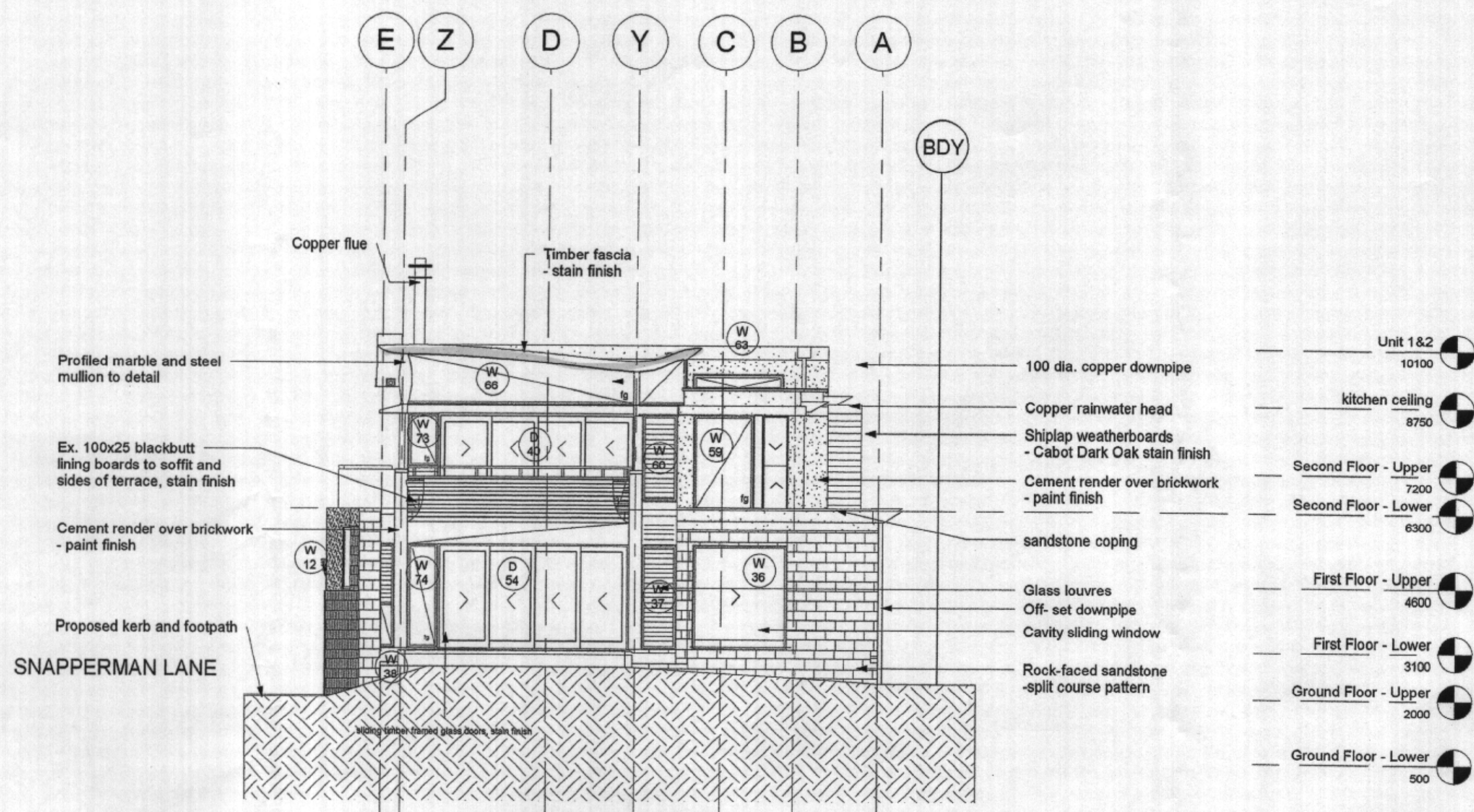
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DEFIRE Pty Limited

Client
Parkview Constructions PTY LTD

Hydraulic Consultant
Neville Brown & Associates

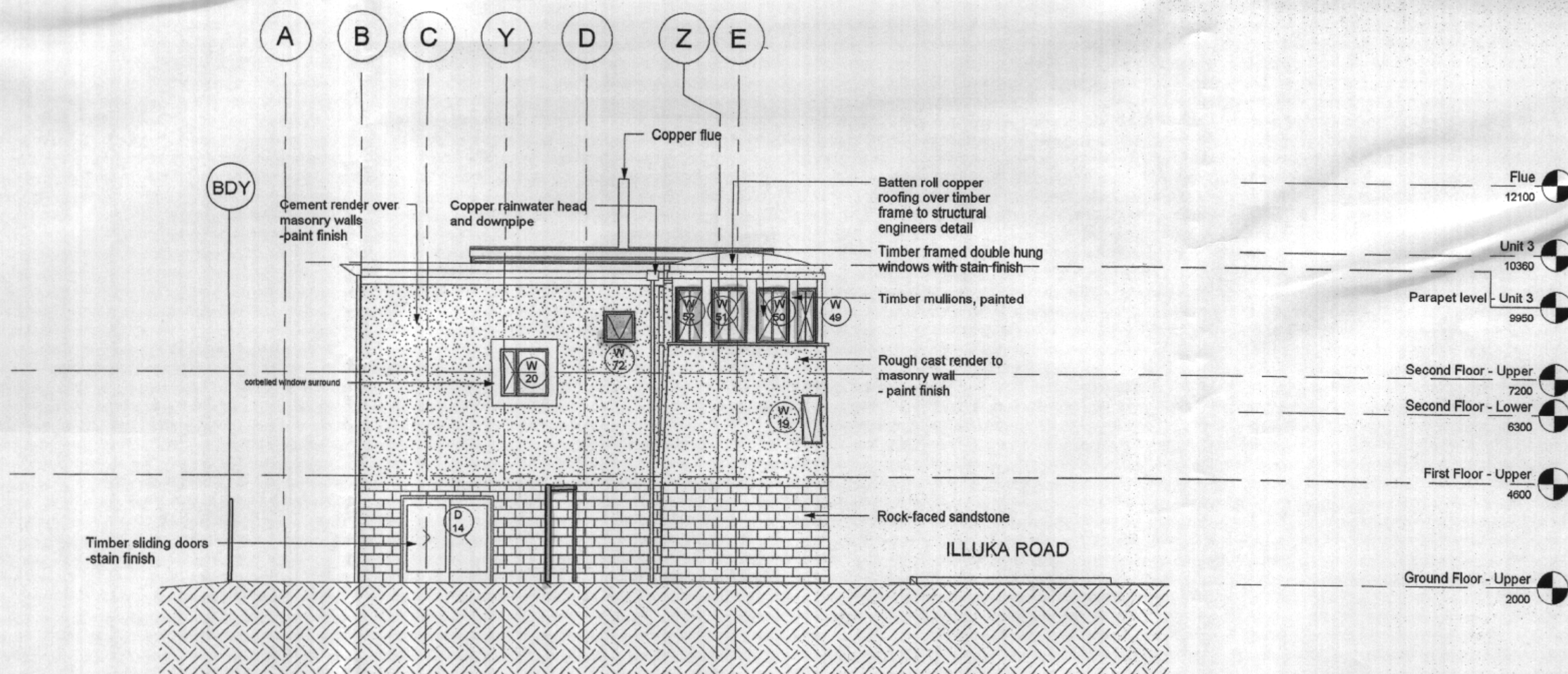
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Civil and Stormwater
Structural
Mechanical
Electrical

Interior Consultant
Marchese & Partners



2 South West Elevation

1 : 100



1 North East Elevation

1 : 100

AMENDMENTS

- UNIT 1 (GROUND FLOOR)
 - Additional ventilation grille to 5th wall of Basement for plant room requirements.
 - Place double sliding doors to 5th wall storage area.
- UNIT 1 (GROUND FLOOR)
 - Change fence to Unit 1 to brushwood.
 - Reduce length of sliding door to Ancillary room.
 - Replace door on 5th wall boundary to Ancillary room with window.
- UNIT 1 (FIRST FLOOR)
 - Replace window in study with double door.
 - Relocate window in 5th wall.
 - Add new glass window to NW wall at first floor stairs.
 - Reconfigure timber stairs.
- UNIT 2 (SECOND FLOOR)
 - Addition of a glass roof adjacent to dining room.
 - Reconfigure kitchen/dining room/entry to include laundry and powder room.
 - Add skylight to roof above hallway.
 - Delete view in roof above bedrooms.
 - Reposition of windows to 5th boundary.
 - Reconfigure windows for copper roof (SW elevation).
- Reconfigure copper roof.
- UNIT 3 (FIRST/SECOND FLOOR)
 - Relocate window position in 5th wall.
 - Relocate and add window in NW wall.
 - Extend deck toward kitchen at living room.
 - Add window to bed 2 en suite.
 - Provide access way to Unit 3 backstairs.
- UNIT 4 (FIRST/SECOND)
 - Change window type in turret.
 - Reduce workshop window length on SW elevation.
 - Add glass modified.
 - Reconfigure office windows.

CITY PLAN SERVICES

Construction Cert. No: Approved Date:

23250/1 15 SEP 2004

Certifying Authority: Brendan Bennett

Accreditation No: PIA3004

The Boatshed

1017 Barranjoey Rd
Palm Beach

NE/SW Elevations

Project number: c

Date: 03.04 Scale: 1 : 100

Drawn by: Author Designed

Drafting Check: Designed Check

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CI 101

Issue C

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DEFIRE Pty Limited

Client

Parkview Constructions Pty Ltd

Hydraulic Consultant

Neville Brown & Associates

GHD

Civil and Stormwater

Structural

Mechanical

Electrical

Interior Consultant

Marchese & Partners

AMENDMENTS

- UNIT 1 (GROUND FLOOR)
-Additional ventilation grille to 6th wall of basement for plant room requirements.
-Change double sliding doors to 2 in bin storage area.
UNIT 2 (GROUND FLOOR)
-Change fence to Unit 3 in bin storage.
-Reduce length of sliding door to Ancillary room.
-Replace door on S/E boundary to Ancillary room with window.
UNIT 3 (FIRST FLOOR)
-Replace window in study with double door.
-Relocate window in D/E wall.
-Add fixed glass window to NW wall at first floor stairs.
-Reconfigure timber frame.
UNIT 4 (SECOND FLOOR)
-Addition of a glass roof adjacent to dining room.
-Reconfigure kitchen/breakfast room/rooftop deck to include laundry and powder room.
-Add skylights to roof above bedrooms.
-Delete step in roof above bedrooms.
-Relocation of windows to S/E boundary.
-Reconfigure windows to copper roof (S/V elevation).
UNIT 5 (FIRST/SECOND FLOOR)
-Relocate copper roof.
-Relocate window position in S/E wall.
-Relocate and add window in W/E wall.
-Extend deck toward kitchen at living room.
-Add window to bed 2 in suite.
-Provide stone entry to unit 3 balustrade.
-Change window type in turret.
UNIT 6 (FIRST/SECOND)
-Reduce vestibule window length on S/V elevation.
-Vent pipe modified.
-Reconfigure office windows.

CITY PLAN SERVICES

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Certifying Authority: Brandon Barnett

Accreditation No: PIA3004

The Boatshed

1017 Barrenjoey Rd
Palm Beach

Elevations East & West

Project Number: C

Date: 03.04 Scale: 1:100

Drawn by: Author Designed

Drafting Check: Designed Check

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CI 102

Issue: C

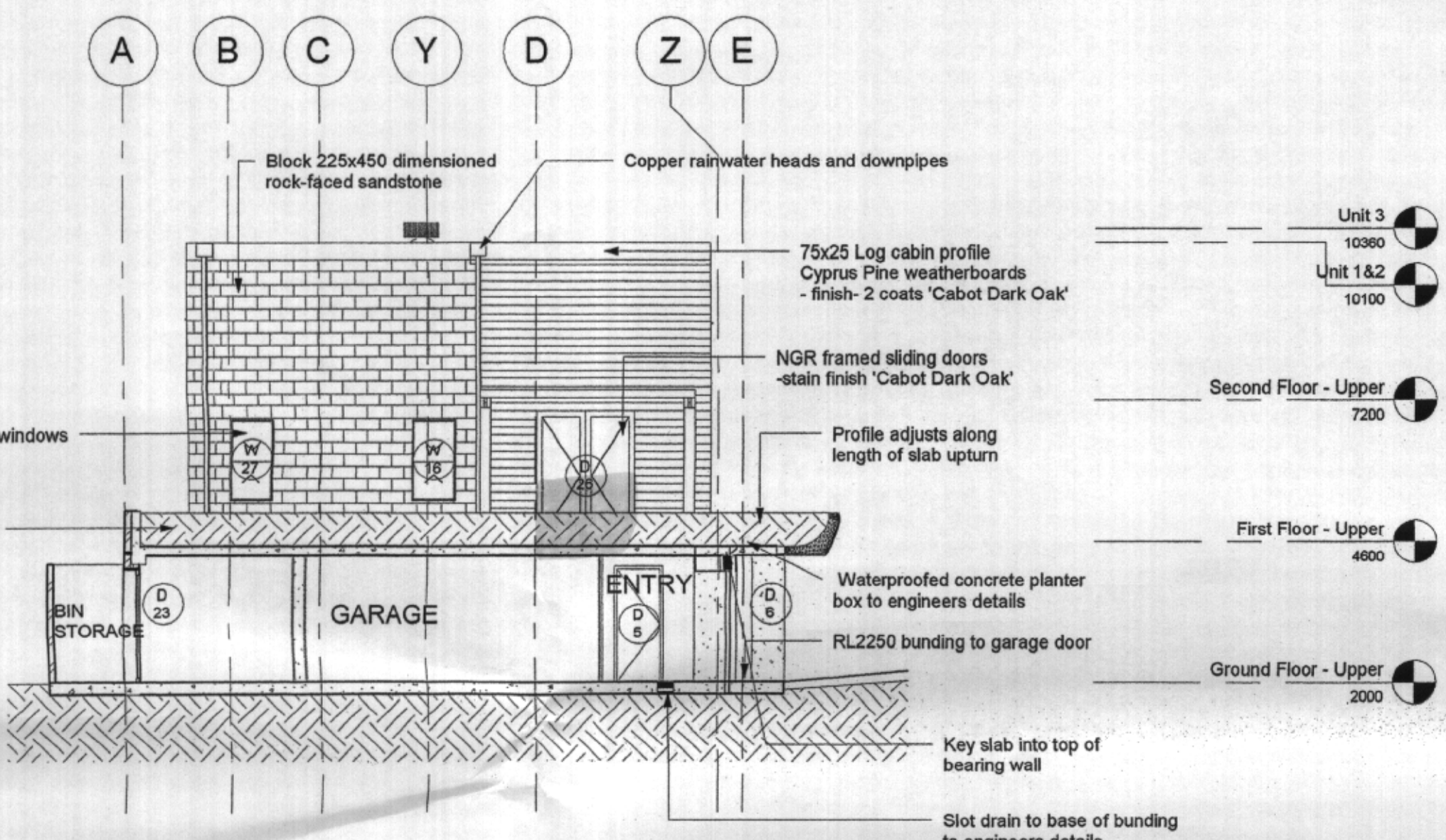
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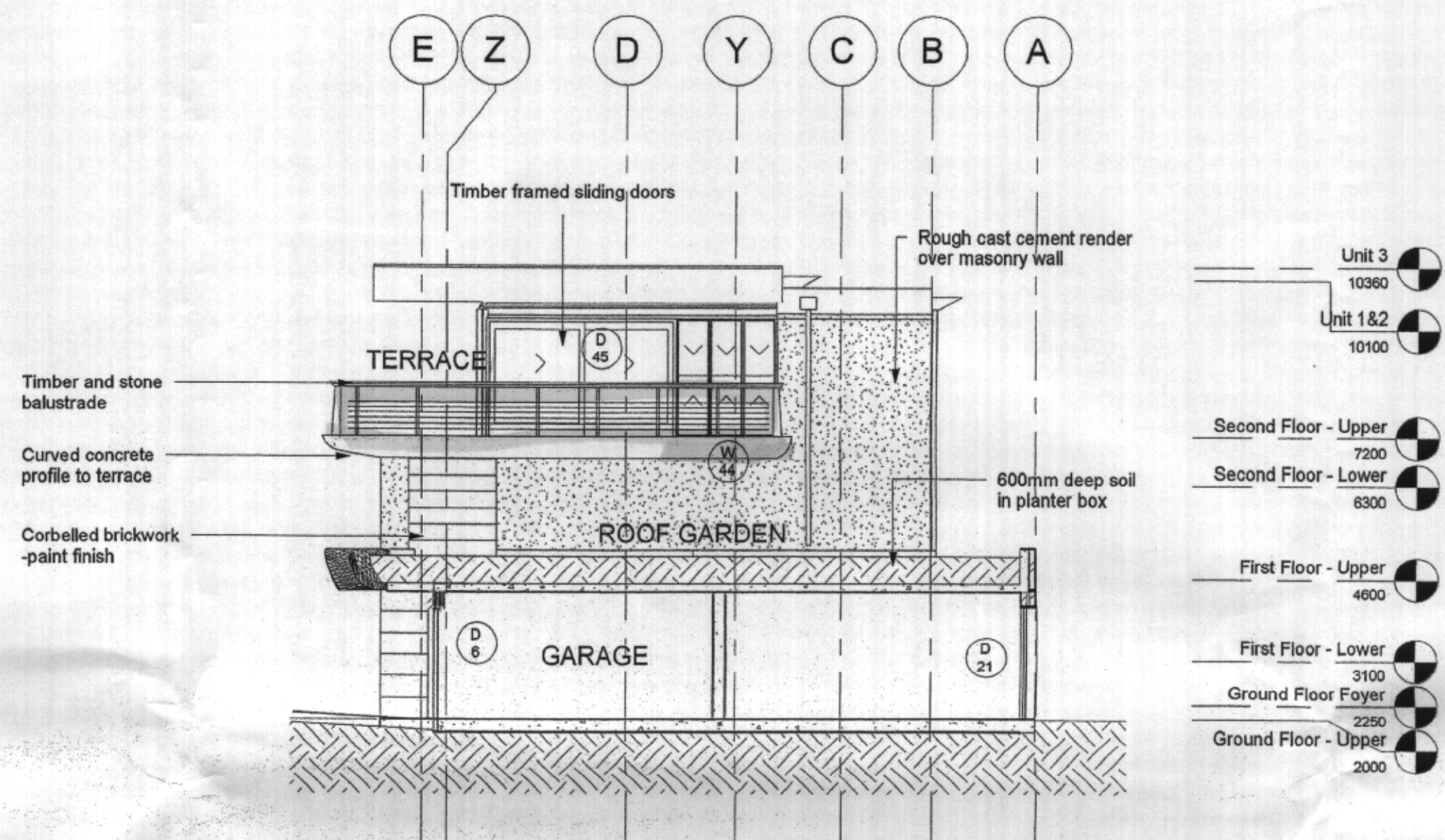
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Hydraulic Consultant
Neville Brown & Associates

GHD
Civil and Stormwater
Structural
Mechanical
Electrical

Interior Consultant
Marchese & Partners

AMENDMENTS

- UNIT 4 (GROUND FLOOR)
- Add/omit ventilation grilles to Stn wall of Basement for plant room requirements.
- Place double sliding door x3 to bin storage area.
UNIT 3 (GROUND FLOOR)
- Change fence to Unit 3 to bushwade.
- Reduce length of sliding door to Ancillary room.
- Replace door on SE boundary to Ancillary room with window.
UNIT 1 (FIRST FLOOR)
- Replace window in study with double door.
- Relocate window in SW wall.
- Add fixed glass window in NW wall at first floor stairs.
- Relocate office window.
UNIT 2 (SECOND FLOOR)
- Relocate a glass roof adjacent to dining room.
- Relocate kitchen window to include laundry and powder room.
- Add window to end dining room.
- Create gap in roof above entrance.
- Relocate window to SE boundary.
- Relocate window to SE boundary (SW elevation).
UNIT 3 (FIRST/SECOND FLOOR)
- Relocate office window.
- Relocate window position in SE wall.
- Relocate and add window in SE wall.
- Extend deck toward kitchen at living room.
- Add window to end of SE wall.
- Provide stone balustrade to Unit 3 balustrade.
- Change window type to Unit 3 balustrade.
UNIT 4 (FIRST/SECOND FLOOR)
- Relocate window position in SE wall.
- Vent pipe modified.
- Relocate office window.

CITY PLAN SERVICES

Construction Cert. No: Approved Date:

23 25 0/1 15 SEP 2004

Certifying Authority: Brendan Bennett

Accreditation No: PIA3004

The Boatshed

1017 Barrenjoey Rd
Palm Beach

Unit 4 Elevations/Section

Project number c
Date 03.04 Scale 1:100

APPROVED DEVELOPMENT CONSENT PLANS
PITTWATER COUNCIL
Drawn by Author
Designed by Designer
Checked by Checker

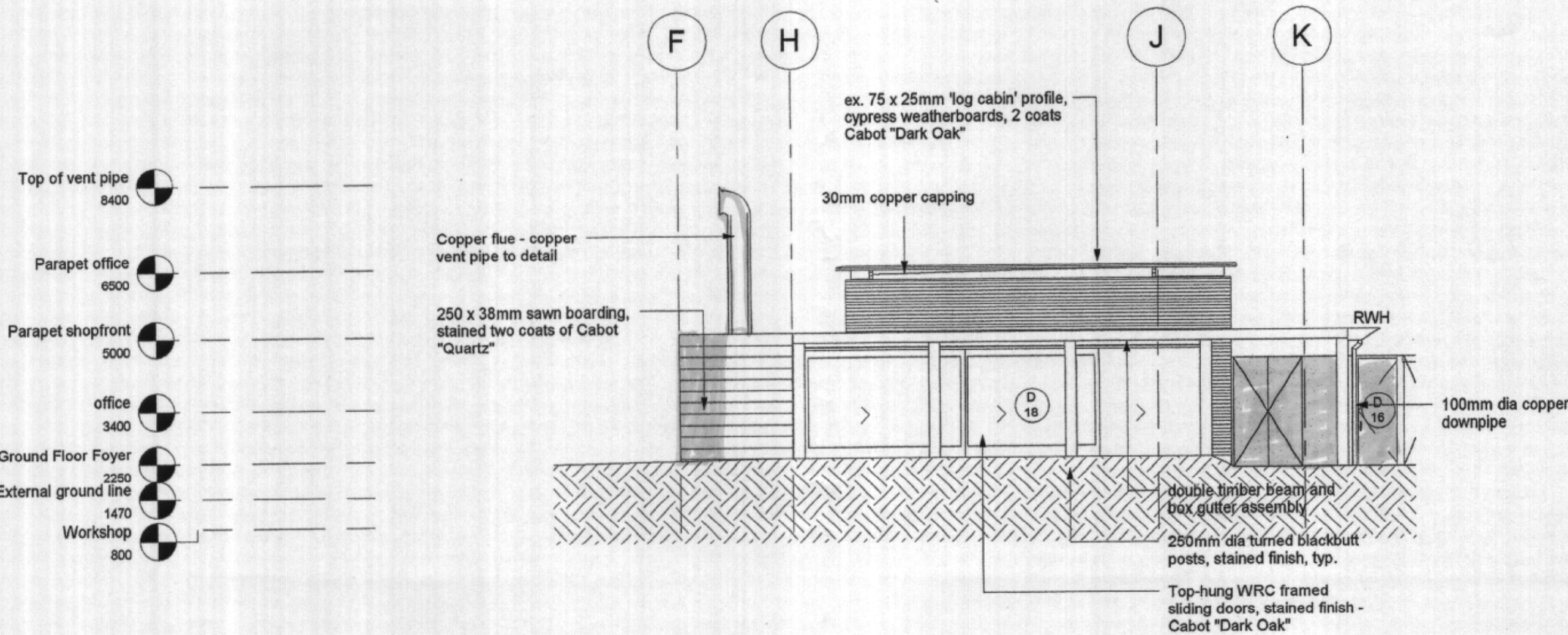
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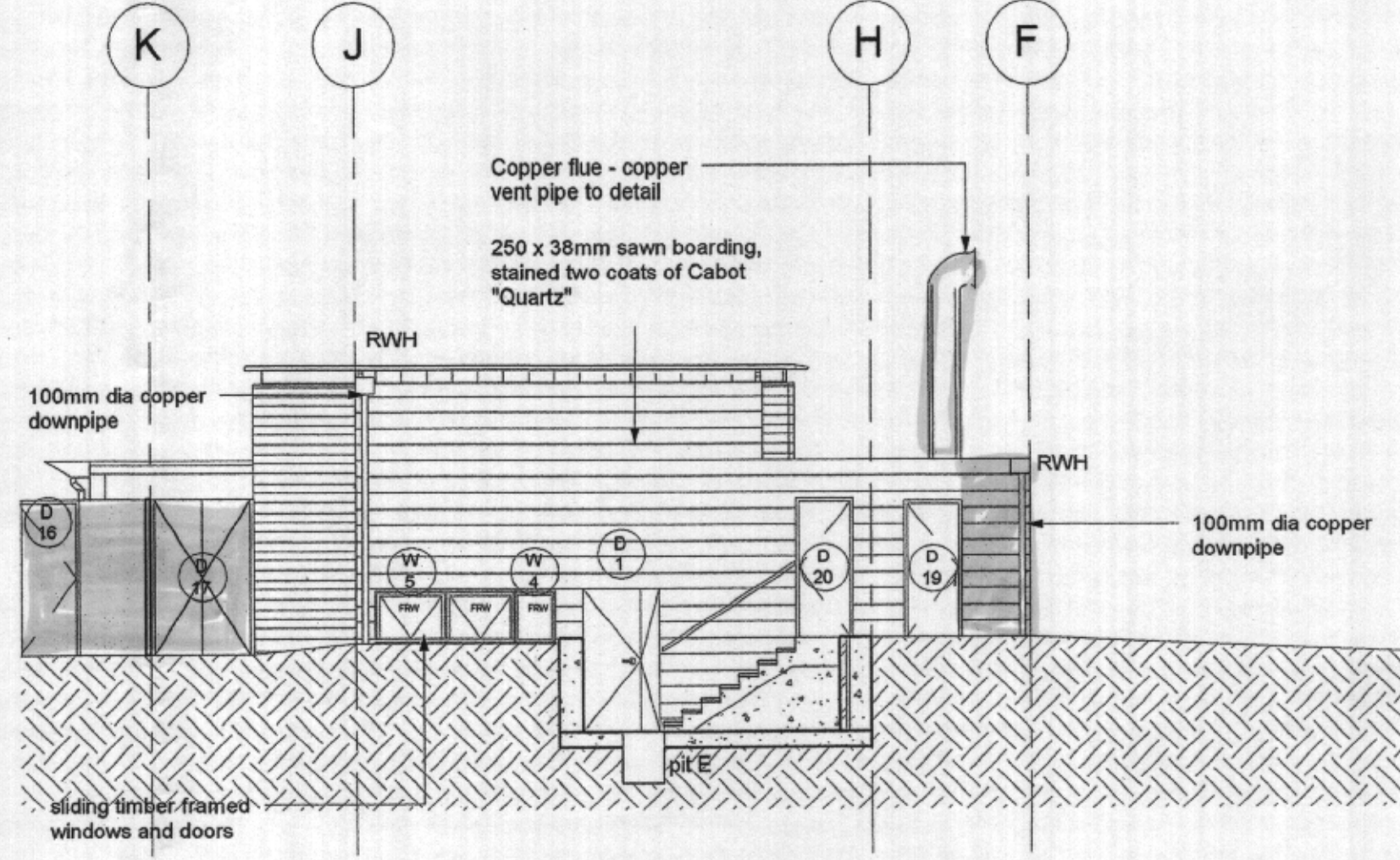
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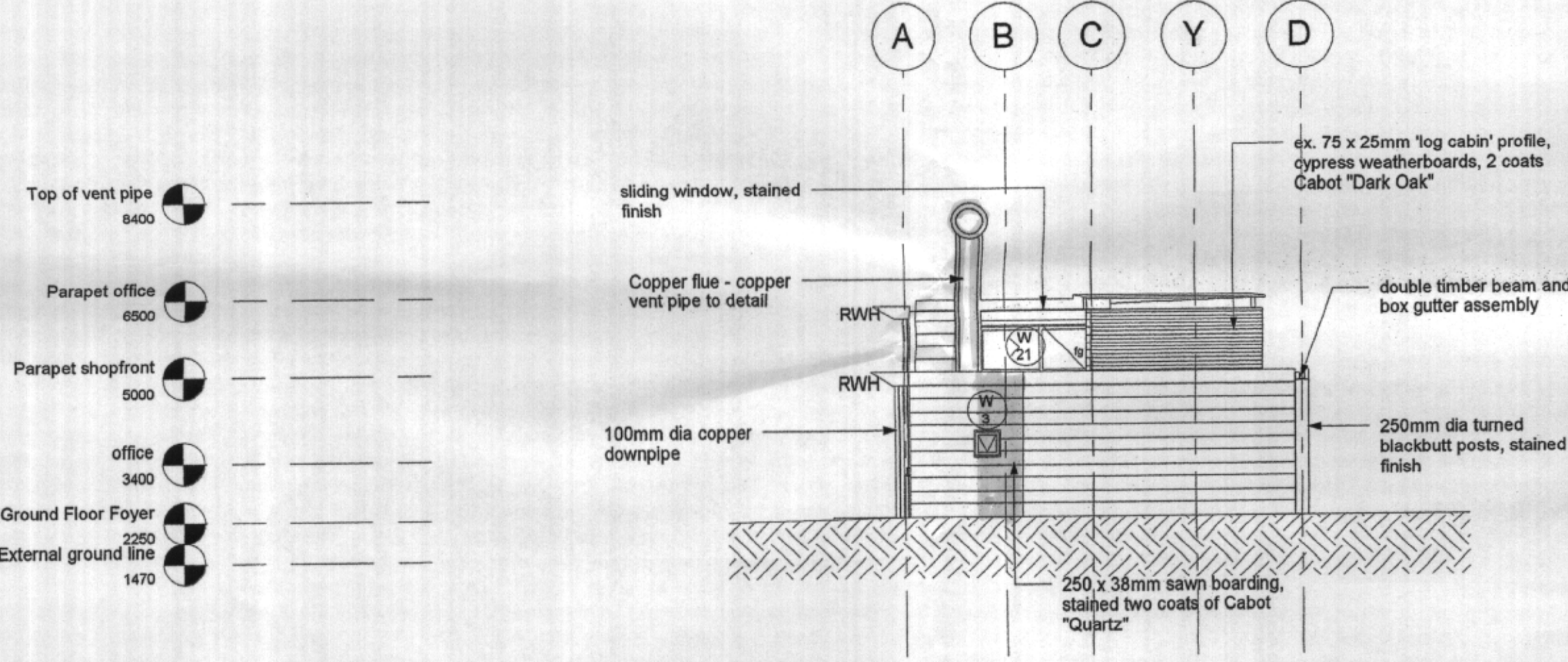
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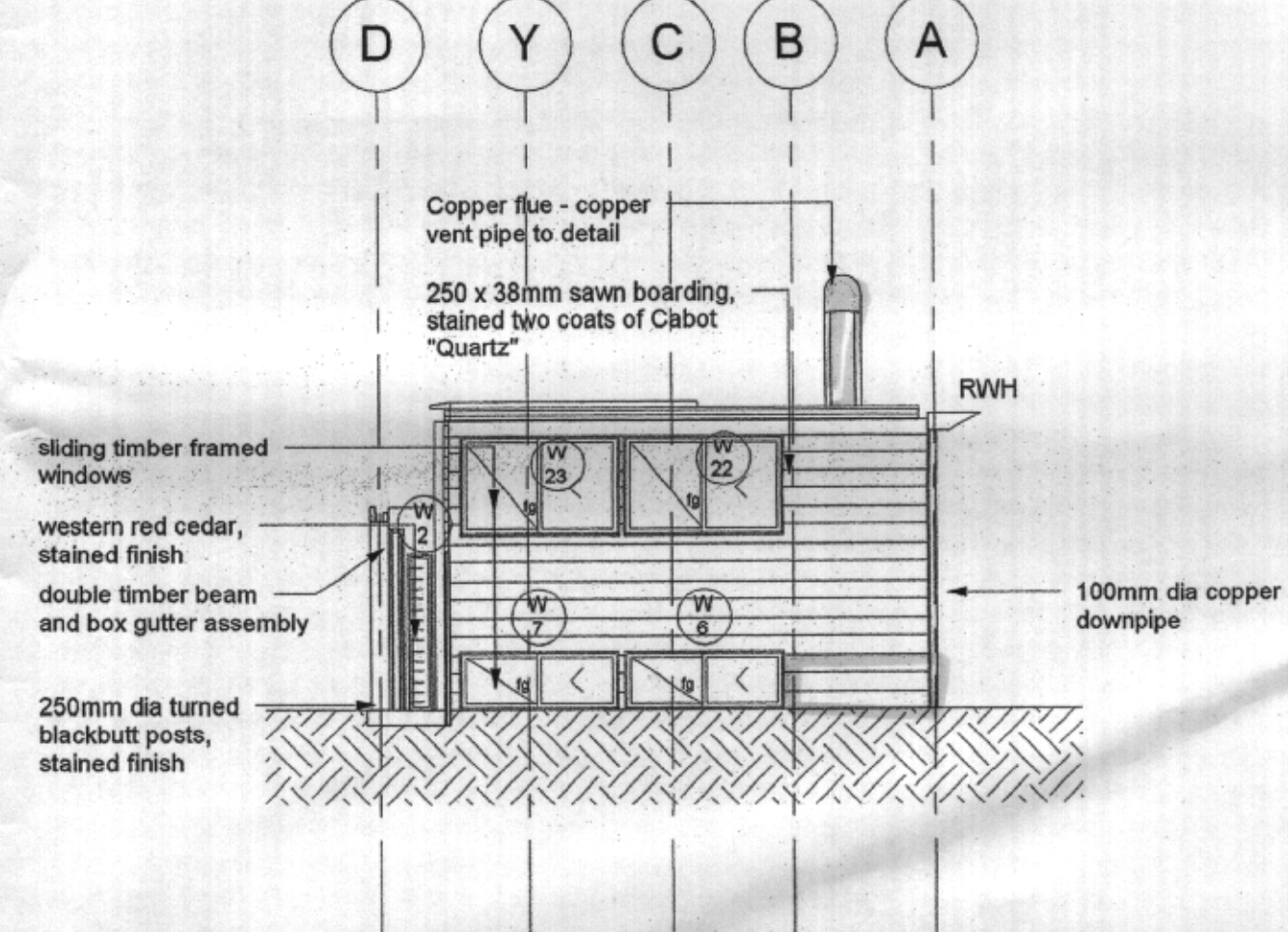
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1:100



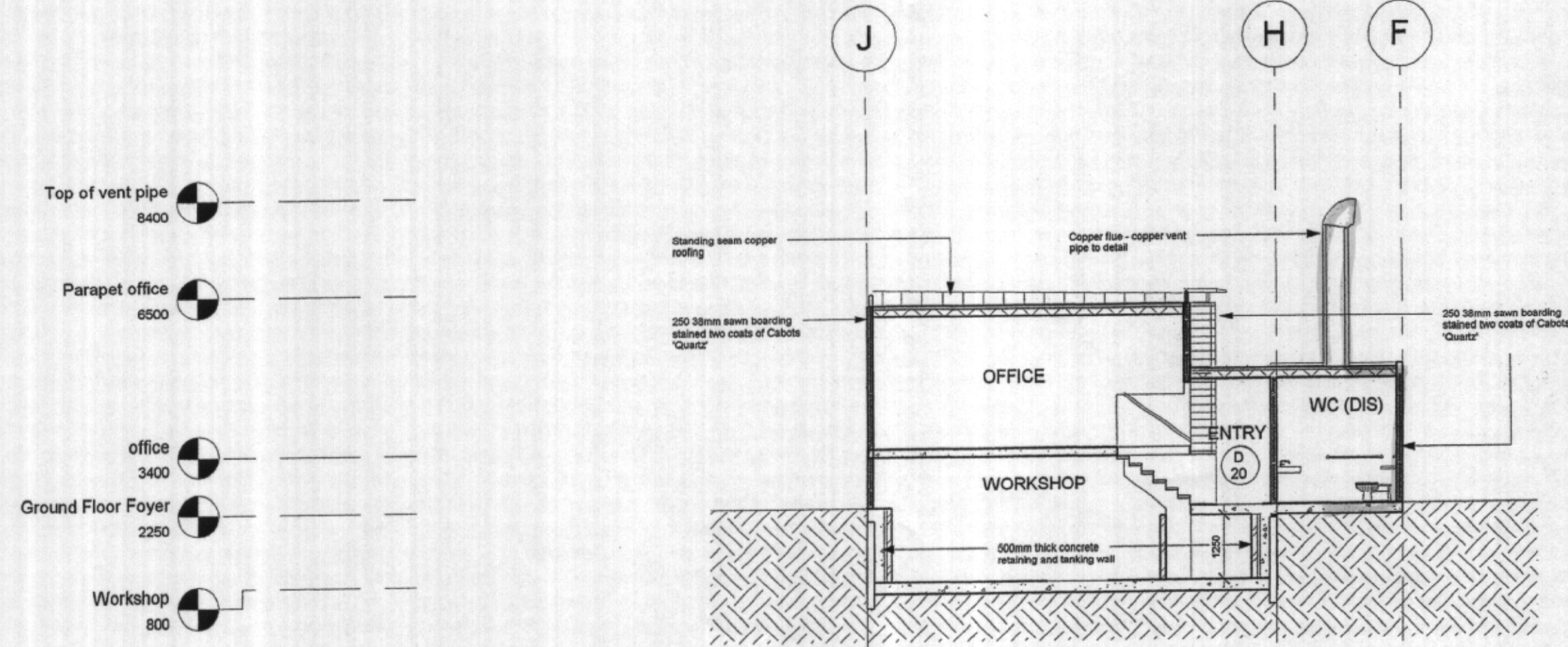
2 SE Elevation - Unit 4
1:100



3 NE Elevation - Unit 4
1:100



4 SW Elevation - Unit 4
1:100



5 Section - Unit 4
1:100

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AMENDMENTS

UNIT 1 (GROUND FLOOR)

- Place concrete slabs at least 60 mm thick.
- Place double sliding doors at its storage area.
- Change fence to Unit 1 to bushwood.
- Remove window from Unit 1 to Archway room.
- Add window from SE elevation to Archway room with viewline.
- (UNIT FLOOR)**
- Replaces window to study with wood frame.
- Replaces window in SE wall.
- Add floor glass partition in WWV wall as first door frame.
- UNIT 2 (SECOND FLOOR)**
- Addition of a glass roof against driving room.
- Addition of a glass roof to support slab to include hallway and powder room.
- Add skylights to roof above lake.
- Install units up to allow drainage.
- Replacement of windows in SE boundary.
- Replace window with copper roof (SW elevation).
- Recalculate copper roof.
- Unit 3 (FIRST/FLOOR)**
- Replaces window position in SE wall.
- Add window and add window in NE wall.
- Extend down lower level kitchen at living room.
- Add window type to Unit 3 balcony.
- Unit 4 (FIFTH/FLOOR)**
- Extend window length on SW elevation.
- View page models.
- Recalculate office construction.

CITY PLACE
Construction Cert

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23250/1 13 SEP 1964

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TO DEVELOPMENT CONSENT PLANS

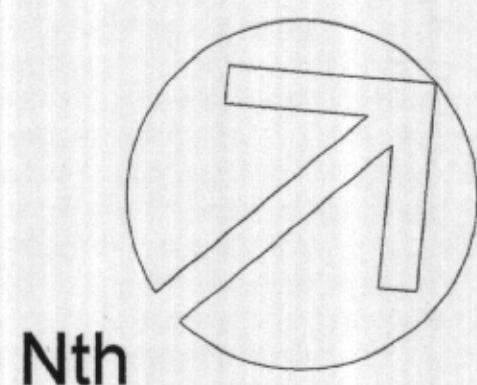
Roof & Site Plan

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Neville Brown & Associates

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Civil and Stormwater
Structural
Mechanical
Electrical

Interior Consultant
Marchese & Partners

AMENDMENTS

- UNIT 1 (GROUND FLOOR)
- Provide stairs to basement access hatch.
 - Reconfigure internal layout to boot store and plant room.
 - Access hatch to location indicated under first floor deck.
 - Reconfigure stairs to storage room.
 - Reconfigure and reconfigure laundry to boot store.
 - Add in wet bar to boot store.
 - Reconfigure entry foyer stairs.
 - Reconfigure deck to terrace.
 - Reconfigure hatch to terrace.
- UNIT 2 (GROUND FLOOR)
- Reconfigure entry foyer.
 - Reconfigure internal stair and delete passenger lift.
 - Stair well under stair to provide primary in Auxiliary room.
 - Add in robe to play room.
 - Add laundry to play room.
 - Add stairs to Auxiliary room.
 - Storage deck to entry.
 - Add walls to cellar room.
 - Reconfigure door from garage through to unit 3 foyer.
 - Change level of ground floor to RL 1970 (04.04).
- UNIT 3 (GROUND FLOOR)
- Provide disabled car space.
 - Enlarge bathroom for disabled access.
 - Provide disabled car space.
 - Indicate road works to fill in including curb and gutter.
 - Change door type to Vitroneur.
 - Reconfigure stair width to workshop.
 - UNIT 4 (FIRST FLOOR)
 - Reconfigure entry to bed 1.
 - Reconfigure wall to bed 1.
 - Reconfigure bathroom.
 - Reconfigure curved stair wall.
 - Add in first floor for sliding window to bed 1.
 - Change floor glass window to sliding window in bed 1.
 - Reconfigure sliding door to 4x6 in living room.
 - Add in first glass window to end of 4x6 sliding door in living room.
- UNIT 5 (SECOND FLOOR)
- Reconfigure laundry and W.C.
 - Reconfigure hallway to bathroom level.
 - Reconfigure hallway to bathroom level.
 - Reconfigure entry to unit 2.
 - Add in curved wall to bed 1.
 - Shift window to bed 1 in suite.
 - Change stair wall in kitchen.
 - Reconfigure windows above dining room.
 - Reconfigure windows above dining room.
 - Add in first glass window to end of 4x6 sliding door in living room.
- UNIT 6 (THIRD FLOOR)
- Reconfigure stairs and delete lift.
 - Reconfigure stairs and delete lift.
 - Shift replace chimney replace 2x sliding door testing room.
 - UNIT 7 (FOURTH FLOOR)
 - Delete Cambrist mast.

CITY PLAN SERVICES
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Palm Beach

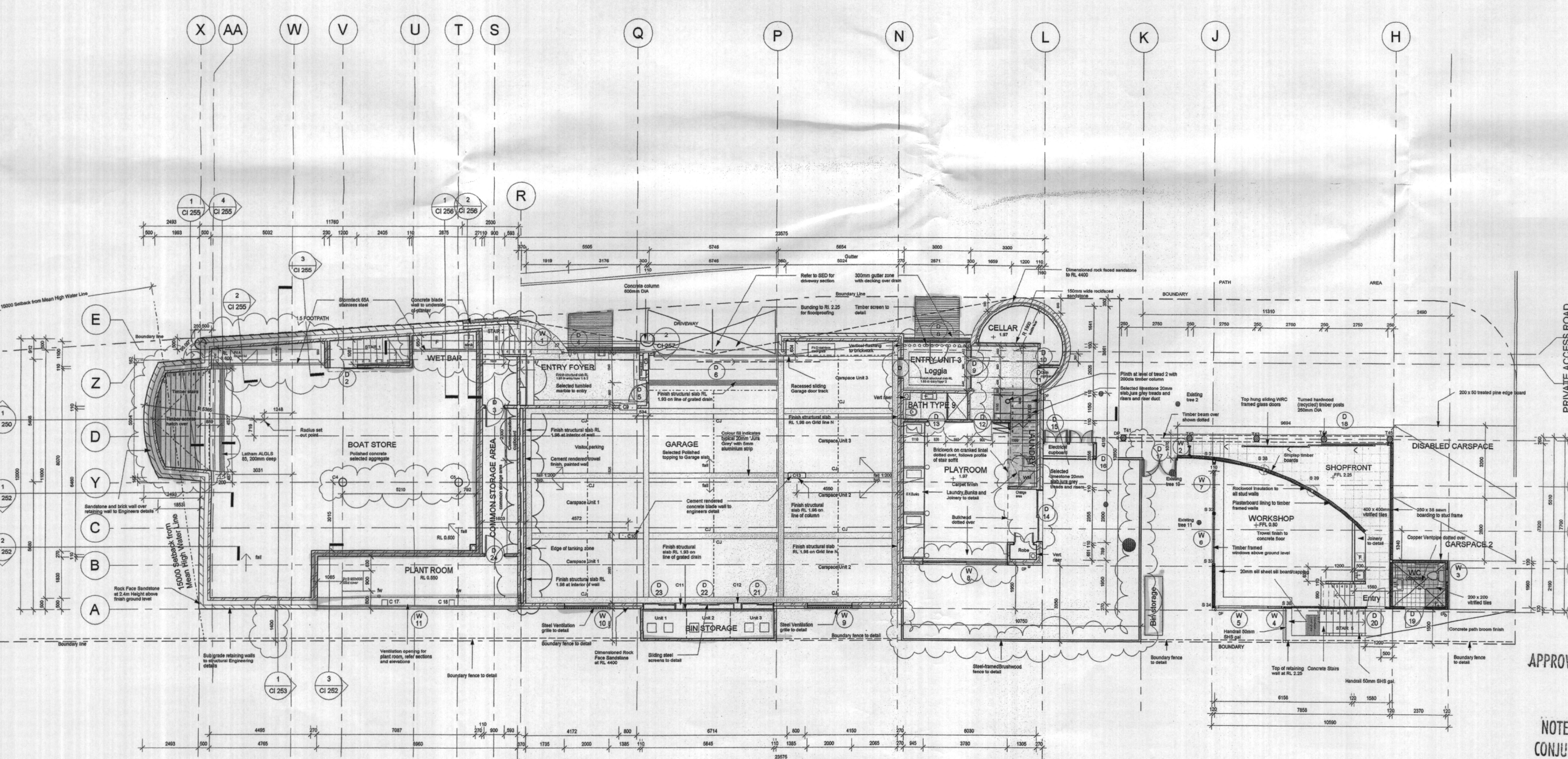
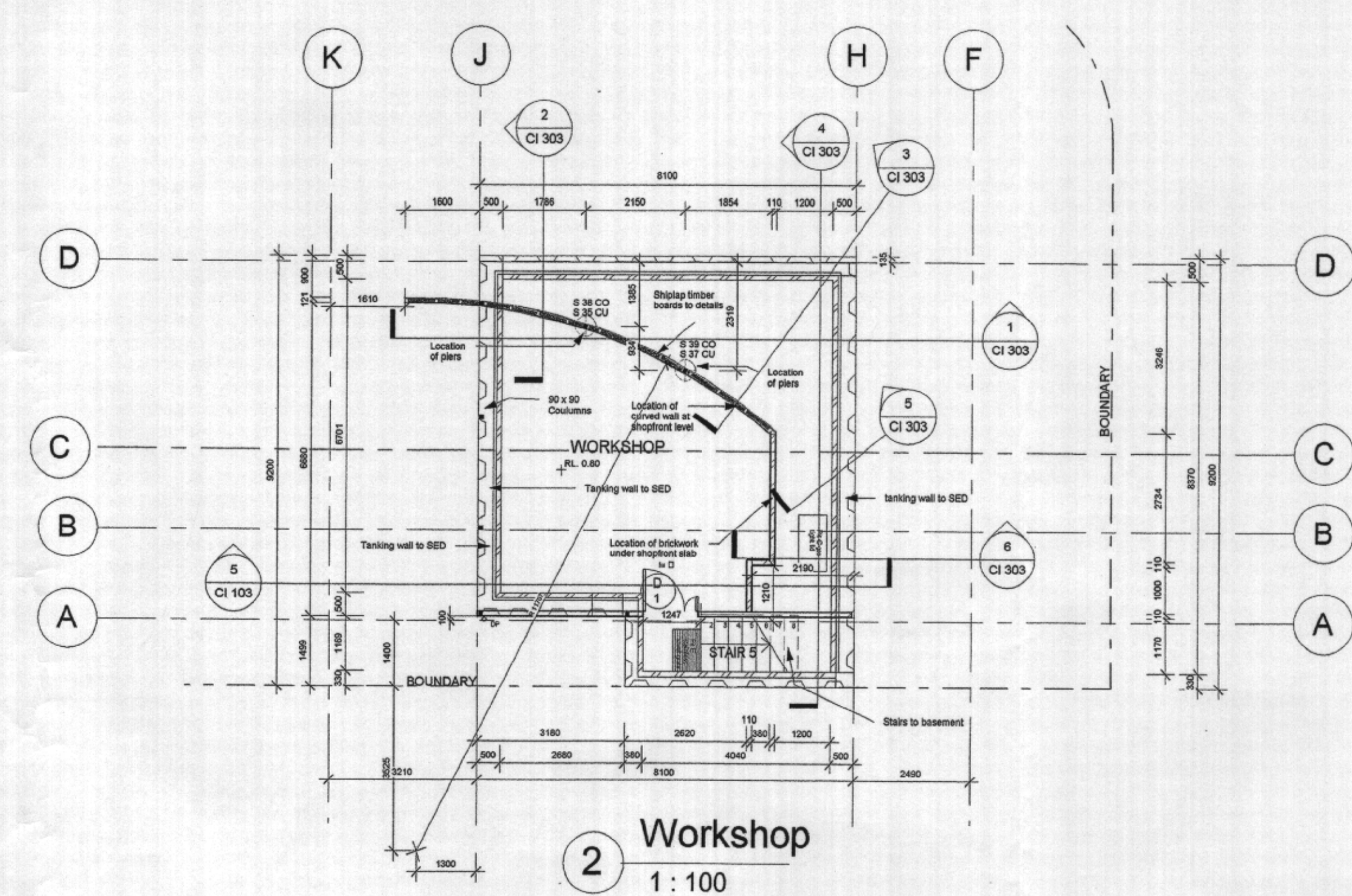
The Boatshed

Plans - Ground Floor

Project number	C		
Date	03.04	Scale	1:100
Drawn by	Author	Designed	
Drafting Check		Designed Check	
APPROVED DEVELOPMENT CONSENT PLANS		Issue	
CI 201		C	

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1 Ground Floor Plan
1:100

Nt: RL's indicate finished DA approved levels. Contractor to allow for set downs as required by floor finishes, falls etc. UNO

Nt: For interior detail fittings refer to Marchese + Partners documentation



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GHD
Civil and Stormwater
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Mechanical
Electrical
Interior Consultant
Marchese & Partners

AMENDMENTS

- UNIT 1 (GROUND FLOOR)
- Provide access to landscaped access hatch.
- Reconfigure internal layout to best store and plant room.
- Access hatch to landscape relocated under first floor deck.
- Reconfigure stairs to storage room.
- Relocate and reconfigure laundry to best store.
- Add in wet bar to best store.
- Reconfigure entry foyer stairs.
- Reconfigure stairs to units 1&2.
- Relocate hatch to best store.
UNIT 2 (GROUND FLOOR)
- Reconfigure entry foyer.
- Relocate internal stair and create passenger lift.
- Relocate wall under stair to provide privacy in Ancillary room.
- Add in robe to play room.
- Add facility to play room.
- Add in bedroom to Ancillary room.
- Reconfigure access to entry.
- Add stairs to central room.
- Relocate door from garage through to unit 3 foyer.
- Change level of ground floor to RL 1070 (DA 04).
UNIT 3 (GROUND FLOOR)
- Provide disabled car space.
- Relocate bathroom for disabled access.
- Provide disabled car space.
- Indicate road works to be included including cuts and gutters.
UNIT 4 (GROUND FLOOR)
- Change door type to Workshop.
- Relocate stairs and stairs to workshop.
UNIT 1 (FIRST FLOOR)
- Reconfigure entry to unit 1.
- Reconfigure bed 1.
- Reconfigure robe to bed 1.
- Reconfigure bathroom.
- Redesign kitchen.
- Reconfigure curved stair wall.
- Add in robe wall for sliding window to bed 1.
- Change floor glass window to sliding window in bed 1.
- Relocate the sliding door to be in living room.
- Add in floor glass window to end of 4th sliding door in living room.
UNIT 2 (SECOND FLOOR)
- Reconfigure laundry and VWC.
- Reconfigure internal stairs to bedroom level.
- Reconfigure hallway to bedroom level.
- Reconfigure bathroom on bedroom level.
- Reconfigure entry to unit 1.
- Add in curved robe wall to bed 1.
- Add window in bed 1 on suite.
- Stand robe wall in kitchen.
- Reconfigure windows above sitting room.
- Reconfigure windows above dining room.
- Add in floor glass window to end of 4th sliding door in sitting room.
UNIT 3 (FIRST/SECOND FLOOR)
- Reconfigure stairs and create lift.
- Reconfigure bathroom layout.
- Split fireplace chimney replace 2nd sliding door to sitting room.
UNIT 4 (FIRST/SECOND FLOOR)
- Delete 'Camber' mast.

CITY PLAN SERVICES

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23250/1 15 SEP 2004

Certifying Authority: Brendan Bennett
The Boatshed No: PIA3004

1017 Barrerjoey Rd
Palm Beach

Plans - First & Second Floor

Project number c

Date 03.04 Scale 1:100

Drawn by Author Designed

Checked by

Issue C

Date

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APPROVED DEVELOPMENT CONSENT PLANS

DATE 03.04.2004 2:06:51 PM

First Floor Plan

1:100

Second Floor Plan