KBI
Kennedy Bell Infrsatructure

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Federation Centres, Nepean Village, NSW

Proposed Site Signage Project
Refurbishment of Pylon and Banner Signs
Provision of New Totem Signs

Project completed for

Bentleigh Signs
(Alicia Morgan)

PAUL KENNEDY
BEng CPEng MIStruct E
Chartered Structural Engineer
Registered Building Practitioner

REGISTERED
Building Practitioner

EC23742

KBI
KENNEDY BELL
INFRASTRUCTURE

Contents

Structural Certification

STATEMENT OF COMPLIANCE—DESIGN

To
Relevant building surveyor:
Attention :
Postal address: Postcode:

From
Structural Engineer: Paul Kennedy
Qualifications: Bachelor of Engineering (Hons) BEng
Chartered Structural Engineer CEng
Member of the Institution of Structural Engineers MIStruct E (Reg No 020280171)

Postal address: 8 Heather court, Hawthorn East Postcode:3123

Property details
Nepean Village
Cnr Station and Reserve St
NSW

Statement

I did prepare the design and I certify that the part of the design described as Proposed Site Signage project, Pylon, Totem and Banner type signs design complies with the following provisions of the Regulations**

** Includes BCA and relevant standards AS 1170, AS1664, AS1684, AS2870, AS3600, AS3700, AS4100,

Design documents

Drawing Nos: PS-3D-07, CPE-ILL-06/08/10, TS-ILL-12, EIS-3D-PT13/PT14/PT15, BS-3D-24
Prepared by: Bentleigh Signs Date: September 2013

Specifications: N/A Prepared by: Date:

Computations:KBI-13-103 1-17 Inclusive Prepared by: P.Kennedy Date: Sept 2013

Test reports: Prepared by: Date:

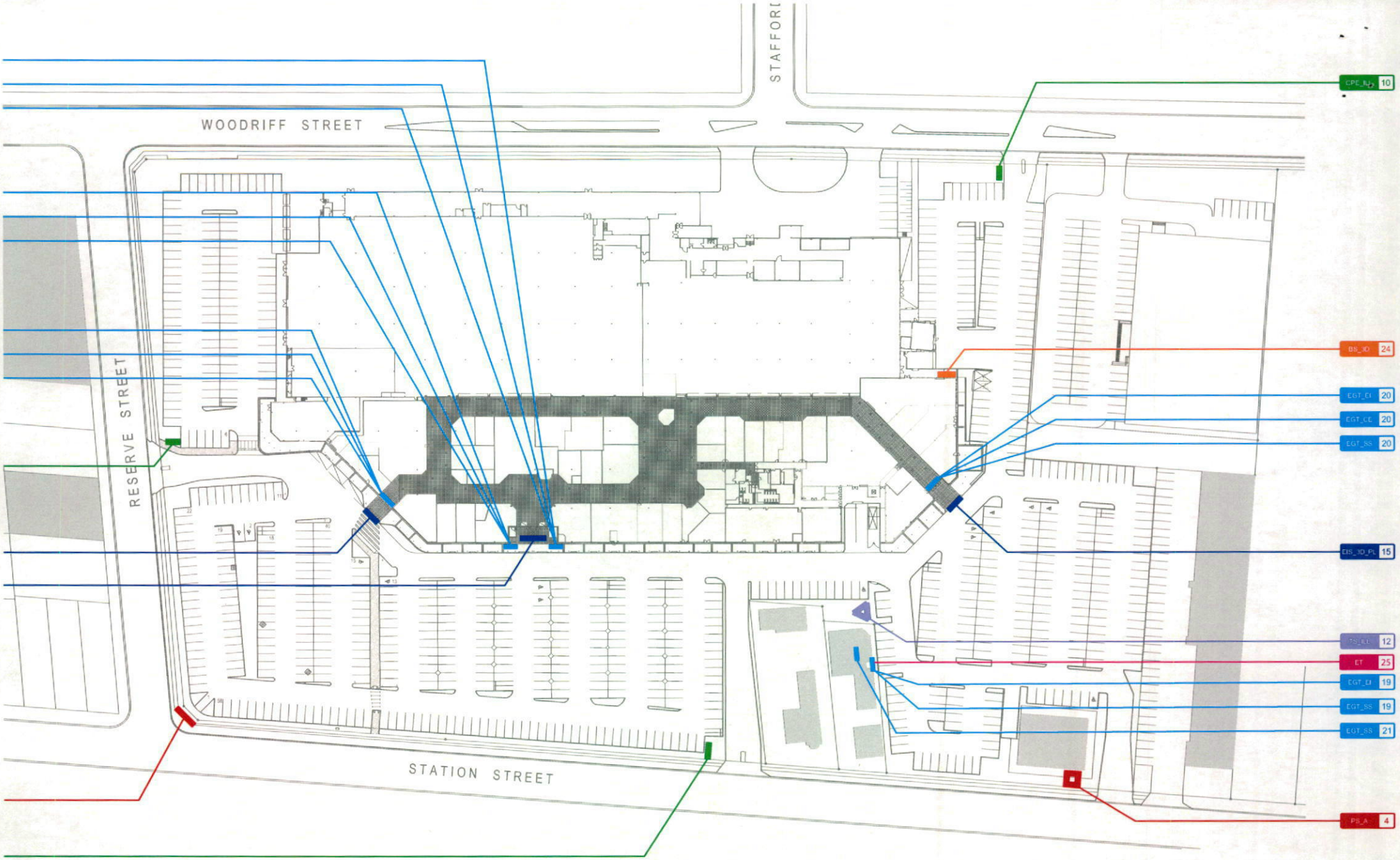
Other documentation: N/A

Signature

Signed: Date: 3rd October 2013

Paul Kennedy BEng CPEng MIStructE

Design Documentation and Notes



KBI - Kennedy Be

Sketch No - KBT-13-103 - 01

Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. **02**	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

DESIGN BRIEF

The signs outlined in this design package vary in nature from face mounted signs fixed directly to the existing structures, base mounted pylon structures and recladding of an existing high level dual leg pylon sign.

All of the signs are at the Nepean Village Shopping centre, New South Wales.

With the signs mounted in various positions reletive to height and orientation to North, a conservative approach to the exact wind load intensity will be used.

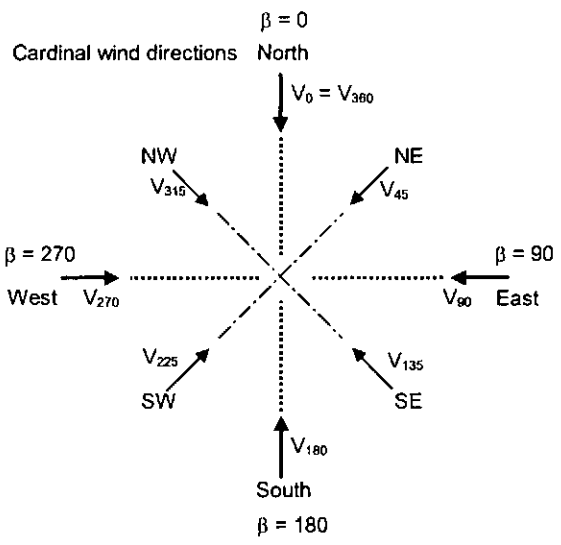
For the signs being mounted directly to the face of the buildings, the design wind load case will be assumed to be a sidewall local pressure (Suction) on the sign face and the attached substructure of the sign.

All other signage will adopt the design loadcase where the wind load is applied to the structure directly onto the face at 90 deg.

Actions will be assessed on the largest sign face and members and will include fixings to the existing structure. These members and fixings will be applied across the entire range of signs to be used on the site.

SITE DESIGN WIND PRESSURE CALCULATION

The site wind speed is independent of the type or shape of structure.



Ultimate limit state and serviceability limit state

Site wind speed;

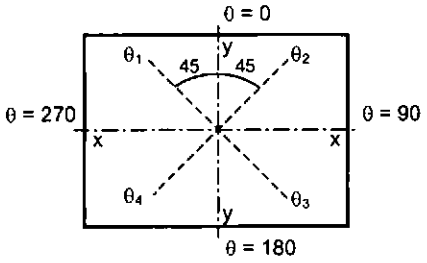
$V_{sit,\beta} = V_R \times M_d \times (M_{z.cat} \times M_s \times M_t)$

V_0 = **32.04** m/s;
V_{45} = **32.04** m/s
V_{90} = **32.04** m/s;
V_{135} = **38.05** m/s
V_{180} = **36.05** m/s;
V_{225} = **38.05** m/s
V_{270} = **40.05** m/s;
V_{315} = **38.05** m/s

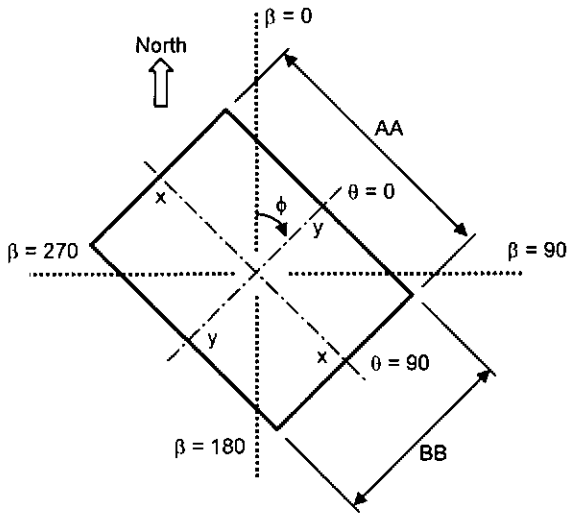
Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. **03**	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

Design wind speed (cl. 2.3)

Orthogonal orientation



Orientate building; ϕ = **0.0°** ; (angle between β = 0° and θ = 0°)



Using cardinal coordinates; θ_1 = **315.0°**; θ_2 = **45.0°**

θ_3 = **135.0°**; θ_4 = **225.0°**

Site wind speed in the range $\theta = \beta$ +/- 45°

$V_{\theta 1}$ = **38.05** m/s; $V_{\theta 2}$ = **32.04** m/s

$V_{\theta 3}$ = **38.05** m/s; $V_{\theta 4}$ = **38.05** m/s

Design wind speed ;

(maximum value of site wind speed in the range $\theta = \beta$ +/- 45°);

$V_{des.\theta 0}$ = **38.05** m/s; $V_{des.\theta 90}$ = **38.05** m/s

$V_{des.\theta 180}$ = **38.05** m/s; $V_{des.\theta 270}$ = **40.05** m/s

Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. **06**	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

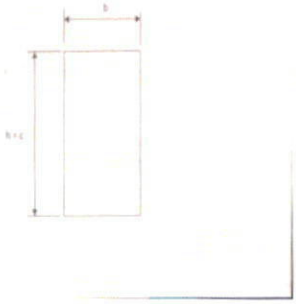
New Totem Signs CPE-III-06, 08, 10 & TS-ILL-12

BENTLEIGH SIGN GROUP

Nepean Village

Federation

Sign Types CPE ILL 06/08/10



Wind loading on Sign

Treating structure as free standing hording
Wind normal to sign face

h = c = 2
b = 0.5

Ratios

c/h = 1
b/c = 0.25

Hence Cpn = 1.3 + 0.5[(0.3+Log (b/c)(0.8-(c/h)]
Cpn = 1.33

and for C_{fig} = 1.0 and C_{dyn} = 1.0

		kN/m²
then - Design Wind Pressure		
$p = (0.5)(\wp) \times V^2 \times Cpn \times C_{fig} \times C_{dyn}$ =		1.31

		kN
Design Total Horizontal load	H = (h x c) x p =	1.31

Design Actions to Columns

		kNm
Design moment per Column	$M = p \times (b/2) \times (h^2/2)$ =	0.65
Servicability (SLS) moment per Column	M(sls)= 0.43 x M =	0.28

		kN
Total Vertical Load per column (Self Weight based on 50x50x5 SHS columns and internals)	N = (2xh) x 6+ (2xb) x 6=	0

Member Design

(Based on Trial Section 50x50x5 SHS columns)

Effective Length l_e

$l_e = K_t \times K_l \times K_r \times l_s$

with segment length restricted to 2m max

$K_t = 1 + [(d_1/l_s) \times \{(d/(2 \times t)\}^3] / n_w$

Section Properties

f_y =	350 M_{pa}
Z_x =	10.3 x10^3 mm^3
I_x =	0.257 x10^6 mm^4
t_f =	5 mm
t_w =	5 mm
d =	50 mm
d_1 =	50 mm
n_w =	2
K_t =	1.002
K_l =	1.4
K_r =	1
Hence l_e=	2804 mm
Moment Reduction Factor Υ_m =	1.5
Slenderness Reduction Factor ∞_m =	0.5
Section Moment Capacity ϕM_{bx} =	3.24 kNm
Member Moment Capacity ϕM_{zx} =	2.43 kNm

ϕM_{sx} =	2.43 kNm	M=	0.65 kNm	***Section Acceptable***
		Efficiency	27%	

Check Deflection

$\delta = Wl^3/8EI$ =	5 mm	l/δ =	365	***Deflection Acceptable***

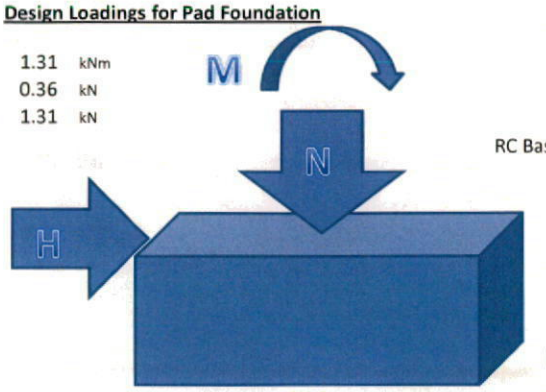
BENTLEIGH SIGN GROUP

Nepean Village
Federation

Design Loadings for Pad Foundation

Treating structure as free standing hording
Wind normal to sign face
Assumed Bearing Pressure = 100kPa

M = 1.31 kNm
N = 0.36 kN
H = 1.31 kN



RC Base Mass (kG/m^3) = 2400

Base Depth - d = 0.5

Base Width - W = 1.15

Base Length - L = 0.9

Quantity of Concrete (m^3) = 0.52

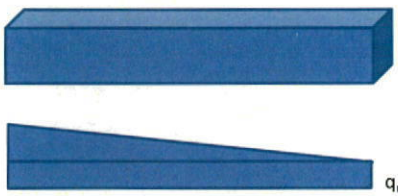
Mass of Base = 12.42 kN

Base Restraining Moment = 7.1415 kNm

		kNm
Total Design Overturning Moment =	M_{ot} = M + (H x d) x 1.5 =	**2.29**

Load Eccentricity e = M/N_{total} = 0.1793 m L/6 = 0.19 **Inside Middle Third - Acceptable**

		kPa
Maximum Ground Brearing Pressure q_{max} =	(N/WxL) + ($6M/WL^2$) =	27
Minimum Ground Brearing Pressure q_{min} =	(N/WxL) - ($6M/WL^2$) =	-2



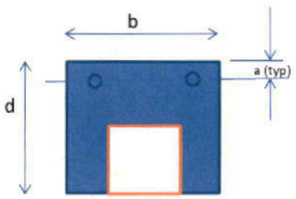
Bearing Pressure Acceptable

q_{max} = 27 kPa q_{min} = -2 kPa

Adopt 0.9 by 1.15 by 0.5 (m) Deep Concrete Base

Holding Down Bolts

	mm
b =	95
d =	95
a =	20



Holding Down Bolt Dimensions

Size	"a"	Overall length
M12	150	300
M16	250	400
M20	350	500
M24	450	600
M30	550	700

All HD Bolts to Be Galvanized

Max Tension in bolts

T= 4 kN

Use M12 X 300 HD Bolts - Gr 4.6 (Capacity 27kN)

or

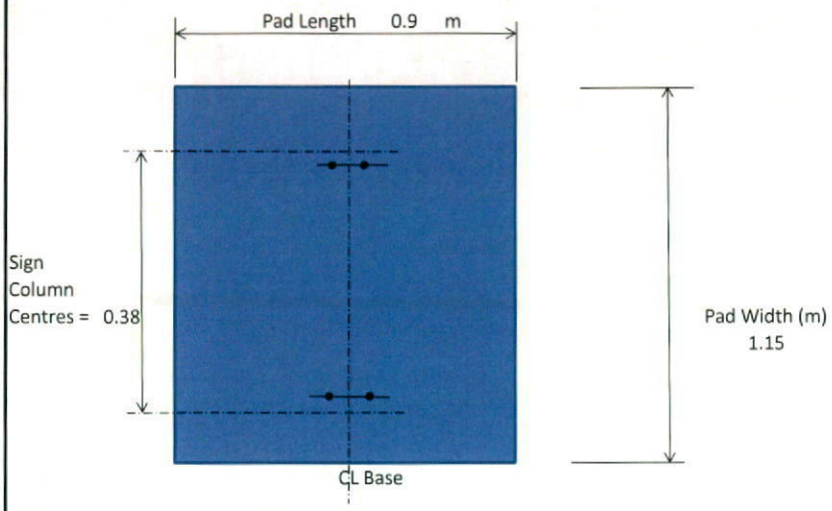
M12 x 150 Hilti Chemset Anchors (Post drill and fix to concrete base)

Dim "a"

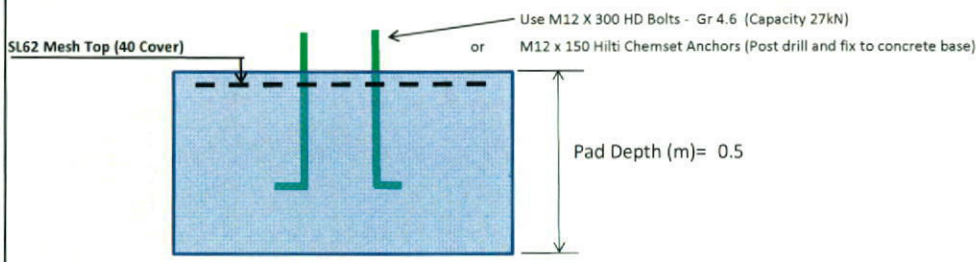
BENTLEIGH SIGN GROUP

Nepean Village
Federation

Pad Foundation Layout and Reinforcement Details



Pad Setout Plan



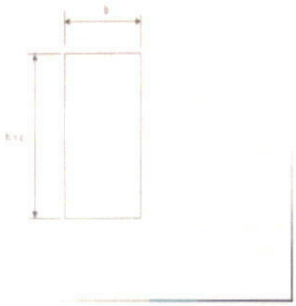
Pad Section

BENTLEIGH SIGN GROUP

Nepean Village

Federation

Sign Type TS ILL 12



Wind loading on Sign

Treating structure as free standing hording
Wind normal to sign face

h = c = 2.5
b = 0.7

Ratios

c/h = 1
b/c = 0.28

Hence Cpn = 1.3 + 0.5[(0.3+Log (b/c)(0.8-(c/h)]
Cpn = 1.33

and for C_{fig} = 1.0 and C_{dyn} = 1.0

		kN/m²
then - Design Wind Pressure		
$p = (0.5)(\wp) \times V^2 \times Cpn \times C_{fig} \times C_{dyn}$ =		1.30

		kN
Design Total Horizontal load	H = (h x c) x p =	2.28

Design Actions to Columns

		kNm
Design moment per Column	M= p x (b/2) x (h^2/2) =	1.43
Servicability (SLS) moment per Column	M(sls)= 0.43 x M =	0.61

		kN
Total Vertical Load per column (Self Weight based on 75x50x5 SHS columns and internals)	N = (2xh) x 6+ (2xb) x 6=	0

Member Design

(Based on Trial Section 75x50x5 SHS columns)

Effective Length l_e

$l_e = K_t \times K_l \times K_r \times l_s$

with segment length restricted to 2m max

$K_t = 1 + [(d_1/l_s) \times \{(d/(2 \times t)\}^3] / n_w$

Section Properties

f_y =	350 M_{pa}
Z_x =	19.4 x10^3 mm^3
I_x =	0.726 x10^6 mm^4
t_f =	5 mm
t_w =	5 mm
d =	75 mm
d_1 =	50 mm
n_w =	2
K_t =	1.002
K_l =	1.4
K_r =	1
Hence l_e=	2804 mm
Moment Reduction Factor Υ_m =	1.5
Slenderness Reduction Factor ∞_m =	0.5
Section Moment Capacity ϕM_{bx} =	6.11 kNm
Member Moment Capacity ϕM_{zx} =	4.58 kNm
ϕM_{sx} = 4.58 kNm	M= 1.43 kNm
	Efficiency 31%

Section Acceptable

Check Deflection

$\delta = WI^3/8EI$ = 7 mm l/δ = 379

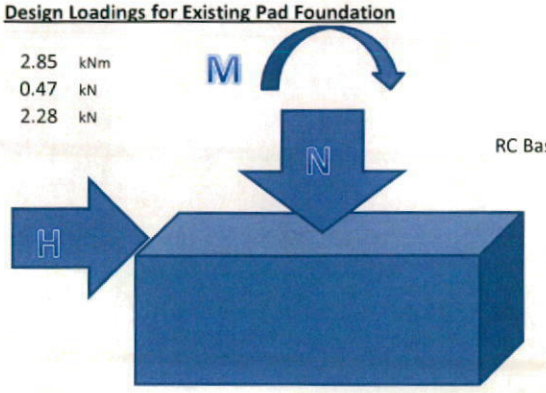
Deflection Acceptable

Nepean Village
Federation

Design Loadings for Existing Pad Foundation

Treating structure as free standing hording
Wind normal to sign face
Assumed Bearing Pressure = 100kPa

M = 2.85 kNm
N = 0.47 kN
H = 2.28 kN



RC Base Mass (kG/m^3) = 2400

Base Depth - d = 1

Base Width - W = 1

Base Length - L = 1

Quantity of Concrete (m^3) = 1.00

Mass of Base = 24 kN

Base Restraining Moment = 12 kNm

		kNm
Total Design Overturning Moment =	M_{ot} = M + (H x d) x 1.5 =	**6.28**

Load Eccentricity e = M/N_{total} = 0.2565 m L/6 = 0.28 **Inside Middle Third - Acceptable**

		kPa
Maximum Ground Brearing Pressure q_{max} =	(N/WxL) + (6M/WL^2) =	62
Minimum Ground Brearing Pressure q_{min} =	(N/WxL) - (6M/WL^2) =	0

Bearing Pressure Acceptable

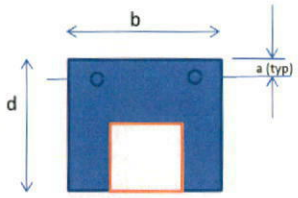
q_{max} = 62 kPa

q_{min} = 0 kPa

Existing 1 by 1 by 1 (m) Deep Concrete Base

Holding Down Bolts

	mm
b =	95
d =	95
a =	20



Max Tension in bolts

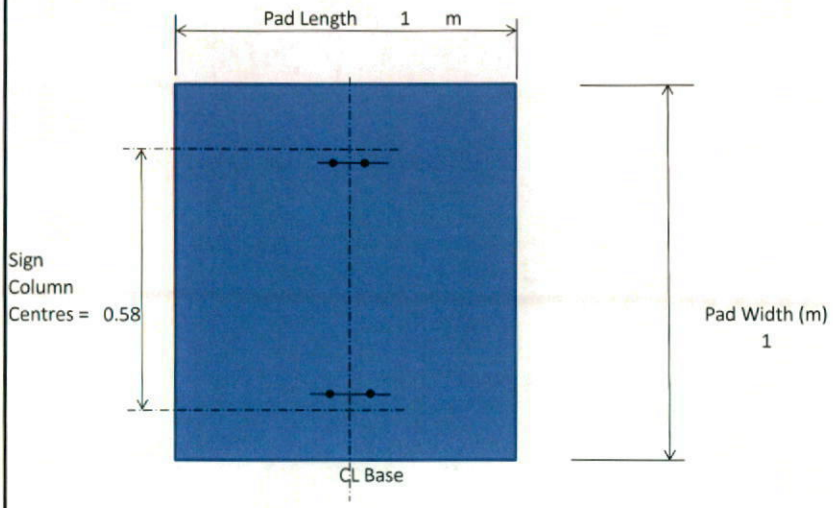
T= 10 kN

Dim "a"

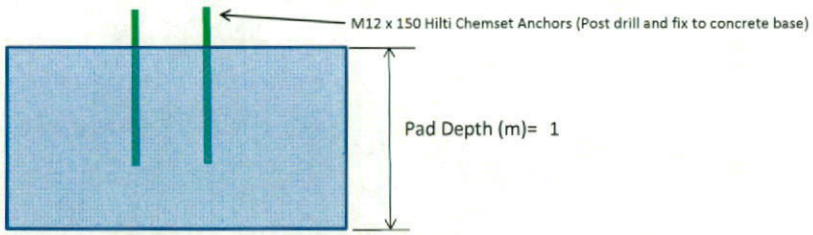
M12 x 150 Hilti Chemset Anchors (Post drill and fix to concrete base)

Nepean Village
Federation

Existing Pad Foundation Layout



Pad Setout Plan



Pad Section

Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. 13	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

New Banner Signs EIS-3D-PT13, 14,15 & BS-3D-24

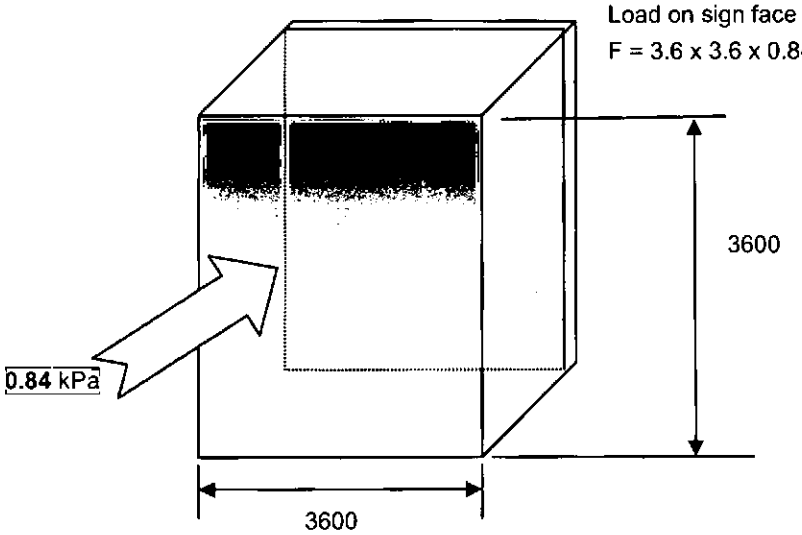
Design wind speed ;
(maximum value of site wind speed in the range $\theta = \beta$ +/- 45°);

$V_{des,\theta0}$ = **38.05** m/s; $V_{des,\theta90}$ = **38.05** m/s
$V_{des,\theta180}$ = **38.05** m/s; $V_{des,\theta270}$ = **40.05** m/s

Wind pressure; $p_{\theta0}$ = 0.74 kPa; $p_{\theta90}$ = 0.74kPa
$p_{\theta180}$ = 0.74 kPa; $p_{\theta270}$ = 0.84 kPa

Design Loading on sign (Aluminium Subframe)

Load on sign face (Maximum dimensions 3.6m x 3.6m)
F = 3.6 x 3.6 x 0.84 = 11 kN (Total)



For 4 fixings top and bottom

Max loading per fixing = 1.4kN.

Note – For ease of site drilling and fixing, adopt 10mm threaded fixings to existing steel members of the suport substructure. Drilling can be done using handheld pistol drills on site. (Capacity of fixings 8kN + depending on type of fixing used)

Design loads on frame members

Main central member will attaract most load on sign face.
Loaded area = 1.8m wide

Load on member = 1.8 x 0.84 = 1.51kN/m
Moment on member from wind load on face = $(1.51 \times 3.6^2) / 8$ = 2.45kNM

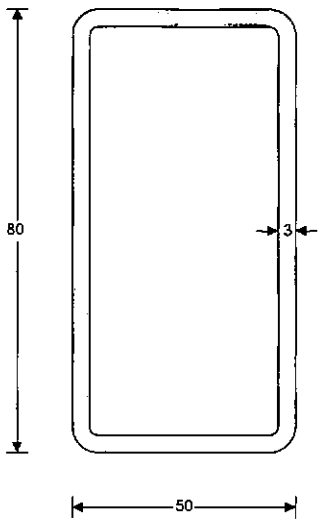
Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. 14	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

MEMBER DESIGN (ALUMINIUM MEMBERS TO AS1664)

In accordance with AS1664-1997

Section details

Section type;	**80x50x3 RHS**
grade;	**6063-T6**
Thickness of material;	t = **3.0** mm
Yield stress;	f_y = **170** N/mm^2
Tensile strength;	f_u = **215** N/mm^2
Modulus of elasticity;	E = **69000** N/mm^2



Design for bending moment

Design bending moment; $M^* = 2.45$ kNm

Section moment capacity for bending about a principal axis - Section 5.2

Effective section modulus	$Z_e = \min(S_x, 1.5 \times Z_x) = 14800$ mm^3
Nominal section moment capacity	$M_s = f_y \times Z_e = 3.7$ kNm
Design section moment capacity;	$M_{sc} = \phi \times M_s = 3.3$ kNm

PASS - Design section moment capacity exceeds design bending moment

The members are acceptable based on the maximum span of the largest rectangular sections for these types of signs.

All signs are to have members fully welded at the joint intersections.

Maximum member length for these signs is 3.8m

Standard notes for fabrication and installation of all signage elements

Tedds Kennedy Bell Infrastructure Level 27 101 Collins Street Melbourne	Project Federation Centre Site Signage - Nepean Village NSW				Job Ref. KBI-13-103	
	Section Bentleigh Signs				Sheet no./rev. 17	
	Calc. by PK	Date 16/09/2013	Chk'd by AB	Date 16/09/2013	App'd by	Date

Standard Notes

General

G1 - These drawings/design calculations shall be read in conjunction with the architectural and all other consultant drawings and specifications and with such other instructions which may be issued during the course of the contract, any discrepancies shall be referred to the superintendent for decision prior to proceeding with the work.

G2 - All dimensions and set out relevant to the office site work shall be verified by the contractor before construction and fabrication is commenced. Do not scale drawings.

G3 - During construction the contractor shall be responsible for maintaining the structure in a stable condition and ensuring that no part shall be overstressed during construction activities. All temporary propping and bracing shall be the contractor's responsibility.

G4 - The approval of substitution shall be sought by the from the superintendent but is not authorization for a cost variation. All cost variations must be agreed by the superintendent before work commences.

G5 - Excavations are not to be left open overnight. concrete to be poured as soon as excavation is complete and reinforcement placed.

G6 - Unless noted otherwise all dimensions are in millimetres.

G7 - Builder to ensure sign frames are fixed to suitable steel framing within the substructure where the signs are to be fixed.

Structural Steelwork

S1 - All workmanship and materials shall be in accordance with AS4100 Steel Structures

S2 - Welding shall be performed by a qualified operator in accordance with AS1554.

S3 - Bolts designated 4.6/S shall be commercial bolts to AS111 and AS112 tightened to snug tight fit, bolts designed as 8.8/S shall be high strength steel bolts to AS1252 tightened to a snug tight fit.

S4 - The ends of all SHS and RHS sections shall be sealed with 6mm thick plate and continuous fillet weld.

S5 - Before fabrication is commenced the contractor shall submit copies of the shop drawings to the superintendent for review in accordance with specification. Review does not include checking dimensions.

S6 - All exposed structural steel work shall be either:

- hot dipped galvansied.Site Welds to existing steel work shall be cleaned and prepared prior to welding. Site welds, cuts and holes shall be repaired with two coats of zinc rich primer.
- Fully painted using Amerlock 2 as supplied by PPG and applied in accordance with the manufacturers recommendations. Site repairs following cutting or welding to be reinstated as per the site application recommendations of the manufacturer.

S7 - Unless noted otherwise:

A. All Welds for the structure to be full strength butt welds uno
B. All cleats and, gussets and end plates shall be 10mm thick
C. Welding electrodes shall be E41XX
D. All fillet welds shall be 6mm continuous
E. All butt welds shall be full penetration
F. All bolts shall be M10 4.6/s UNO
G. Bolt holt clearance shall be 2mm

S8 - The grade of structructural steel shall be as follows:

4. Square and Rectangular Hollow Sections 450MPa

Design drawings