STRUCTURAL CALCULATIONS

葛量洪醫院

DRYWALL PARTITION SYSTEMS

Drywall Assembly Wall Type

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KIRII (HK) LTD

16-May-2025

Revision Notes

Revision No	Issue No	Revision Details	Date
0	1	Issued for review	16-May-2025

Revision: 0
Issue: 1

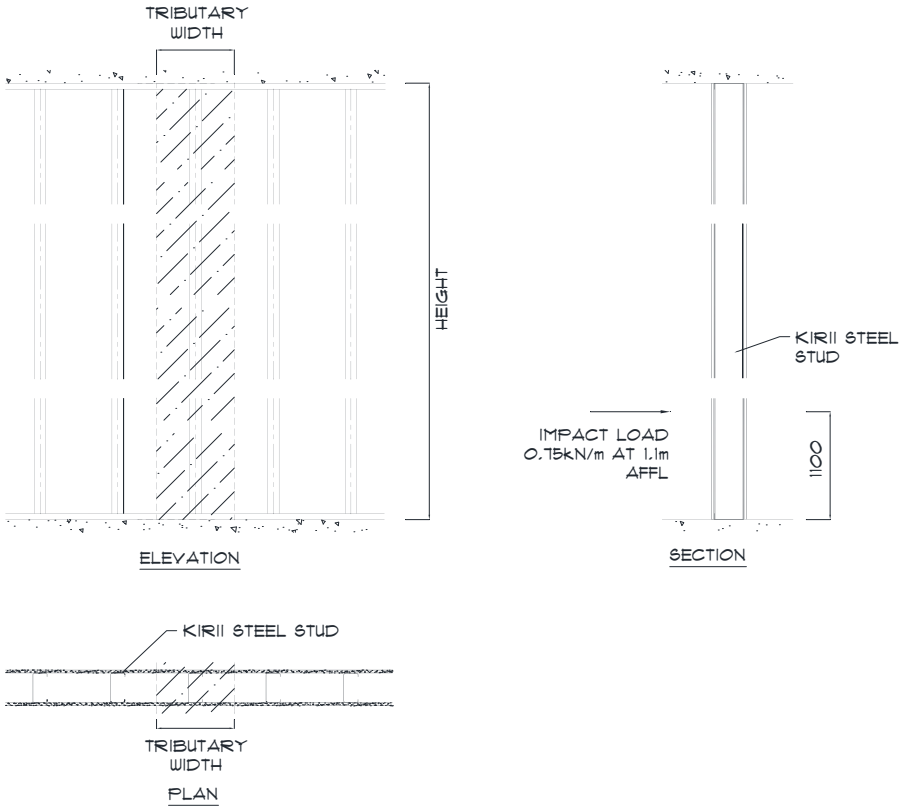
Structural Calculations			Job No	
			Date	16-May-2025
Job	葛量洪醫院		Prep.	TC
Subject	C 75x45x0.8t/4100H/406o.c.		Sheet	B - 1 Rev. 0

INTRODUCTION

This set of structural calculations is intended to substantiate the structural adequacy of the proposed KIRII drywall steel C-stud, dimensioned 75mmD x 45mmW x 0.8mm thick, simply supported, from a uniform load. Checking is based on bending strength and deflection limit, whichever is more stringent.

Design and checking of other building elements, anchorage, and wall attachments is beyond the scope of this submittal and is to be by others.

DIAGRAM



Design Data

$L := 4100mm$ Span between supports

$T_w := 406mm$ Tributary width/stud spacing

$W := 0.75kN \cdot m^{-1}$ Design imposed load at 1.1m AFFL

Critical load case = Imposed load only

$Q_k := 1.6$ Partial load factor - imposed load only

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Section Properties

KIRII steel C-stud 75 x 45 x 0.8t mm

$A := 136mm^2$ Area

$I_x := 131785mm^4$ Moment of inertia - major axis

$S_x := 3514mm^3$ Elastic section modulus - major axis

$I_y := 34843mm^4$ Moment of inertia - minor axis

$r_x := 31.0mm$ Radius of gyration - major axis

$r_y := 15.9mm$ Radius of gyration - minor axis

$A_e := 136mm^2$ Effective section area

$I_{xe} := 125552mm^4$ Effective 2nd moment of area

$S_{xe} := 2712mm^3$ Effective section modulus

Material Strength

$p_y := 200MPa$ Design strength

$p_{v.y} := 0.6(p_y) = 120 \cdot N \cdot mm^{-2}$ Plastic shear capacity

$p_{v.cr} := \left(\frac{1000t}{D}\right)^2 = 113.8 \cdot N \cdot mm^{-2}$ Shear buckling strength

$p_v := p_{v.cr} = 113.8 \cdot N \cdot mm^{-2}$ Average shear capacity

$E := 205000MPa$ Modulus of elasticity

$\gamma_m := 1.2$ Material factor

Check bending

$M_c := \frac{Q_k \cdot W \cdot T_w \cdot (1.1m)(L - 1.1m)}{L}$ Design bending moment

$M_c = 392 \cdot kN \cdot mm$

$M_b := \frac{p_y \cdot S_{xe}}{1.2} = 452 \cdot kN \cdot mm$ Bending capacity

$M_b > M_c$ OK -- safe from bending moment

Check shear

$F_v := \frac{Q_k \cdot T_w \cdot W}{2} = 243.6\,N$ Design shear force

$A_v := (75mm)(0.8mm) = 60 \cdot mm^2$ Shear area

$V_c := p_v \cdot A_v = 6827\,N$ Shear capacity

$V_c > F_v$ OK -- safe from shear

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Check web crushing

$$P_w := 1.21t^2 \cdot k_w \cdot c_3 \cdot c_4 \cdot c_{12} \cdot \left(1350 - 1.73\frac{D}{t}\right)\left[1 + 0.01\left(\frac{N_b}{t}\right)\right]$$ Web crushing capacity

$$k_w := \frac{p_y}{275} = 0.73 \cdot MPa$$

$$c_3 := 1.33 - 0.4 \cdot k_w = 1.038$$

$$c_4 := 1.15 - 0.15 \cdot \frac{r}{t} = 0.869$$

$$c_{12} := 1$$

$$N_b := 32mm$$

$P_w = 848\,N$ Web crushing capacity

$R_w := \frac{T_w \cdot W}{2} = 152\,N$ Factored reaction force on each web

$P_w > R_w$ OK - safe from web crushing

Check deflections

$$\delta_{max} := \frac{W \cdot T_w \cdot (L - 1.1m)\left[L^2 - (L - 1.1m)^2\right]^{\frac{3}{2}}}{9 \cdot \sqrt{3} \cdot L \cdot E \cdot I_{xe}}$$

$\delta_{max} = 12.12 \cdot mm$ Max. deflection of stud

$\delta_{allow} := \frac{L}{240} = 17.08 \cdot mm$ Allowable deflection of stud

$\delta_{allow} > \delta_{max}$ OK safe from deflection

The use of the proposed KIRII C-studs sized 75mmD x 45mmW x 0.8mm thick section with a span of UPTO 4100mm with a stud spacing of 406mm centres maximum is adequate

APPENDIX

SECTION PROPERTIES

KIRII STUDCO galvanized steel C-stud,
nominally 75(D) x 45(W) x 0.8mm thickness

2007 North American Specification LRFD
DATE: 5/16/2025
葛量洪醫院

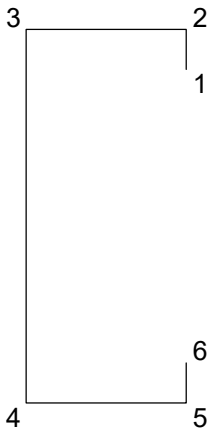
SECTION DESIGNATION: Single

Section Dimensions:

Web Height =	75.00 mm
Top Flange =	45.00 mm
Bottom Flange =	45.00 mm
Stiffening Lip =	6.30 mm
Inside Corner Radius =	1.587 mm
Design Thickness =	0.800 mm

Steel Properties:

Fy =	200.00 MPa



Gross Properties

A(gross)	Weight	A(net)	Sxx	Ixx	Rx	Iyy	Ry
(mm^2)	(N/m)	(mm^2)	(mm^3)	(mm^4)	(mm)	(mm^4)	(mm)
136.8	10.5292	136.8	3514.3	131785	31.0388	34843	15.9599

Effective Properties

Ixx(defl)	Sxx	Phi*Mn-x	Phi*Mn-x(dist)	Phi*Vng	Syy	Phi*Mn-y
(mm^4)	(mm^3)	(N-m)	(N-m)	(N)	(mm^3)	(N-m)
125552	2712	515.4	473.4	5376	1094	207.9

K-phi for Distortional Buckling = 0.00 N*mm/mm

Torsional Properties

Jx1000	Cw	Xo	m	Ro	Beta
(mm^4)	(mm^6)	(mm)	(mm)	(mm)	
29182	38440982	-866.070	20.062	48.793	0.512

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(mm^3)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(mm^2)	(mm^2)	(mm^2)
1196405.6	3199	1274.7	895.5	-744.3	744.3	-895.5	-1274.7

Web Crippling - Nominal Loads, Phi*Pn (N)

End Bearing Length = 1.00 (mm)
Interior Bearing Length = 1.50 (mm)

Cond. 1 (E1F)	Cond. 2 (I1F)	Cond. 3 (E2F)	Cond. 4 (I2F)
844	1804	668	2059