KEVIN BURROWS ENGINEERS
P O Box 163
Whangaparaoa
Phx 2624513

BEAM CALCULATIONS
FOR SIMPLY SUPPORTED BEAMS

PAGE No	B1
JOB No	22-447
DATE	4/05/2022
DESIGN BY	

PROJECT DESCRIPTION S & K Fullan
ADDRESS 68 Weka Street, Mangawhai

BEAM REFERENCE No B1
BEAM LOCATION <u>**LINTEL**</u>
BEAM SPANS 2.4

CONTRIBUTING LINEAL LOADS			TRIBUTARY WIDTH		TRIBUTARY FORCE (kN)			
FROM:	TYPE	WT kPa	metres		G	Q	U*	Us
ROOF 1	LIGHT	0.4	2.1		0.84	0.53	4.44	2.02
			TOTALS	W1	0.84	0.53	4.44	2.02

	CALCULATED MOMENT (kNm)			
MAXIMUM CALCULATED BEAM BENDING MOMENTS	1.4G	Q	U*	Us
AT CENTRE B1	0.85	0.38	1.33	0.60
AT LOCATION "a"(Based on location of load P1)	0.00	0.00	0.00	0.00

	CALCULATED FORCE (kN)			
TOTAL BEAM END REACTIONS	G	Q	U*	Us
END ONE	1.01	0.63	2.22	1.01
END TWO	1.01	0.63	2.22	1.01

To fine end reactions only.

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BEAM CALCULATIONS
FOR SIMPLY SUPPORTED BEAMS

PROJECT DESCRIPTION	S & K Fullan	**PAGE No**	GT1
ADDRESS	68 Weka Street, Mangawhai	**JOB No**	22-447
		DATE	4/05/2022
		DESIGN BY	

BEAM REFERENCE No GT1
BEAM LOCATION **LINTEL**
BEAM SPANS 4.3

CONTRIBUTING LINEAL LOADS			TRIBUTARY WIDTH		TRIBUTARY FORCE (kN)			
FROM:	TYPE	WT kPa	metres		G	Q	U*	Us
ROOF 1	LIGHT	0.4	2.3		0.92	0.58	8.70	3.96
			TOTALS	W1	0.92	0.58	8.70	3.96

	CALCULATED MOMENT (kNm)			
MAXIMUM CALCULATED BEAM BENDING MOMENTS	1.4G	Q	U*	Us
AT CENTRE	2.98	1.33	4.68	2.13
AT LOCATION "a"(Based on location of load P1)	0.00	0.00	0.00	0.00
	CALCULATED FORCE (kN)			
TOTAL BEAM END REACTIONS	G	Q	U*	Us
END ONE	1.98	1.24	4.35	1.98
END TWO	1.98	1.24	4.35	1.98

To fine end reactions only.

KEVIN BURROWS ENGINEERS
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BEAM CALCULATIONS
FOR SIMPLY SUPPORTED REINFORCED CONCRETE BEAMS

PAGE No	F1
JOB No	22-447
DATE	4/05/2022
DESIGN BY	AA

PROJECT DESCRIPTION	S & K Fullan
ADDRESS	68 Weka Street, Mangawhai
BEAM REFERENCE No	F1
BEAM LOCATION	BEAM
BEAM SPANS	2.4

CONTRIBUTING LINEAL LOADS			TRIBUTARY WIDTH		TRIBUTARY FORCE (kN)			
FROM:	TYPE	WT kPa	metres		G	Q	U*	Us
ROOF 1	Light	0.40	3.4		1.36	0.85	7.18	3.26
FLOOR 1	LIGHT	0.40	1.4		0.56	3.5	15.1	7.2
FLOOR 2	HEAVY	2.50	1.2		3	1.8	15.55	10.22
		TRIBUTARY HEIGHT						
			metres					
WALLS TYPE 1	LIGHT	0.45	2.5		1.1025		3.18	2.65
BEAM SELF WEIGHT		Ug/m	0.3	0.3	2.23		5.4	5.4
			TOTALS	W1	8.25	6.15	46.32	28.71

		CALCULATED MOMENT (kNm)		
MAXIMUM CALCULATED BEAM BENDING MOMENTS	1.4G	Q	U*	Us
AT CENTRE	8.32	4.43	13.90	8.61
AT LOCATION "a"(Based on location of load P1)	0.00	0.00	0.00	0.00
		CALCULATED FORCE (kN)		
TOTAL BEAM END REACTIONS	G	Q	U*	Us
END ONE	9.91	7.38	23.16	14.36
END TWO	9.91	7.38	23.16	14.36

			Weight of			D Load/m beam		
Beam depth	310	mm	Concrete:			Ug/m	Us/m	U*/m
Beam width	300	mm	2400	kg/m^3	Beam	3.12	2.23	2.68

REINFORCMENT TO BEAM

Beam span	2.4	m cover =	50					
Beam moment	13.9			**BEAM LINK DESIGN**				
fy	500			AT SUPPORTS TO		600	FOR REMAINING MID	
Reinf size	12	dia No.=	3	mm PAST SUPPORT EDGE			SPAN OF BEAM	
Ast	339	mm2	300	Dia stirrups	6		Dia stirrups	6
d	254	mm		As	56.5		As	56.5
fm =	25	MPa		V*	23.16		V*	11.58
a = AsFy/0.85Fc.b	26.6	mm		vi	0.41		vi	0.20
M*	13.9	kNm		vn	0.25		vn	0.40
ϕM =	34.7	**OK**		Spacing S1	127.0		Spacing S2	127.0
				Vc	0.57			

BEAM DEFLECTION ***SHEAR REINFORCEMENT ACTUALLY REQUIRED -*** ***NO***

allowable deflection δ1	9.60	short term loading		
allowable deflection δ2	8.00	long term loading		
calculated deflection Δ1	0.811	short term loading	G+ΨsQ	**OK**
calculated deflection Δ2	1.805	long term loading	G+ΨlQ	**OK**

Lateral support for beam not to exceed 50xb = 15000 mm **OK**

SUMMARY FOR: **F1**
Provide :

Concrete Section:	300	mm Wide x	310	mm Deep	Concrete Beam of		25	MPa Comp
Bottom Steel:	3	No. Bars	12	diameter	HD	grade		Strength
Top Steel:	2	No. Bars	12	diameter	HD	grade		
Support links S2:	6	dia links @	150	c/c min for				

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BEAM CALCULATIONS
FOR SIMPLY SUPPORTED REINFORCED CONCRETE BEAMS

		PAGE No	F2
PROJECT DESCRIPTION	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4/05/2022
		DESIGN BY	AA

BEAM REFERENCE No F2
BEAM LOCATION BEAM
BEAM SPANS 2.4

CONTRIBUTING LINEAL LOADS			TRIBUTARY WIDTH		TRIBUTARY FORCE (kN)			
FROM:	TYPE	WT kPa	metres		G	Q	U*	Us
ROOF 1	Light	0.40	4.4		1.76	1.1	9.29	4.22
FLOOR 1	LIGHT	0.40	2.0		0.80	5.0	21.5	10.3
FLOOR 2	HEAVY	2.50	1.2		3	1.8	15.55	10.22
		TRIBUTARY HEIGHT	metres					
WALLS TYPE 1	LIGHT	0.45	2.8		1.26		3.63	3.02
BEAM SELF WEIGHT		Ug/m	0.3	0.3	2.23		5.4	5.4
			TOTALS	W1	9.05	7.90	55.33	33.15

	CALCULATED MOMENT (kNm)			
MAXIMUM CALCULATED BEAM BENDING MOMENTS	1.4G	Q	U*	Us
AT CENTRE	9.12	5.69	16.60	9.94
AT LOCATION "a"(Based on location of load P1)	0.00	0.00	0.00	0.00

	CALCULATED FORCE (kN)			
TOTAL BEAM END REACTIONS	G	Q	U*	Us
END ONE	10.86	9.48	27.67	16.57
END TWO	10.86	9.48	27.67	16.57

		Weight of			<u>D Load/m beam</u>		
Beam depth	310 mm	Concrete:			Ug/m	Us/m	U*/m
Beam width	300 mm	2400 kg/m^3		Beam	3.12	2.23	2.68

REINFORCMENT TO BEAM

Beam span	2.4	m cover =	50				
Beam moment	16.6			**<u>BEAM LINK DESIGN</u>**			
fy	500			<u>AT SUPPORTS TO</u>	<u>600</u>	<u>FOR REMAINING MID</u>	
Reinf size	12	dia No.=	2	<u>mm PAST SUPPORT EDGE</u>		<u>SPAN OF BEAM</u>	
Ast	226	mm2	300	Dia stirrups	6	Dia stirrups	6
d	254	mm		As	56.5	As	56.5
fm =	25	MPa		V*	27.67	V*	13.83
a = AsFy/0.85Fc.b	17.7	mm		vi	0.48	vi	0.24
M*	16.6	kNm		vn	0.30	vn	0.40
ϕM =	23.6	**OK**		Spacing S1	127.0	Spacing S2	127.0
				Vc	0.50		

BEAM DEFLECTION ***SHEAR REINFORCEMENT ACTUALLY REQUIRED - YES***

allowable deflection δ1	9.60	short term loading		
allowable deflection δ2	8.00	long term loading		
calculated deflection Δ1	0.969	short term loading	G+ΨsQ	**OK**
calculated deflection Δ2	1.913	long term loading	G+ΨlQ	**OK**

Lateral support for beam not to exceed 50xb = 15000 mm **OK**

SUMMARY FOR: F2
Provide :

Concrete Section:	300	mm Wide x	310	mm Deep	Concrete Beam of	25	MPa Comp
Bottom Steel:	2	No. Bars	12	diameter	HD	grade	Strength
Top Steel:	2	No. Bars	12	diameter	HD	grade	
Support links S2:	6	dia links @	150	c/c min for			

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FIRTH INDUSTRIES LTD.

RIBRAFT FLOOR SYSTEM

TWO STOREY BUILDING RIBRAFT DESIGN - EDGE BEAM

SHEET **FA1** OF 2

<Job No.>:	22-447	Date:	4/5/22
<Job Title>:	S & K Fullan	Designer:	AA
<Description>:	68 Weka Street, Mangawhai	Checker:	

Edge Beam Geometry

Beam Widt	**300**	mm	**OK!**
Pod Depth =	**220**	mm	**OK!**
Top slab Depth =	**90**	mm	
Self Weight =	**2.23**	kN/m	

Construction Types/Loadings

Walls - Height

Light Clad Frame =		m @	**0.45**	kPa
LW Brick Veneer =	**2.5**	m @	**1.86**	kPa
LW 15 Series Block =		m @	**2.84**	kPa
LW 20 Series Block =		m @	**3.92**	kPa
HW Brick Veneer =		m @	**2.31**	kPa
HW 15 Series Block =		m @	**3.29**	kPa
HW 20 Series Block =		m @	**4.00**	kPa

Floor - Tributary Length = L/2

Floor, =		m @	**0.45**	kPa

Roof - Tributary Length = S

Roof, Light =	**3.7**	m @	**0.46**	kPa
Roof, Heavy =		m @	**0.84**	kPa

Loadings Summary

Walls	**4.56**	kN/m	Dead
Floors*	**3.53**	kN/m	Dead
Incl. Slab	**0.30**	kN/m	Super Imposed Dead
	0.90	kN/m	Live
Roof	**1.70**	kN/m	Dead
		kN/m	Live^
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

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* Includes Edge Beam Weight, SDL = 0.5 kPa LL = 1.5 kPa
^ Roof LL not added if midfloor exists else LL = 0.25 kPa

FIRTH INDUSTRIES LTD.

RIBRAFT FLOOR SYSTEM

TWO STOREY BUILDING RIBRAFT DESIGN - EDGE BEAM

Working Loads	**Dead**	**10.09**	kN/m
	Live	**0.90**	kN/m
Ultimate Loads (1.2G + 1.6Q)	**Dead**	**12.10**	kN/m
	Live	**1.44**	kN/m
Total Ultimate Load on Edge		**13.54**	kN/m

Ribraft Construction Type
Minimum Beam Widths:

200 mm, min for Clad Frame
300mm, min for Brick Veneer or Block

Lower Floor Wall Construction Type? b
(c=clad frame, b=brick or block)

Standard Raft Construction

(N.B. Half Edge Beam Load Distributed into Slab)
Assume 50 kPa Bearing Capacity Over Whole Platform.

Bearing Capacity Over Platform: **150** kPa ULT
Bearing Check = **300** mm Edge Beam **OK!**
Check Minimum Requirement:
Pressure = 18.31 kPa
OK, Brick Veneer or Block
Steel Requirements - As Per Firth Std Drg's

Top Steel: **2HD12**
Btm Steel: **3HD12**

Continuous Piers

(N.B. All Edge Beam Load in to 'strip' footing)
Assume 100 kPa Bearing Under Edge Beam,
unless a Soil Report indicates otherwise.

Bearing Capacity under Piers: **150** kPa ULT
Bearing Check = **300** mm Edge Beam **OK!**
Check Minimum Requirement
Pressure = 36.62 kPa
OK, Brick Veneer or Block
Steel Requirements - As Per Firth Std Drg's

Top Steel: **1HD12**
Btm Steel: **2HD12**

Prescribed Design

Floor Construction Type? **r**
(r=raft, c=continuous piers)

Standard Raft Contruction,
300 wide edge beam required with
2HD12 in top 3HD12 in btm.

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FIRTH INDUSTRIES LTD.

RIBRAFT FLOOR SYSTEM

TWO STOREY BUILDING RIBRAFT DESIGN - INTERNAL LOADBEARING RIB

<Job No.>:	22-447	Date:	4/5/22
<Job Title>:	S & K Fullan	Designer:	AA
<Description>:	68 Weka Street, Mangawhai	Checker:	

Internal Rib Geometry

Beam Width =	**200**	mm	**OK!**
Pod Depth =	**220**	mm	**OK!**
Top slab Depth =	**90**	mm	
Self Weight =	**1.49**	kN/m	

Construction Types/Loadings

Walls - Height

Light Clad Frame =	**2.5**	m @	**0.35**	kPa
LW Brick Veneer =		m @	**1.86**	kPa
LW 15 Series Block		m @	**2.84**	kPa
LW 20 Series Block		m @		kPa
HW Brick Veneer =		m @	**2.31**	kPa
HW 15 Series Block		m @	**3.29**	kPa
HW 20 Series Block =		m @	**4.00**	kPa

Floor - Tributary Length = L1/2+L2/2 etc..

Floor, =		m @	**0.45**	kPa

Roof - Tributary Length Check if Rafter/Trussed roof.

Roof, Light =	**6.4**	m @	**0.46**	kPa
Roof, Heavy =		m @	**0.84**	kPa

Loadings Summary

Walls	**0.88**	kN/m	Dead
Floors*	**2.78**	kN/m	Dead
Incl. Slab	**0.30**	kN/m	Super Imposed Dead
	0.90	kN/m	Live
Roof	**2.94**	kN/m	Dead
		kN/m	Live^
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

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* Includes Edge Beam Weight, SDL = 0.5 kPa LL = 1.5 kPa
^ Roof LL not added if midfloor exists else LL = 0.25 kPa

FIRTH INDUSTRIES LTD.

RIBRAFT FLOOR SYSTEM

TWO STOREY BUILDING RIBRAFT DESIGN - INTERNAL LOADBEARING RIB

Working Loads	**Dead**	**6.90**	kN/m
	Live	**0.90**	kN/m
Ultimate Loads (1.2G + 1.6Q)	**Dead**	**8.28**	kN/m
	Live	**1.44**	kN/m

Total Ultimate Load on Internal **10** kN/m

Ribraft Construction Type

Standard Raft Construction
(N.B. Half Internal Wall Load Distributed into Slab)
Assume 50 kPa Bearing Capacity Over Whole Platform.

Bearing Capacity: **150** kPa ULT
Bearing Check = **200** mm INTERNAL Beam **OK!**

Pressure = 19.51 kPa

Steel Requirements - As Per Firth Std Drg's

Btm Steel: **2HD12**

Continuous Piers
(N.B. All Interal Load in to 'strip' footing)
Assume 100 kPa Bearing Under Loadbearing Rib,
unless a Soil Report indicates otherwise.

Bearing Capacity: **150** kPa ULT
Bearing Check = **200** mm INTERNAL Beam **OK!**

Pressure = 39.02 kPa

Steel Requirements - As Per Firth Std Drg's

Btm Steel: **2HD12**

Prescribed Design

Floor Construction Type? **r**
(r=raft, c=continuous piers)

Standard Raft Contruction,
200 wide Rib required with
2HD12 in btm. **1HS12 top**

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HOUSE FOUNDATIONS BY SPECIFIC DESIGN		**PAGE No**	B
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	04-May-22
		DESIGN BY	aa

Check on pole foundations to act as cantilever posts for new house
Check to see that poles OK in bending and have sufficient embedment for horiz and vertical loads.
Pile A

Pile diameter	150	mm	Z	331341		
Area pile	17672	mm2	I	24850294		
Pile height	1600	m	S	10.7	(L/d)	
Brief vertical loads to pile	55	kN	1.2G+Qu	Loading Condition		
Brief horiz loads to piles	1	kN	Eu	medium	brief	
Pile bending moment	1.3	kNm	k1	0.8	1.0	Refer NZS3603:1993
Permiss comp stress	16	Mpa	k2	2.0	1.0	Refer NZS3603:1993
Permiss bending stress	38	Mpa	k8	1.00	1.00	Refer NZS3603:1993
				fb	fc	
			k20	0.85	1.0	Refer NZS3603:1993
			k21	0.85	0.9	Refer NZS3603:1993
			k22	1.00	1.00	Wet situation

Brief Loadings (Horizontal)

Permiss bearing capacity	203.2		
Permiss bending capacity	7.3		
Combined loads	0.46	0	**OK**

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HOUSE FOUNDATIONS BY SPECIFIC DESIGN		**PAGE No**	A1
PROJECT DESCRIPTION	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	########
		DESIGN BY	aa

Refer Building Industry Authority Appx A B1/VM4 Pille A

Case 1 150 dia driven pile.

Hiley Formula	**R = Whn/(S+C/2)**					
Ult Resistance	R	200				
Hammer wgt	W	kN				
Hammer fall	h					
Efficiency	n					
set per blow	S	100				
Compressions	C	133				
Substrate	Easy driving	Refer Geotech Report				
Pile Material	Timber					
Diam pile	150	mm				
permissable load for pile ϕN	55	kN	Based on max L = 6000mm			

Sum of Compressions	mm	Refer table A1:		Easy driving	
Timber pile + packing	Cc	1.50		Table A1	
Timber pile.	Cp	1.05		0.00035	
Permiss bearing capacity	Cq	1.50			
Permiss bending capacity	C	4.05			
	S	25	Assumed set		
	L	3000	mm		
	W	5.0	kN		
	h	1000	mm		
	P	0.27	kN		
	P/W	0.1			
	e	0.25	Timber pile & drop hammer		
	Pe	0.07		Is W < Pe -	**No**
Efficiency	n	0.95	Refer table A2 or	n =	**0.95**
Ultimate Resistance of Pile	R	176.3			
Design capacity for pile	ϕ R =	58.8	FS = 3 for unfactored loads.		
		88.1	FS = 2 for factored loads.		
	ϕN =	55.3	KN for brief loads		**OK**
		55.34	KN for medium loads		**OK**

150 Dia H5 post driven to min 2.5m and to achive max set 25mm.

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Phx 2624513

HOUSE FOUNDATIONS BY SPECIFIC DESIGN		**PAGE No**	B
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	04-May-22
		DESIGN BY	aa

Check on pole foundations to act as cantilever posts for new house
Check to see that poles OK in bending and have sufficient embedment for horiz and vertical loads.
Pile A

Pile diameter	150	mm	Z	331341		
Area pile	17672	mm2	I	24850294		
Pile height	1600	m	S	10.7	(L/d)	
Brief vertical loads to pile	40	kN	1.2G+Qu	Loading Condition		
Brief horiz loads to piles	1	kN	Eu	medium	brief	
Pile bending moment	1.3	kNm	k1	0.8	1.0	Refer NZS3603:1993
Permiss comp stress	16	Mpa	k2	2.0	1.0	Refer NZS3603:1993
Permiss bending stress	38	Mpa	k8	1.00	1.00	Refer NZS3603:1993
				fb	fc	
			k20	0.85	1.0	Refer NZS3603:1993
			k21	0.85	0.9	Refer NZS3603:1993
			k22	1.00	1.00	Wet situation

Brief Loadings (Horizontal)

Permiss bearing capacity	203.2		
Permiss bending capacity	7.3		
Combined loads	0.38	0	**OK**

KEVIN BURROWS ENGINEERS
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Phx 2624513

HOUSE FOUNDATIONS BY SPECIFIC DESIGN		**PAGE No**	B1
PROJECT DESCRIPTION	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	04-May-22
		DESIGN BY	aa

Refer Building Industry Authority Appx A B1/VM4 Pille A

Case 1 150 dia driven pile.

Hiley Formula	**R = Whn/(S+C/2)**					
Ult Resistance	R	200				
Hammer wgt	W	kN				
Hammer fall	h					
Efficiency	n					
set per blow	S	100				
Compressions	C	133				
Substrate	Easy driving	Refer Geotech Report				
Pile Material	Timber					
Diam pile	150	mm				
permissable load for pile ϕN	40	kN	Based on max L = 6000mm			
Sum of Compressions		mm	Refer table A1:		Easy driving	
Timber pile + packing		Cc	1.50		Table A1	
Timber pile.		Cp	1.05		0.00035	
Permiss bearing capacity		Cq	1.50			
Permiss bending capacity		C	4.05			
		S	30	Assumed set		
		L	3000	mm		
		W	5.0	kN		
		h	1000	mm		
		P	0.27	kN		
		P/W	0.1			
		e	0.25	Timber pile & drop hammer		
		Pe	0.07		Is W < Pe -	**No**
Efficiency		n	0.95	Refer table A2 or	n =	**0.95**
Ultimate Resistance of Pile		R	148.8			
Design capacity for pile		ϕ R =	49.6	FS = 3 for unfactored loads.		
			74.4	FS = 2 for factored loads.		
		ϕN =	40.1	KN for brief loads		**OK**
			40.1	KN for medium loads		**OK**

150 Dia H5 post driven to min 2.5m and to achive max set 30mm.

KEVIN BURROWS ENGINEERS
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SPECIFIC DESIGN OF ISOLATED TIMBER POSTS		**PAGE No**	S1
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4-May-22
		DESIGN BY	AA

Geometry and loads for Studs

Green or Dry Post			DRY	
Beam size. bxd =		90	90 mm	**OK USE**
Post height	L		5526 mm	
Vertical loads to post	N*		0.40 kN	
eccentricity to post	e		5 mm	

COMPRESSION CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	A	Fc	$\phi N\nu\chi\psi$ = k1k8FcA = 0.64 Fc A	
			vsg8		
90	90	8100	**18**	93.31	KN

BENDING CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	z	fb	ϕMn = k1k4k5k8FbZ = 0.64 Fb Z	
			vsg8		
90	90	121500	**14**	1.09	kNm

TO FIND DESIGN MOMENT
WIND LOADING DATA

WIND ZONE	SED							
V =	45		Ms =	1.00		Vz =	44	
Mls =	0.93		Mt =	1.10		qz =	1.15	
Mz =	0.95		Mr =	1.00		Cp =	1.2	
Tributary width on post (m)			A =	**0.20**				
Horizontal wind pressure load			W =	0.23	kN/m			
MOMENT DUE TO WIND		**My1* =**	**WL2/8 =**	**0.88**	**KNm**			
MOMENT DUE TO Eccentricity		**My2* =**	**Nc x e =**	**0.00**	**KNm**	**TOTAL MO**	**0.88**	**KNm**

AXIAL LOAD DATA
Nc* = ULTIMATE AXIAL LOAD ACTING AT TOP OF POST = 0.40 KN

COMBINED AXIAL AND BENDING FORCES TO SATISFY:

$$\frac{My^*}{\phi Mn} + \frac{Nc^*}{\phi Nncy} < 1.0$$

						USE POST SIZE	
TIMBER GRADE:						b	d
vsg8	0.8065709	+	0.004286694	0.811	**OK USE**	90	90

SUMMARY - S1 SPAN = 5.526 M
USE **MSG 8** GRADE 2/45x90 studs 5.526m heigh @ 200 c/c.

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SPECIFIC DESIGN OF ISOLATED TIMBER POSTS		**PAGE No**	S2
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4-May-22
		DESIGN BY	AA

Geometry and loads for Studs

Green or Dry Post			DRY		
Beam size. bxd =		90	90	mm	**OK USE**
Post height	L		5000	mm	
Vertical loads to post	N*		0.60	kN	
eccentricity to post	e		5	mm	

COMPRESSION CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	A	Fc	ϕNνχψ = k1k8FcA = 0.64 Fc A	
			vsg8		
90	90	8100	**18**	93.31	KN

BENDING CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	z	fb	ϕMn = k1k4k5k8FbZ = 0.64 Fb Z	
			vsg8		
90	90	121500	**14**	1.09	kNm

TO FIND DESIGN MOMENT

WIND LOADING DATA

WIND ZONE	SED							
V =	45		Ms =	1.00		Vz =	44	
Mls =	0.93		Mt =	1.10		qz =	1.15	
Mz =	0.95		Mr =	1.00		Cp =	1.2	
Tributary width on post (m)			A =	**0.30**				
Horizontal wind pressure load			W =	0.34	kN/m			
MOMENT DUE TO WIND		**My1* =**	**WL2/8 =**	**1.08**	**KNm**			
MOMENT DUE TO Eccentricity		**My2* =**	**Nc x e =**	**0.00**	**KNm**	**TOTAL MO**	**1.08**	**KNm**

AXIAL LOAD DATA

Nc* = ULTIMATE AXIAL LOAD ACTING AT TOP OF POST = 0.60 KN

COMBINED AXIAL AND BENDING FORCES TO SATISFY:

$$\frac{My^*}{\phi Mn} + \frac{Nc^*}{\phi Nncy} < 1.O$$

						USE POST SIZE	
TIMBER GRADE:						b	d
vsg8	0.9909942	+	0.006430041	0.997	**OK USE**	90	90

SUMMARY - S2 SPAN = 5 M

USE **MSG 8** GRADE 2/45x90 studs 5.0m heigh @ 300 c/c.

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SPECIFIC DESIGN OF ISOLATED TIMBER POSTS		**PAGE No**	S3
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4-May-22
		DESIGN BY	AA

Geometry and loads for Studs

Green or Dry Post			DRY		
Beam size. bxd =		90	90	mm	**OK USE**
Post height	L		4300	mm	
Vertical loads to post	N*		0.60	kN	
eccentricity to post	e		5	mm	

COMPRESSION CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	A	Fc	$\phi N\nu\chi\psi$ = k1k8FcA = 0.64 Fc A	
			vsg8		
90	90	8100	**18**	93.31	KN

BENDING CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	z	fb	ϕMn = k1k4k5k8FbZ = 0.64 Fb Z	
			vsg8		
90	90	121500	**14**	1.09	kNm

TO FIND DESIGN MOMENT

WIND LOADING DATA

WIND ZONE	SED				
V =	45	Ms =	1.00	Vz =	44
Mls =	0.93	Mt =	1.10	qz =	1.15
Mz =	0.95	Mr =	1.00	Cp =	1.2

Tributary width on post (m)		A =	**0.40**				
Horizontal wind pressure load		W =	0.46	kN/m			
MOMENT DUE TO WIND	**My1* =**	**WL2/8 =**	**1.06**	**KNm**			
MOMENT DUE TO Eccentricity	**My2* =**	**Nc x e =**	**0.00**	**KNm**	**TOTAL MO**	**1.06**	**KNm**

AXIAL LOAD DATA

Nc* = ULTIMATE AXIAL LOAD ACTING AT TOP OF POST = 0.60 KN

COMBINED AXIAL AND BENDING FORCES TO SATISFY:

$\frac{My^*}{\phi Mn} + \frac{Nc^*}{\phi Nncy} < 1.O$

TIMBER GRADE:						USE POST SIZE b	d
vsg8	0.9772906	+	0.006430041	0.984	**OK USE**	90	90

SUMMARY - S3 SPAN = 4.3 M

USE **MSG 8** GRADE 2/45x90 studs 4.3m heigh @ 400 c/c.

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SPECIFIC DESIGN OF ISOLATED TIMBER POSTS		**PAGE No**	S4
FOR:	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4-May-22
		DESIGN BY	AA

Geometry and loads for Studs

Green or Dry Post			DRY	
Beam size. bxd =		45	90 mm	**OK USE**
Post height	L		3000 mm	
Vertical loads to post	N*		0.60 kN	
eccentricity to post	e		5 mm	

COMPRESSION CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	A	Fc	$\phi N\nu\chi\psi$ = k1k8FcA = 0.64 Fc A	
			vsg8		
45	90	4050	**18**	46.66	KN

BENDING CAPACITY CALCULATION FOR DRY TIMBERS FULLY LATERALLY SUPPORTED BASED ON A SINGLE ELEMENT ACTION

b	d	z	fb	ϕMn = k1k4k5k8FbZ = 0.64 Fb Z	
			vsg8		
45	90	60750	**14**	0.54	kNm

TO FIND DESIGN MOMENT

WIND LOADING DATA

WIND ZONE	SED							
V =	45		Ms =	1.00			Vz =	44
Mls =	0.93		Mt =	1.10			qz =	1.15
Mz =	0.95		Mr =	1.00			Cp =	1.2
Tributary width on post (m)			A =	**0.40**				
Horizontal wind pressure load			W =	0.46	kN/m			
MOMENT DUE TO WIND		**My1* =**	**WL2/8 =**	**0.52**	**KNm**			
MOMENT DUE TO Eccentricity		**My2* =**	**Nc x e =**	**0.00**	**KNm**	**TOTAL MO**	**0.52**	**KNm**

AXIAL LOAD DATA

Nc* = ULTIMATE AXIAL LOAD ACTING AT TOP OF POST = 0.60 KN

COMBINED AXIAL AND BENDING FORCES TO SATISFY:

$$\frac{My^*}{\phi Mn} + \frac{Nc^*}{\phi Nncy} < 1.0$$

						USE POST SIZE	
TIMBER GRADE:						b	d
vsg8	0.9542204	+	0.012860082	0.967	**OK USE**	45	90

SUMMARY - S4 SPAN = 3 M

USE **MSG 8** GRADE 45x90 studs 3.0m heigh @ 400 c/c.

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Description:	**Stormwater Detention Tank Design**	**PAGE No**	T
For:	S & K Fullan	**JOB No**	22-447
Address:	68 Weka Street, Mangawhai	**DATE**	4/05/2022
		DESIGN BY	aa

DATA

TIME OF CONCENTRATION	10	MIN	
TOTAL SITE AREA	660	sqm	
	AREA	COVERAGE	NETT
EXISTING SITE COVERAGE	**A**	**C**	**CA**
Remainder garden etc	660.0	0.35	231.00
Total	660.0	0.35	231.00
CA max	0.35		
TOTAL			
Allow C max	0.35		
PROPOSED RUNOFF AREA			
Total new roof	221.76	0.90	199.6
Total new paved	56.2	0.85	47.8
Total reduced remainder garden etc	-277.96	0.35	-97.3
Total	0		150.1
REMAINING UNDRAINED AREA			
Total remainder garden etc	382.04	0.35	133.71
Total not drained	382.04	0.35	133.71

CONTROL DATA

Q = CIA.

Existing C	0.35	*CA Extg/Site Area*
Developed CA	247.4	*CA Extg+CA Adds-CA Undrained*
Additional areas	0	*A Additional*
Inflow		*CA Dev*depth*
Outflow		*Qav*time*

RUNOFF DATA USE TABLE Longview St, Mangawhai. NIWA HIRS V3 data

Intensity	*110.40*	mm/hr
Allowable Qmax all	*7.08*	litres/sec
Reduced runoff volumes	*4.10*	litres/sec
Allowable Qmax From existing runoff	*2.98*	
Allowable Qav From existing runoff	*1.94*	

REQ'D STORAGE	TIME	DEPTH	INFLOW	OUTFLOW	STORAGE	
All Storms	mins	mm	litres	litres	litres	
	10	18.4	4551.3136	1164	3388	
	20	26.6	6579.6164	2327	4253	
	30	32.7	8088.4758	3491	4598	Tank Size
	60	45.5	11254.607	6981	4273	
	120	61.3	15162.8	13962	1200	

AVAILABLE HEAD	0.26	metres	REFER SITE DETAILS
FLOW VELOCITY	2.24	m/sec	SQRT(2GH)
GROSS ORIFICE AREA	1445.7	sqmm	(VOL)/(VEL)
DIAMETER	43	mm	CALC
Available TANK SIZE	22.50	c.m	
MAXIMUM DISCHARGE	2.98	l/sec	
ORIFICE DIAMETER	41	mm	

Use part of 22500 Litre Absolute Concrete water tank for detention with 41mm Dia orifice.

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PROPPED RC BLOCK RETAINING WALL DESIGN		**PAGE No**	rw1
STRUCTURE	S & K Fullan	**JOB No**	22-447
ADDRESS	68 Weka Street, Mangawhai	**DATE**	4/05/2022
		DESIGN BY	AA

DESCRIPTION BRW2 *RC WALL SUPPORTED AT TOP BY FLOOR*
CONCRETE WALL *IT THEN ACTS AS PROPPED CANTILEVER*

WALL PARAMETERS			**BACKFILL PARAMETERS**			
HEIGHT	H (m)	0.6	SOIL DENSITY		18	KN/m3
Thickness		190	INT. FRICTION ANGLE		30	DEGREE
LENGTH		1.0	WALL FRICTION		14	DEGREE
SURCHARGE	S (kPa)	1.5	BACKFILL SLOPE		0	DEGREE
GRADE		B	WALL SLOPE		0	DEGREE
CLAY BEARING ST'GTH kPa		150	WATER TABLE Ht		0	(m)
			AT REST COEFF	**Ko =**	**0.50**	
			ACTIVE COEFF	**Ka =**	**0.30**	

BENDING DESIGN USE "AT REST" COEI yes Top slab in place

FORCES				
LATERAL FORCE DUE TO BACKFILL	Pah	1.6		
LATERAL FORCE DUE TO SURCHARGE	Pas	0.5		
LATERAL FORCE DUE TO WATER	Paw	0.0		
TOTAL LATERAL FORCE	Ptotal	2.1		
MAXIMUM BENDING MOMENT	Mw	0.16 kNm @ BA\$	0.08	kNm along span
LIMIT STATE MOMENT	M*w	**0.26**	**0.12**	

REINFORCING COVER TO STEEL = 85 mm

DIAMETER	SPACING	fy(MPa)	Ast	f'm(MPa)	a	ϕMu	M*w	
12	600	500	188.5	20	5.5	**7.26**	**0.26**	**OK**

Heavy roof, heavy walls

FROM	D.L.	L.L.	Trib width	G	Q	Ug/m 1.4G	Us/m Ge + Qe	U*/m 1.2G+1.6Q
1ST floor slab	0.40	1.50		0.00	0.00	0.00	0.00	0.00
RETAINING wall	4.56		0.6	2.736		3.83	2.74	3.28
			kN/m	2.74	0.00	3.83	2.74	3.28

			Load/m on footing Ug/m	Us/m	U*/m
Ftg overall Length **L**	1 m				
Ftg depth-N/A **d**	300 mm	house	3.83	2.74	3.28
Ftg width-N/A **b**	300 mm	footing	3.02	2.16	2.59
			6.85	4.90	5.88

OVERTURNING Prior to conc slab in place

FLOOR SLAB ?	NO	CONVENTIONAL DESIGN				
WALL HEIGHT (m)	0.6	Wall Wt	kN/m	3.8		
HEEL RETURN (m)	50	Heel Wt	kN/m	0.9		
FOOTING SIZE	300X 300	Footing Wt	kN/m	2.2		length (mm) of
SURCHARGE ON FOOTING ?	YES	Amount	kN/m	2.0		footing = 300
VERTICAL LOAD			kN/m	8.9		length (mm) of
VERTICAL BEARING		Vb	kPa	**32.9**	**OK**	slab adding
FACTORED OVERTURNING MOMENT		M*w	kNm	**0.26**		to sliding
ACTING HORIZONTAL FORCE		Ph	kN/m	**3.3**	**OK**	resistance =
RESTORING MOMENT		Mr	kPa	**0.9**	**OK**	**150**
SLIDING RESISTANCE		**F***	**kN**	**20.9**	**OK**	
FOOTING REINFORCING		Ast	MM^2	**188.5**	**OK**	
			USE	**D**	12	@ 600

FOR TIES INTO SLAB TRY D 12 @ 600 c/c **OK** = in mm^2 188.50
FOS = 17.07

SUMMARY PROPPED RC WALL - 0.9M RETAINING - RW1
USE MASONRY BLOCKS 190 mm THICK 12 Mpa Concrete
USE PANEL VERTICAL BARS D 12 @ 600 C/C
COVER TO STEEL TO BE 85 FROM FILL FACE & USE D12 HORIZONTAL BARS @ 600 C/C
USE FOOTING SIZE 300 X 300 DEEP WITH 4-D12 cage with R-6 stirups (@ 150
& D12 starters @ 600 c/c for blocks.
PROVIDE STEEL TIES AT TOP D 12 @ 600 C/C 550 INTO SLAB

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RETAINING WALL DESIGN
WALL TYPE: **TIMBER POLE CANTILEVER**

PROJECT DESCRIPTION	S & K Fullan	**PAGE No**	PRW1
ADDRESS	68 Weka Street, Mangawhai	**JOB No**	22-447
		DATE	4/05/2022
		DESIGN BY	

WALL REFERENCE No	PRW1
LOCATION	STANDARD RETAINING POLE STRUCTURE FOR THE FOLLOWING MAX HT
WALL HEIGHT	0.9

WALL PARAMETERS			BACKFILL		
RETAINED HEIGHT	H (m)	0.9	SOIL DENSITY	18	KN/m3
DIAMETER	D (mm)	175	INT. FRICTION ANGLE	30	DEGREE
SPACING	L (m)	1.00	WALL FRICTION	14	DEGREE
SURCHARGE	S (kPa)	12.0 *	BACKFILL SLOPE	0	DEGREE
ENCASEMENT	B (mm)	400	WALL SLOPE	0	DEGREE
			WATER TABLE Ht	0	(m)
PILE DIA. TO SPACING = 1 TO		2.5			
		62.50 %	ACTIVE COEF.	**Ka =**	**0.30**
RAILS			AT REST COEF.	**Ko =**	**0.50**
SIZE		150 X50			
CODE		1	STRENGTH REDUCTION FACTOR FROM PILES SPA	**0.63**	
Z (CM3)		62.5	(APPLICABLE TO SOIL STRENGTH ONLY)		
Fb =		7.5			

BENDING DESIGN	Use Active coeff	NO			**Ko =**	**0.50**			
LATERAL FORCE DUE TO BACKFILL		Pah				3.6			
LATERAL FORCE DUE TO SURCHARGE		Pas				5.4			
LATERAL FORCE DUE TO WATER		Paw				0.0			
TOTAL LATERAL FORCE		Ptotal				9.0			
MAXIMUM POLE MOMENT		Mp				4.55			
LIMIT POLE MOMENT		M*p				**7.28**			
BOT. RAIL MOMENT		M*r				**0.12**	@ BOTTON **0.12**	0.9	M from
ULT BENDING STRENGTH OF POLE		ϕMn	=	ϕKfbZp	=	**9.79**	**OK**		top
ULT BENDING STRENGTH OF RAIL		ϕMn	=	ϕKfbZr	=	**0.34**	**OK using**	1	rails
ULT BENDING STRENGTH OF UPPER RAILS		ϕMn	=	ϕKfbZr	=	**0.34**	**OK using**	1	rails

Brohms

L' = β(1+(2(1+2e'/β))^0.5)	0.7418
β = P/9cuD =	0.0919
e = Mp/Ptotal =	0.5032
e' = e + 1.5D =	1.1032
H =	1.342

NOTE 'S' IS REDUCED BY STRENGTH REDUCTION FACTOR ABOVE. 'S' IS THE AVERAGE ALLOWABLE SOIL BEARING CAPACITY @ DEPTH 0.34L

EMBEDMENT				
SOIL STRENGTH 'S'		70	kPa	
DESIGN SOIL STRENGTH 'S'		44	kPa	
MIN EMB'T DEPTH REQ'D				
No GR'D RESTRAINT, H1		**1.34**	m	
FOOT GRD SLOPE	7	**1.35**	m	USE

SUMMARY OF WALL DETAIL **PRW1**

USE MIN 175 DIA POLES @ 1.0m c/c EMBEDDED MIN 1.4m INTO SOIL
USE MIN 400 DIA CONC FOOTING 1400mm DEEP WITH MIN 25 Mpa CONC.
(with max 12.5mm aggregate)
PROVIDE 150X50 TIMBER RAILS BETWEEN POLES