

STRUCTURAL CALCULATIONS

For

476 Garstang Road Broughton PR3 5JB

PROPOSED ALTERATIONS AND EXTENSION

STRUCTURAL ENGINEERS

ROBERT E. FRY & ASSOCIATES LTD.

45 Bridgeman Terrace Wigan WN1 1TT Tel: (01942) 826020 Fax: (01942) 230816

PROJECT NO: 191929

Revision 0 – January 2020

By: Paul M. Bithell I.Eng AMI.Struct.E AaPS

	Project				Job Ref.	
KEFA		476 Garstang r	oad, Broughto	n	19 [,]	192
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<u>BRIEF</u>

To provide designs as requested for the proposed alterations and extension at the above property; no other structural aspects have been considered as it is assumed that these comply with Document A/Building Regulations:

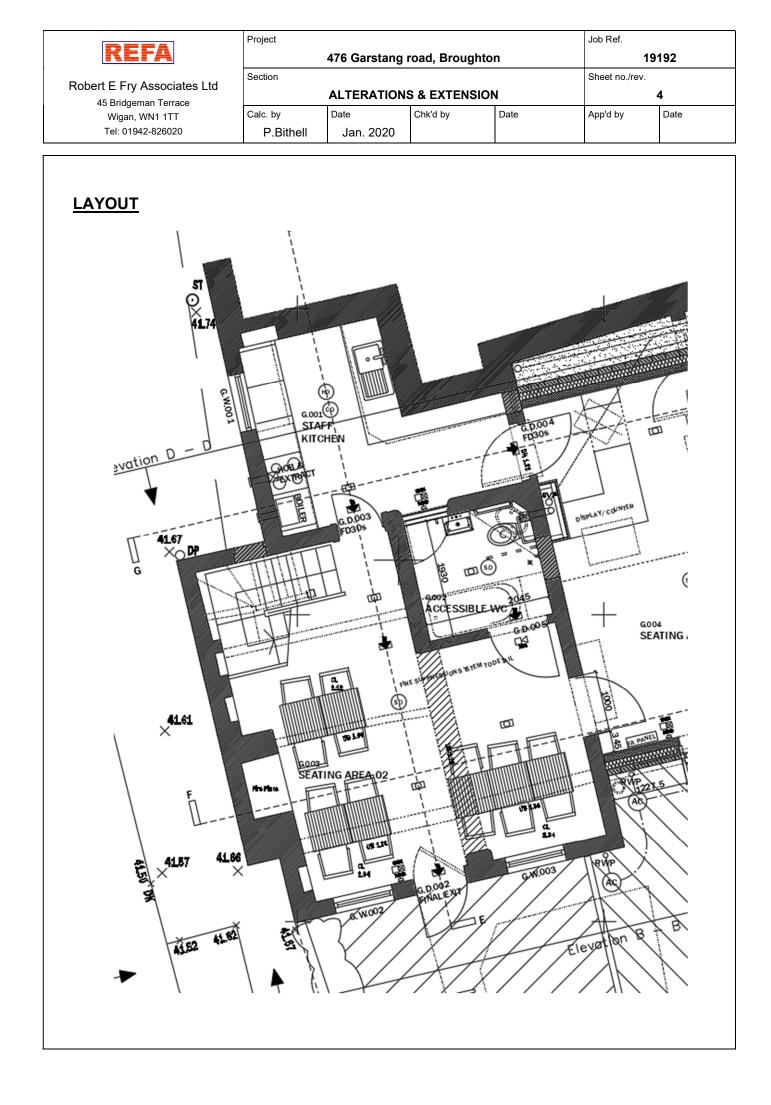
The calculations are based on our interpretation of the drawings submitted and a number of assumptions have been made; these assumptions will need to be checked and confirmed on site and any variation which may affect the design should be brought to the attention of the Engineer for comment.

In line with the CDM Regulations 2015, we are obliged to inform the Client of the risks that may be encountered in the works and, wherever possible, risks have been eliminated from the design however it is not possible to remove all risks. The Client must take all reasonable steps to ensure that only competent contractors who are experienced and familiar with this type of work are employed; in addition, suitable arrangements must be in place to manage the works. Further information can be found at: www.hse.gov.uk/pubns/indg411.htm.

Your appointed Contractor must plan, manage and monitor the construction work under their control so that it is carried out without risks to health and safety and shall co-ordinate their activities with others involved with the project; they are required to prepare a construction phase plan.

Any work that is carried out prior to approval of the calculations/details shall be at the risk of the Client and their Contractor. The Engineer cannot be held responsible for any additional work that may be deemed necessary by the Local Authority or other statutory body after work has commenced prior to approval. The Client and/or Contractor must bear all the costs associated with any additional work.

REFA	Project	476 Garstang	road, Brough	ton	Job Ref.	19192
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45 Bridgeman Terrace	Calc. by	ALTERATION: Date	Chk'd by	Date	App'd by	3 Date
Wigan, WN1 1TT Tel: 01942-826020	P.Bithell	Jan. 2020		Dute	, the g p	Bale
LOADINGS						
MAIN ROOF	tiles felt/battens rafters, etc	0.55 0.05 <u>0.10</u> 0.70	<u>)</u>			
	<u>0.70</u> = cos 35°	0.85	i			
	insulation ceiling	0.05 <u>0.15</u> 1.05		DEAD		
	roof/snow ceiling	0.75 <u>0.25</u> 1.00	<u>i</u>	IMPOSE	D	
1 st FLOOR	boards joists ceiling partitions	0.20 0.15 <u>0.25</u> 0.75		DEAD		
	communal	2.00	kN/m²	IMPOSE	D	
EXT. WALL	render 215 brick 1-plaster	0.50 4.36 <u>0.25</u> 5.11	;	DEAD		



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EXISTING TIMBER BEAMS

Assess loading – and reactions – to existing timber beams to the front of the property; beams support main roof (no ceiling) and nominal loading from low level lean-to roof over plus self-weight of brick wall, new timber 1st floor will span parallel with the beams and will not be considered.

Beams span 2.85m (left) and 2.15m (right) over the proposed seating area.

Loading:	roofs (d)	=	1.05 [#] x [(1.30+1.10) / 2]	=	1.26
	roofs (i)	=	0.75 [#] x [(1.30+1.10) / 2]	=	0.90
	wall (d)	=	5.11 [#] x 1.55m	=	7.92
	self-wt (d)	=	say,	=	0.50
Applied loading,	dead	=	(1.26+7.92+0.50)	=	9.68 kN/m
	imposed	=	(0.90)	=	0.90 kN/m
Beam reactions:	left-side(d)	=	9.68 x (2.85 / 2)	=	13.79 kN
	left-side (i)	=	0.90 x (2.85 / 2)	=	1.28 kN
	right-side(d)	=	9.68 x (2.15 / 2)	=	10.41 kN
	right-side (i)	=	0.90 x (2.15 / 2)	=	0.97 kN
Total reaction (to	new beam)	= =	13.79+10.41 1.28+ 0.97	= =	<u>24.50 kN</u> (d) <u>2.25 kN</u> (i)

NEW FLOOR BEAM

Beam supports new 1st floor construction plus reactions from existing timber beams only.

Assume beam to be unrestrained over its span and limit deflection, under total dead & imposed, 10mm; max. span = 3.60m

Loading:	floor (d) floor (i)	= =	0.75 [#] x [(2.85 2.00 [#] x [(2.85		= 1 =	.88	5.00
	reaction (d) reaction (i)	= =	24.50 kN 2.25 kN	applied at 1.0 applied at 1.0			

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Wigan, WN1 1 Tel: 01942-826		Calc. by P.Bithell	Date Jan. 2020	Chk'd by	Date	App'd by	Date
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	_			- / - / - /			
Reactions	RA		0 kN ult. (d		-		
	$R_{\scriptscriptstyle B}$	= 30.8	0 kN ult. (d	= 11.0KN &	I = 9.6 KIN)		
			\rightarrow	for det (S275)	tail, adopt 203	3 x 203 x 46	UC
	tallation; e				consider han rs, etc. during :		
<u>STEEL BEAM AN</u> In accordance w				dum No.1			
			Lood Enveloped Co	ulturation d		TEDDS calcu	lation version 3.
	37.900		Load Envelope - Co	nbination 1			
	0.0		↓				
	mm [A			3600 1		J B	
	kNm 0.0		Bending Moment	Envelope			
	42.017						
	42.017 – mm [4	42.0	3600 1] B	
	kN 47.6		Shear Force En	velope			
	47.649		36.4				
	0.0-						
	-30.805 mm			3600		-30.8	
	A			1		B	

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	T.Dittici	0dn. 2020				
Support conditions						
Support A		•	restrained			
Current D		Rotationa	-			
Support B		-	restrained			
		Rotationa	ily liee			
Applied loading						
Beam loads		Dead self	weight of beam ¹			
-			ad full UDL 1.88 kN/m			
			osed full UDL 5 kN/m			
		-	s - Dead point load 24		00 mm	
			s - Imposed point load			
Load combinations						
Load combination 1 - gravity		Support A		Dead	<u></u> 1.40	
				Impose	ed	
				-	<u></u> 1.40	
					ed 1.60	
		Support B			´ 1.40	
		Support				
				impose	ed	
Analysis results						
Maximum moment;		M _{max} = 42	kNm:	Mmin =	0 kNm	
Maximum shear;		V _{max} = 47 .			-30.8 kN	
Deflection;		δ _{max} = 3.8		δ _{min} = (
Maximum reaction at support	A:	R _{A_max} = 4			= 47.6 kN	
Unfactored dead load reactio		$R_{A_{Dead}} = 1$				
Unfactored imposed load rea			= 10.6 kN			
Maximum reaction at support		R _{B_max} = 3		R _B min	= 30.8 kN	
Unfactored dead load reactio		$R_{B_{Dead}} =$		_		
Unfactored imposed load rea	ction at support B;	R _{B_Imposed}				
Section details						
Section type;	UC 203x203x46	6 (BS4-1);	Steel grade;		S275	
Classification of cross sect	ions - Section 3.5					
Tensile strain coefficient;	ε = 1.00 ;		Section classificatio	n;	Compact	
S						
hear capacity - Section 4.2.	3					
Design shear force;	F _v = 47.6 kN;		Design shear resista	ance;	P _v = 241.4 kM	١
			SS - Design shear re			

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Tel: 01942-82602	20	P.Bithell	Jan. 2020				
Moment capacity - Design bending mo		M = 42 kNm;		Moment capac	city low shear;	; M _c = 136.8	kNm
Buckling resistance	ce momen	t - Section 4.3.6	.4				
Buckling resistance	moment;	M _b = 102.4 kNr		M _b / m _{LT} = 118	-		
			PASS - Buck	ling resistance	moment exc	eeds design be	ending mom
Check vertical defl Consider deflection			oade				
Limiting deflection		$\delta_{\text{lim}} = 10 \text{ mm};$	Jaus	Maximum defl	ection:	δ = 3.81 mr	n
		omi iv min,	PA	SS - Maximum			
<u>check beam be</u>							
Reactions	R _A	= 47.60) kN ult	d = 21.9	i = 10	0.6	
	R _B	= 30.80) kN ult	d = 11.0	i = 9	9.6	
Assume 103mm manufacture and	-		lay brickwor	κ laid in M4	mortar thro	oughout with	normal
	d constru	iction	lay brickworl →	provide	440mm lo	oughout with ong x 100mr padstone, 2	n wide
manufacture and	d constru	iction	-	provide	440mm lo concrete	ong x 100mr	n wide
manufacture and	d constru g onto fr	ont pier:	, ,	provide (C8/10)	440mm lo concrete	ong x 100mr padstone, 2	n wide 215mm
manufacture and <u>Consider bearing</u>	d constru g onto fr	ont pier:	, ,	provide (C8/10)	440mm lo concrete	ong x 100mr padstone, 2	n wide 215mm
manufacture and <u>Consider bearin</u> <u>MASONRY BEARII</u> Masonry details	d constru g onto fr	ont pier:	→ :2005	provide (C8/10) deep, at	440mm lo concrete	ong x 100mr padstone, 2	n wide 215mm
manufacture and <u>Consider bearing</u>	d constru g onto fro NG DESIG	ont pier:	→ :2005 m silicate bric	provide (C8/10) deep, at	440mm lo concrete bearing	ong x 100mr padstone, 2	n wide 215mm
manufacture and Consider bearing MASONRY BEARIN Masonry details Masonry type;	d constru g onto fro NG DESIG	ont pier: <u>N TO BS5628-1</u> Clay or calciu	→ :2005 m silicate bric	provide (C8/10) deep, at	440mm lo concrete bearing	ong x 100mr padstone, 2	n wide 215mm
manufacture and Consider bearing MASONRY BEARIN Masonry details Masonry type; Compressive streng	d constru <u>g onto fre</u> <u>NG DESIG</u> gth;	Iction ont pier: N TO BS5628-1: Clay or calciu punit = 20.0 N/m	→ :2005 m silicate bric	provide (C8/10) deep, at ks Mortar designa	440mm lo concrete bearing	ong x 100mr padstone, 2 TEDDS calcu iii	n wide 215mm Ilation version 1.0
MASONRY BEARIE Masonry details Masonry type; Compressive streng Masonry units;	d constru <u>g onto fre</u> <u>NG DESIG</u> gth;	Iction ont pier: N TO BS5628-1: Clay or calciu punit = 20.0 N/m Category II;	→ :2005 m silicate bric	provide (C8/10) deep, at ks Mortar designa Construction c	440mm lo concrete bearing ation; ontrol; strength;	ong x 100mr padstone, 2 TEDDS calcu iii Normal	m wide 215mm ulation version 1.0
MASONRY BEARIE Masonry details Masonry type; Compressive streng Masonry units; Partial safety factor;	d constru <u>g onto fre</u> <u>NG DESIG</u> gth;	Clay or calciu punt = 20.0 N/m Category II; γm = 3.5;	→ :2005 m silicate bric	provide (C8/10) deep, at Ks Mortar designa Construction of Characteristic	440mm lo concrete bearing ation; ontrol; strength; thickness;	png x 100mr padstone, 2 TEDDS calcu iii Normal fk = 5.0 N/m	m wide 215mm Ilation version 1.0
MASONRY BEARIN MASONRY BEARIN Masonry details Masonry type; Compressive streng Masonry units; Partial safety factor; Leaf thickness;	d constru <u>g onto fre</u> <u>NG DESIG</u> gth;	Clay or calciu punit = 20.0 N/m Category II; γm = 3.5; t = 440 mm;	→ :2005 m silicate bric	provide (C8/10) deep, at ks Mortar designa Construction of Characteristic Effective wall t	440mm lo concrete bearing ation; ontrol; strength; thickness;	ong x 100mr padstone, 2 TEDDS calcu iii Normal fk = 5.0 N/m t _{ef} = 440 mr	m wide 215mm Ilation version 1.0
MASONRY BEARIN MASONRY BEARIN Masonry details Masonry type; Compressive streng Masonry units; Partial safety factor; Leaf thickness; Wall height;	d constru <u>g onto fre</u> <u>NG DESIG</u> gth; ;	Initial content Citic Clay or calciu punit = 20.0 N/m Category II; γm = 3.5; t = 440 mm; h = 2400 mm;	→ :2005 m silicate bric	provide (C8/10) deep, at ks Mortar designa Construction of Characteristic Effective wall t	440mm lo concrete bearing ation; ontrol; strength; thickness;	ong x 100mr padstone, 2 TEDDS calcu iii Normal fk = 5.0 N/m t _{ef} = 440 mr	m wide 215mm Ilation version 1.0

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Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
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Loading details						
Concentrated dead load;	$G_k = 22 \text{ kN};$		Concentrated in	mposed load;	Q _k = 11 kN	
Design concentrated load;	F = 47.6 kN					
Masonry bearing type						
Bearing type;	Not applicable	;	Bearing safety	factor;	γ _{bear} = 1.00	
Check design bearing with	out a spreader					
Design bearing stress;	f _{ca} = 2.346 N/m	m²;	Allowable bear	ing stress;	f _{cp} = 1.429 N	/mm²
	FAIL - L	Design bearing	stress exceeds	allowable be	earing stress, u	ise a spread
Spreader details						
Length of spreader;	l _s = 440 mm;		Depth of spread	der;	h₅ = 215 mm	
Edge distance;	s _{edge} = 0 mm					
Spreader bearing type						
Bearing type;	Туре 3 ;		Bearing safety	factor;	γ _{bear} = 2.00	
		PASS	Allowable bear	ring stress ex	ceeds design l	bearing stre
Check design bearing at 0.		0				
D · · · · ·	f _{ca} = 0.102 N/m				t _{cp} = 1.414 N	/mm²
Design bearing stress;			Allowable beari			hearing stre
	- Allowable beari					bearing stre
	- Allowable beari	ing stress at 0. <u>r</u> :	4 ´ h below be	aring level ex	ceeds design i	-
PASS	- Allowable beari	ing stress at 0.	4 ´ h below be	aring level ex		-
PASS	- Allowable beari	ing stress at 0. <u>r</u> :	4 [´] h below be no pads	aring level ex	ceeds design i	rovide
PASS	- Allowable beari	ing stress at 0. <u>r</u> :	4 [´] h below be no pads 440mm l	aring level ex stone requisiong x 100	rceeds design i ired but p	rovide C8/10)
PASS	- Allowable beari	ing stress at 0. <u>r</u> :	4 [´] h below be no pads 440mm l	aring level ex stone requisiong x 100	ired but pi mm wide (rovide C8/10)
PASS	- Allowable beari	ing stress at 0. <u>r</u> : →	4 ⁻ h below bea no pads 440mm l concrete	aring level ex stone requisiong x 100	ired but pi mm wide (rovide C8/10)
PASS	- Allowable beari	ing stress at 0. <u>r</u> : →	4 ⁻ h below bea no pads 440mm l concrete	aring level ex stone requisiong x 100	ired but pi mm wide (, 215mm de	rovide C8/10) ep, at
PASS	- Allowable beari	ing stress at 0. <u>r</u> : →	4 ⁻ h below bea no pads 440mm l concrete	aring level ex stone requisiong x 100	ired but pi mm wide (, 215mm de	rovide C8/10) ep, at
PASS Consider bearing onto i MASONRY BEARING DESI Masonry details Masonry type;	- Allowable beari nternal wall pie GN TO BS5628-1: Clay or calciu	ing stress at 0. <u>r</u> : → <u>2005</u> m silicate brick	4 [´] h below be no pads 440mm l concrete bearing	aring level ex stone requisiong x 100	ired but pi mm wide (, 215mm de	rovide C8/10) ep, at
PASS Consider bearing onto i MASONRY BEARING DESI Masonry details Masonry type; Compressive strength;	<u>nternal wall pie</u> <u>GN TO BS5628-1:</u> Clay or calcium punit = 20.0 N/m	ing stress at 0. <u>r</u> : → <u>2005</u> m silicate brick	4 [~] h below bea no pads 440mm l concrete bearing	aring level ex stone requ long x 100 padstone	ired but pi mm wide (, 215mm de	rovide C8/10) ep, at
PASS <u>Consider bearing onto i</u> <u>MASONRY BEARING DESI</u> <u>Masonry details</u> Masonry type; Compressive strength; Masonry units;	- Allowable beari nternal wall pie GN TO BS5628-1: Clay or calciu	ing stress at 0. <u>r</u> : → <u>2005</u> m silicate brick	4 [^] h below bea no pads 440mm l concrete bearing Mortar designa Construction co	tion; tion;	ired but pi mm wide ((, 215mm de TEDDS calcula iii Normal	rovide C8/10) ep, at ation version 1.0
PASS Consider bearing onto i MASONRY BEARING DESI Masonry details Masonry type; Compressive strength; Masonry units; Partial safety factor;	<u>nternal wall pie</u> <u>GN TO BS5628-1:</u> Clay or calcium punit = 20.0 N/m	ing stress at 0. <u>r</u> : → <u>2005</u> m silicate brick	4 [~] h below bea no pads 440mm l concrete bearing	tion; tion;	ired but pi mm wide (4 , 215mm de	rovide C8/10) ep, at ation version 1.0
PASS <u>Consider bearing onto i</u> <u>MASONRY BEARING DESI</u> <u>Masonry details</u> Masonry type; Compressive strength; Masonry units;	<u>nternal wall pie</u> <u>GN TO BS5628-1:</u> Clay or calcium p _{unit} = 20.0 N/m Category II;	ing stress at 0. <u>r</u> : → <u>2005</u> m silicate brick	4 [^] h below bea no pads 440mm l concrete bearing Mortar designa Construction co	tion; btone required to the second se	ired but pi mm wide ((, 215mm de TEDDS calcula iii Normal	rovide C8/10) ep, at ation version 1.0

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	0	476 Garstang	road, Broughte	on		9192
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45 Bridgeman Terrace	Calc. by	Date	Chk'd by	Date	App'd by	Date
Wigan, WN1 1TT Tel: 01942-826020	P.Bithell	Jan. 2020	Clika by	Date	Арра Бу	Dale
101.01042-020020	F.Dittlell	Jan. 2020				
Bearing details	e					
Beam spanning out of plane					1 400	
Width of bearing;	B = 203 mm;		Length of bear	ring;	l _b = 100 mm	
Edge distance;	x _{edge} = 100 mm	1				
Loading details						
Concentrated dead load;	G _k = 11 kN;		Concentrated	imposed load;	Q _k = 10 kN	
Design concentrated load;	F = 30.8 kN					
Masonry bearing type						
	Turna 2 ·		Rooring offet	factor		
Bearing type;	Type 2 ;		Bearing safety	factor;	γ _{bear} = 1.50	
Check design bearing with	out a spreader					
Design bearing stress;	f _{ca} = 1.515 N/n	וm²;	Allowable bea	ring stress;	f _{cp} = 2.143 N	l/mm²
		PASS	- Allowable bea	ring stress ex	ceeds design	bearing str
Chaok dealers bearing at 0	1. h halow tha h	aaring laval				
Check design bearing at 0.		-	Allowable bea	rina stress:	for = 0 731 N	l/mm ²
Design bearing stress;	f _{ca} = 0.113 N/m	nm²;	Allowable bea	-		
Design bearing stress;		nm²;		-		
Design bearing stress;	f _{ca} = 0.113 N/m	nm²;		-		
Design bearing stress;	f _{ca} = 0.113 N/m	nm²;		-		
Design bearing stress;	f _{ca} = 0.113 N/m	nm²;		-		
Design bearing stress; <i>PASS</i>	f _{ca} = 0.113 N/m	nm²;		-		
Design bearing stress;	f _{ca} = 0.113 N/m	nm²;		-		
Design bearing stress; PASS FLOOR JOISTS Consider joists over lh-	f _{ca} = 0.113 N/n <i>- Allowable bear</i> side of the sea	ting area with	4 ^f h below be	earing level ex n = 2.85m as	ceeds design	bearing sti
Design bearing stress; PASS	f _{ca} = 0.113 N/n <i>- Allowable bear</i> side of the sea	ting area with	4 ^f h below be	earing level ex n = 2.85m as	ceeds design	bearing sti
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with	4 ^f h below be	earing level ex n = 2.85m as	ceeds design	bearing sti
Design bearing stress; PASS FLOOR JOISTS Consider joists over lh-	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with	4 ^f h below be	earing level ex n = 2.85m as	ceeds design	bearing sti
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN	earing level ex n = 2.85m as N/m ²	ceeds design	<i>bearing sti</i>
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with	4 [´] h below be n a max. spar sed = 2.00 kN provide	earing level ex n = 2.85m as V/m ² 47 x 175	worst case	bearing sti ; applied bists at
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	ceeds design	bearing sti ; applied bists at
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst case	bearing sti ; applied bists at
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst case	bearing sti ; applied bists at
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n 5 - <i>Allowable bear</i> side of the sea lead = 0.75 kN/	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst case	bearing sti ; applied bists at
Design bearing stress; PASS <u>FLOOR JOISTS</u> Consider joists over Ih- loading (as previous), d	f _{ca} = 0.113 N/n s - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm ma	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst case mm C16 jo oughout wi	bearing sti ; applied bists at ith mid-
Design bearing stress; PASS FLOOR JOISTS Consider joists over Ih loading (as previous), d Adopt C16 timber joists <u>TIMBER JOIST DESIGN (B</u>	f _{ca} = 0.113 N/n s - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm ma	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst case mm C16 jo oughout wi	bearing sti ; applied bists at
Design bearing stress; PASS FLOOR JOISTS Consider joists over Ih loading (as previous), d Adopt C16 timber joists TIMBER JOIST DESIGN (BS Joist details	f _{ca} = 0.113 N/n s - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm ma: <u>S5268-2:2002)</u>	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm span str	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr	worst cases mm C16 jo roughout wi	bearing sti ; applied pists at ith mid- ation version 1
Design bearing stress; PASS FLOOR JOISTS Consider joists over Ih- loading (as previous), d Adopt C16 timber joists Adopt C16 timber joists <u>TIMBER JOIST DESIGN (B</u> Joist details Joist breadth;	f _{ca} = 0.113 N/n <i>i</i> - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm ma: <u>S5268-2:2002)</u> b = 47 mm;	ting area with m ² ; ting area with m ² and impor x. centres.	4 [~] h below be n a max. spar sed = 2.00 kN provide 400mm span str Joist depth;	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr rutting	s worst case mm C16 jo roughout wi	bearing sti ; applied pists at ith mid- ation version 1
Design bearing stress; PASS FLOOR JOISTS Consider joists over Ih loading (as previous), d Adopt C16 timber joists Monte Joist Stressign (B: Joist details Joist breadth; Joist spacing;	f _{ca} = 0.113 N/n s - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm max <u>S5268-2:2002)</u> b = 47 mm; s = 400 mm;	ting area with m ² ; ting area with m ² and impor x. centres.	4 [´] h below be n a max. spar sed = 2.00 kN provide 400mm span str	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr rutting	worst cases mm C16 jo roughout wi	bearing sti ; applied pists at ith mid- ation version 1
Design bearing stress; PASS FLOOR JOISTS Consider joists over Ih- loading (as previous), d Adopt C16 timber joists Adopt C16 timber joists <u>TIMBER JOIST DESIGN (B</u> Joist details Joist breadth;	f _{ca} = 0.113 N/n <i>i</i> - <i>Allowable bear</i> side of the sea lead = 0.75 kN/ at 400mm ma: <u>S5268-2:2002)</u> b = 47 mm;	ting area with m ² ; ting area with m ² and impor x. centres.	4 [~] h below be n a max. spar sed = 2.00 kN provide 400mm span str Joist depth;	earing level ex n = 2.85m as V/m ² 47 x 175 centres thr rutting	s worst case mm C16 jo roughout wi	bearing sti ; applied pists at ith mid- ation version 1

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45 Bridgeman Terrace Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
Tel: 01942-826020	P.Bithell	Jan. 2020				
Span details Number of spans; Clear length of span; Section properties	N _{span} = 1 ; L _{s1} = 2850 mm	;	Length of be	earing;	j B L _b = 50 mm	
Second moment of area;	l = 20990885 n	nm ⁴ ;	Section mod	dulus;	Z = 239896	mm ³
Loading details						
Joist self weight;	F _{swt} = 0.03 kN/r	m;	Dead load;		Fd_udl = 0.75	kN/m²
Imposed UDL(Long term);	Fi_udl = 2.00 kN	/m²				
Imposed point load (Medium);	F _{i_pt} = 1.40 kN					
Consider long term loads						
Design bending moment;	M = 1.142 kNm	1;	Design shea		V = 1.603 k	
Design support reaction;	R = 1.603 kN;		Design defle	ection;	δ = 5.535 m	im
Check bending stress Permissible bending stress;	σ _{m_adm} = 6.186	N/mm²;	Applied ben	-	σ _{m_max} = 4.7	
			PASS - App	lied bending s	tress within per	rmissible li
Check shear stress Permissible shear stress;	τ _{adm} = 0.737 N/	′mm²;	Applied she PASS - A		τ _{max} = 0.292 stress within per	
Check bearing stress						
Permissible bearing stress;	σc_adm = 1.870	N/mm²;	Applied bea PASS - Apj	-	σc_max = 0.6 stress within per	
Check deflection						
Permissible deflection;	δ _{adm} = 8.550 m	m;	Actual defle PASS		δ = 5.535 m ection within per	
Consider medium term loads	_		_			
Design bending moment;	M = 1.327 kNm	ו;	Design shea	ar force;	V = 1.863 k	N
Design support reaction;	R = 1.863 kN;		Design defle		δ = 5.519 m	

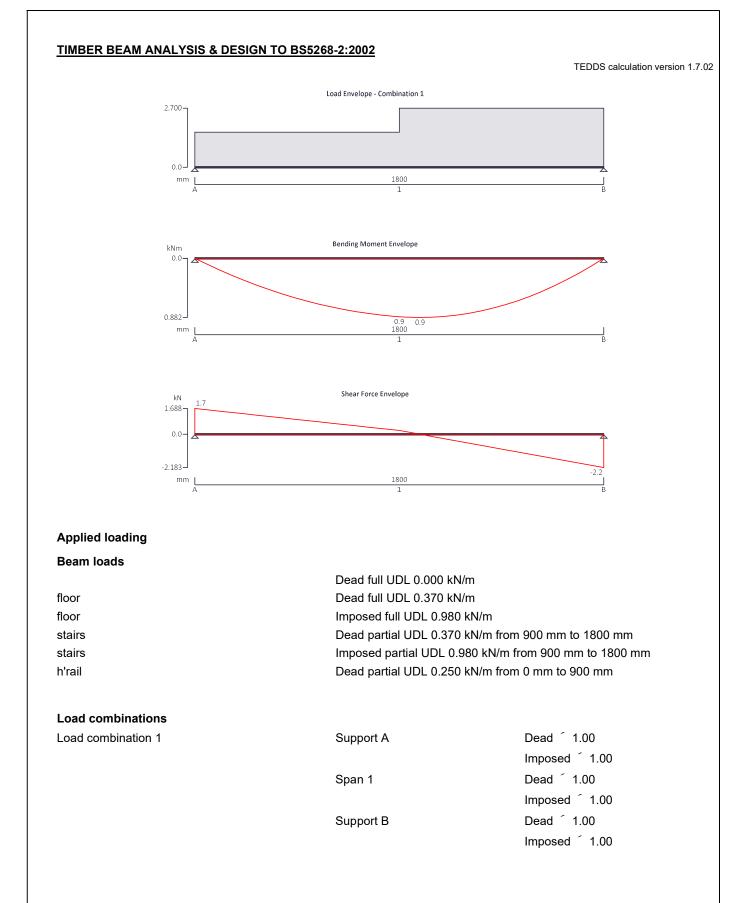
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REFA		476 Garstang	road, Broug	hton		19192	
	Section				Sheet no./rev		
Robert E Fry Associates Ltd 45 Bridgeman Terrace		ALTERATION	IS & EXTENS	ION	12		
Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date	
Tel: 01942-826020	P.Bithell	Jan. 2020					
.							
Check bending stress							
Permissible bending stress;	σm_adm = 7.733	N/mm ² ;	Applied ben	ding stress;	σm_max = 5.	534 N/mm²	
			PASS - App	olied bending s	tress within pe	rmissible lim	
Check shear stress							
Permissible shear stress;	τ _{adm} = 0.921 N/	/mm²;	Applied she	ar stress;	τ _{max} = 0.340) N/mm²	
			PASS - A	pplied shear s	tress within pe	rmissible lim	
Check bearing stress			PASS - A	pplied shear s	tress within pe	rmissible lim	
	σc_adm = 2.338	N/mm²;	PASS - A Applied bea		tress within per σc_max = 0.7		
Check bearing stress	σc_adm = 2.338	N/mm²;	Applied bea	ring stress;		' 93 N/mm²	
Check bearing stress	σc_adm = 2.338	N/mm²;	Applied bea	ring stress;	σc_max = 0.7	' 93 N/mm²	
Check bearing stress Permissible bearing stress;	σc_adm = 2.338 δ _{adm} = 8.550 m		Applied bea	ring stress; p lied bearing s	σc_max = 0.7	' 93 N/mm² rmissible lim	

FLOOR TRIMMERS

Consider landing trimmer (1); max. span = 1.80m (supports floor plus stairs), adopt C16 timber

Loading:	floor (d floor (i)	,	= =		(0.98 / 2 (0.98 / 2	=	0.37	0.98
	stairs (stairs (,	= =	say, as say, as		=	0.37	0.98
	balustr	ade (d)	=	say,		=	0.25	
Reactions	R _A R _B	= =	1.69 kl 2.18 kl		(d = 0.59 (d = 0.64		,	
						e 1-No. r to lar		75mm C16 joist as

	Project				Job Ref.	
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Robert E Fry Associates Ltd 45 Bridgeman Terrace		ALTERATION	S & EXTENSIO	DN	1	3
Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
Tel: 01942-826020	P.Bithell	Jan. 2020				

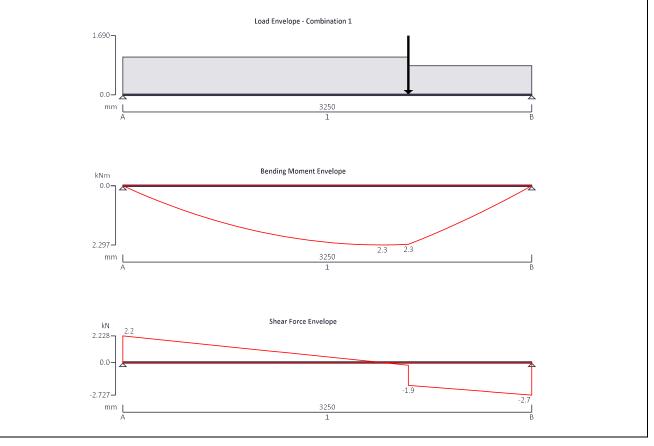


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Robert E Fry Associates Ltd		ALTERATION	NS & EXTEN	SION	Cheet no.//ev	14
45 Bridgeman Terrace Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
Tel: 01942-826020	P.Bithell	Jan. 2020				
Analysis results Design moment; Total load on beam; Reactions at support A; Unfactored dead load reaction	••	l kN; R _{A_Dead} =			F = 2.183 k	N
Unfactored imposed load reac			= 1.103 kN	(00)))		
Reactions at support B;	R _{B_max} = 2.183		R _{B_min} = 2.	183 kN		
Unfactored dead load reaction	••	$R_{B_{Dead}} =$				
Unfactored imposed load reac	tion at support B;	RB_Imposed	= 1.544 kN			
Timber section details			_			
Breadth of section;	b = 47 mm;		Depth of s		h = 175 mm	
Number of sections;	N = 1 ;		Breadth of	beam;	b _b = 47 mm	
Timber strength class;	C16					
Member details						
Service class of timber;	1;		Load durat	tion;	Long term	
Length of span;	L _{s1} = 1800 mm					
Length of bearing;	L _b = 50 mm					
Lateral support - cl.2.10.8						
Permiss.depth-to-breadth ratio	o; 5.00 ;		Actual dep	th-to-breadth ra PA :	atio; 3.72 SS - Lateral supp	ort is adeq
Chock booring stross						
Check bearing stress	1 700	N/mm ²	Applied be	aring atraca	0.020	N/mm ²
Permissible bearing stress; PAS	σ _{c_adm} = 1.700 SS - Applied con			aring stress; an permissible	σ _{c_a} = 0.929 e compressive st	
Bending parallel to grain						
Permissible bending stress;	σm_adm = 5.624	N/mm²;	Applied be	nding stress;	σ _{m_a} = 3.67	7 N/mm ²
		PASS - Applie	ed bending s	stress is less t	han permissible	bending st
Shear parallel to grain						
Shear parallel to grain Permissible shear stress;	τ _{adm} = 0.670 N/		Applied sh Applied shea		τa = 0.398 Ν s than permissib	
	τ _{adm} = 0.670 N/					
Permissible shear stress; Deflection		PASS - A	Applied shea	ar stress is les	s than permissib	le shear st
Permissible shear stress;	τ _{adm} = 0.670 N/ δ _{adm} = 5.400 mi	PASS - ,	Applied shea Total defle	ar stress is les ction;		nm
Permissible shear stress; Deflection		PASS - 7	Applied shea Total defle	ar stress is les ction;	s than permissib δa = 2.771 r	nm
Permissible shear stress; Deflection		PASS - 7	Applied shea Total defle	ar stress is les ction;	s than permissib δa = 2.771 r	nm

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Robert E Fry Asso 45 Bridgeman To				ALTERA	TIONS	& EXTEN	SION			15
Wigan, WN1		Calc. b	у	Date		Chk'd by	Da	ie	App'd by	Date
Tel: 01942-826	6020	P.I	Bithell	Jan. 2	020					
Consider stair	trimmer (2). max	span	= 3 25m	(supp	orts nom	ninal flo	or plus r	eaction fro	m landing
trimmer), adop			. opun	0.2011	(oupp		inter no			inianang
,,,										
Loading:	floor (,	=			0.30m	=	0.23		
	floor (i)	=	2.00#	x say,	0.30m	=		0.60	
	balust	rade (d	1) =	say,			=	0.25		
		,	,	,						
	reactio	on (d)	=	0.59 k	٨N	applie	ed at 2	27 <i>m</i> fron	n R _A	
	reactio	· · ·	=	1.10 k	٨N			27 <i>m</i> fron		
Reactions	R_A	=	2.23	kN	(d =	0.92kN 8	& i = 1.	31kN)		
	R _B	=	2.72	kN	(d =	0.98kN 8	& i = 1.	74kN)		
	2			-	1					
					_	provi	do 2.N	0.47×1^{-1}	75mm C16	ioiete ac
					\rightarrow			o. 47 x 1 acent st	75mm C16	joists as

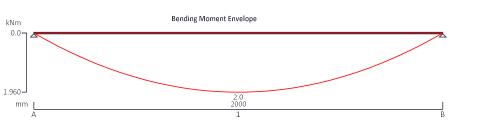
TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02



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Robert E Fry Associates Ltd 45 Bridgeman Terrace		ALTERATION	S & EXTENSIO	N		16
Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
Tel: 01942-826020	P.Bithell	Jan. 2020				
Applied loading						
Beam loads floor		Dead full I	JDL 0.230 kN/m			
floor			ull UDL 0.600 kl			
trimmer		•	t load 0.590 kN			
trimmer		•	point load 1.100			
h'rail			ial UDL 0.250 kl			
Load combinations						
Load combination 1		Support A			ead 1.00	
					posed 1.00	
		Span 1		De	ead	
				Im	posed	
		Support B		De	ead	
				Im	posed 1.00	
Analysis results						
Design moment;	M = 2.297 kNm		Design shear;		F = 2.727 k	N
Total load on beam;	W _{tot} = 4.955 kN					
Reactions at support A;	RA_max = 2.228		R _{A_min} = 2.228	kN		
Unfactored dead load reaction	••	-	R _{A_Dead} = 0.921 kN R _{A_Imposed} = 1.307 kN ; R _{B_min} = 2.727 kN			
Unfactored imposed load read Reactions at support B;	R _{B max} = 2.727					
Unfactored dead load reaction	-	$R_{B_{Dead}} = 0$				
Unfactored imposed load read	••		= 1.743 kN			
Timber eaction dataile						
Timber section details Breadth of section;	b = 47 mm;		Depth of section	on:	h = 175 mm	ı
Number of sections;	N = 2 ;		Breadth of bea		b _b = 94 mm	
Timber strength class;	C16			-		
Member details						
Service class of timber;	1;		Load duration;		Long term	
Length of span;	L _{s1} = 3250 mm		uuuuu,		g	
Length of bearing;	L _b = 50 mm					
Lateral support - cl.2.10.8 Permiss.depth-to-breadth ratio	o: 5.00 .		Actual depth-to	o-breadth rai	tio: 1 .86	
	-, -: ,				S - Lateral supp	ort is adequ
Check bearing stress						
Permissible bearing stress;	σ _{c adm} = 1.870 №	N/mm²;	Applied bearin	g stress;	σ _{c_a} = 0.580) N/mm ²
-	-			-	compressive st	

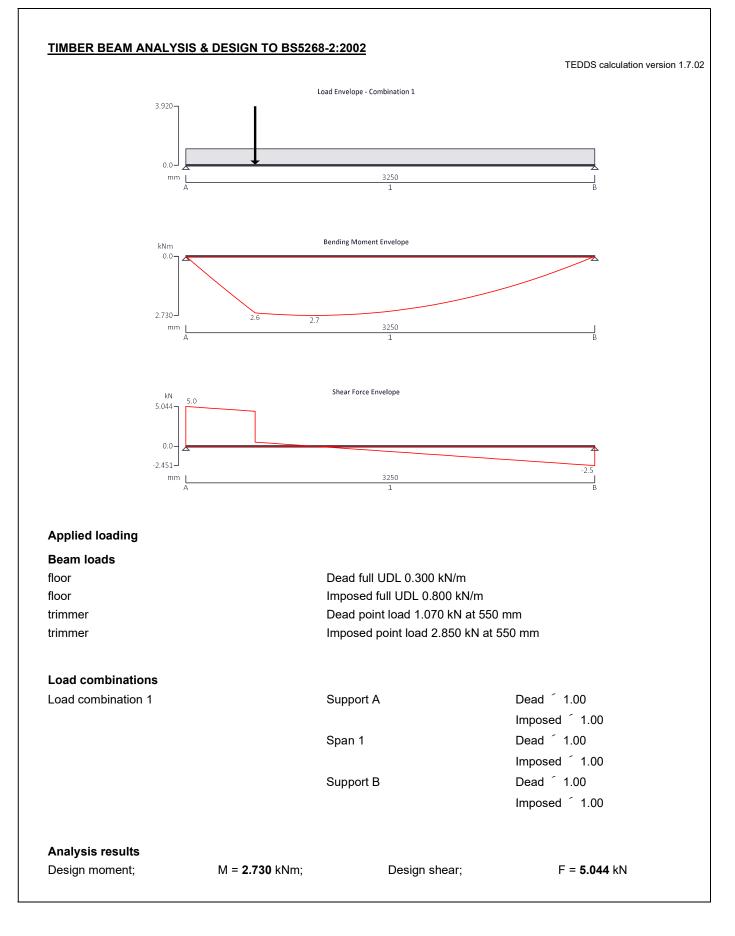
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KEFA			476 Garstang	road, Brou	ghton			19192
Robert E Fry Associ	ates I td	Section		ONS & EXTENSION			Sheet no./rev.	
45 Bridgeman Terra			ALTERATION					
Wigan, WN1 1T		Calc. by	Date	Chk'd by	Date		App'd by	Date
Tel: 01942-82602	20	P.Bithell	Jan. 2020					
Bending parallel to	-	σ _{m_adm} = 6.186		Applied be	-		σ _{m_a} = 4.78 n permissible	
Shear parallel to g	rain			-				-
Permissible shear s		τ _{adm} = 0.737 Ν	J/mm ^{2.}	Applied sh	near stress	s.	τ _a = 0.249 Ν	J/mm ²
	auc33,						han permissib	
			1 400 - 1	איזיבי איזיקיי	30 633	13 1 6 33 li		is shear str
Deflection								
Permissible deflecti	on;	δ _{adm} = 9.750 n	nm;	Total defle	ection;		δa = 9.267 r	nm
						on is les	s than permiss	sible deflect
Consider chimn	ey trimme	<u>er (3);</u> max. s	pan = 2.00m	(supports	floor on	ly), ado	pt C16 timbe	er
<u>Consider chimn</u> Loading:	<u>ey trimme</u> floor (d floor (i	d) =	pan = 2.00m 0.75 [#] x (2. 2.00 [#] x (2.	85 / 2)	=	ly), ado 1.07	pt C16 timbe 2.85	er
	floor (d	= (b) =	0.75 [#] x (2.	85 / 2) 85 / 2)	=	1.07	2.85	er
Loading:	floor (d floor (i	= (b) =	0.75 [#] x (2. 2.00 [#] x (2.	85 / 2) 85 / 2) (d = 7 provi	= = 1.07kN 8	1.07 & <i>i</i> = 2.8 5.47 x 1	2.85 85kN) 8 75mm C16 j	
Loading:	floor (d floor (i R _A = R	d) =) = 2 _B =	0.75 [#] x (2. 2.00 [#] x (2. 3.92 kN →	85 / 2) 85 / 2) (d = 7 provi	= = 1.07kN 8	1.07 & <i>i</i> = 2.8 5.47 x 1	2.85 85kN) 1 75mm C16] /	
Loading: <i>Reactions</i>	floor (d floor (i R _A = R	d) =) = 2 _B =	0.75 [#] x (2. 2.00 [#] x (2. 3.92 kN →	85 / 2) 85 / 2) (d = 7 provi trimn	= = 1.07kN 8	1.07 & <i>i</i> = 2.8 5.47 x 1	2.85 85kN) 1 75mm C16] /	joists as



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45 Bridgeman Terrace			S & EXTENS			18
Wigan, WN1 1TT Tel: 01942-826020	Calc. by P.Bithell	Date Jan. 2020	Chk'd by	Date	App'd by	Date
kN 3.9		Shear Force En	velope			
3.920						
0.0-					A	
-3.920 – mm [2000		-3.9 B	
^			Ŧ		U	
Applied loading						
Beam loads						
floor			JDL 0.000 kN			
floor floor			JDL 1.070 kN ull UDL 2.850			
		inposed i	un ODE 2.000	N 7/11		
Load combinations						
Load combination 1		Support A			ead 1.00	
		0 1			posed 1.00	
		Span 1			ead 1.00	
		Support B			posed	
		Support B			posed 1.00	
					posed 1.00	
Analysis results						
Design moment; Total load on beam;	M = 1.960 kNm; W _{tot} = 7.840 kN		Design shea	ar;	F = 3.920 k	٢N
Reactions at support A;	RA_max = 3.920 ki		RA_min = 3.92	2 0 kN		
Unfactored dead load reaction	••	R _{A_Dead} = '				
Unfactored imposed load react Reactions at support B;	ion at support A; R _{B_max} = 3.920 kl		= 2.850 kN R _{B min} = 3.9 2	20 kN		
Unfactored dead load reaction		N, R _{B_Dead} = '	-			
Unfactored imposed load react			= 2.850 kN			
Timber section details						
Breadth of section;	b = 47 mm;		Depth of sec	ction;	h = 175 mn	n
Number of sections;	N = 2 ;		Breadth of b		b₀ = 94 mm	
Timber strength class;	C16					
Member details						
Service class of timber;	1;		Load duration	on;	Long term	
Length of span;	L _{s1} = 2000 mm L _b = 50 mm					

		Project 476 Garstang road, Broughton						Job Ref. 19192 Sheet no./rev.		
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45 Bridgeman Ter				ALTERATIO	ONS & EXT	NS & EXTENSION			19	
Wigan, WN1 1T Tel: 01942-8260		Calc. by P.B	Bithell	Date Jan. 2020	Chk'd by	Da	te	App'd by	Date	
Lateral support - Permiss.depth-to-b		; 5.00;			Actual	depth-to-bro		; 1.86 - Lateral supj	nort is adam	
Check bearing sti	1055						FA33	- Laterai Supp	ont is adequ	
Permissible bearin		σc adm =	= 1.700	N/mm²;	Applied	d bearing st	ress:	σc_a = 0.83	4 N/mm ²	
	-			mpressive str		-				
Bending parallel t Permissible bendir		σm_adm ⁻	= 5.624			d bending st ng stress i s		თ _{m_a} = 4.08 n permissible		
Shear parallel to g	-									
Permissible shear	stress;	τ _{adm} = ().670 N			d shear stre shear stres		τa = 0.357 han permissi		
Deflection										
Permissible deflect	tion [.]	$\delta_{adm} = 6$	6 000 m	ım.	Total d	eflection;		δa = 3.748	mm	
					PA35 - 1	otal dellect	uon is ies	s than permis	ssible defiect	
					PA33 - 1	otal deneci	uon is ies:	s than permis	isible deflect	
<u>Consider floor t</u> adopt C16 timb	er floor (c	- 	span = =	0.75 [#] x 0	oports flo			om chimney		
adopt C16 timb	er	- 	-		oports flo	or plus re	action fro			
adopt C16 timb	er floor (c	d)) on (d)	=	0.75 [#] x 0	oports flo .40m .40m <i>ap</i>	or plus re =	action fro 0.30 .55 <i>m fro</i> i	om chimney 0.8 n R _A		
adopt C16 timb	er floor (o floor (i reactio	d)) on (d)	= =	0.75 [#] x 0 2.00 [#] x 0 1.07 kN 2.85 kN	oports flo .40m .40m <i>ap</i> <i>ap</i>	or plus re = = plied at 0.	action fro 0.30 .55 <i>m froi</i> .55 <i>m froi</i>	om chimney 0.8 n R _A		
adopt C16 timb Loading:	er floor (c floor (i reactic reactic	d)) on (d) on (i)	= = =	0.75 [#] x 0 2.00 [#] x 0 1.07 kN 2.85 kN	2000 - 2000 -40m -40m -40m -40 -40 -40 -40 -40 -40 -40 -40 -40 -40	or plus re = = plied at 0 plied at 0	action fro 0.30 .55 <i>m froi</i> .55 <i>m froi</i> 67kN)	om chimney 0.8 n R _A		
adopt C16 timb Loading:	floor (o floor (i reactic reactic	d)) on (d) on (i) =	= = = 5.05	0.75 [#] x 0 2.00 [#] x 0 1.07 kN 2.85 kN	2000 - 2000 - 40m - 40m - 40m - 40 - 40 - 40 - 40 - 40 - 40 - 40 - 40	or plus re = = plied at 0 plied at 0. :N & i = 3. :N & i = 1.	action fro 0.30 .55 <i>m</i> fro .55 <i>m</i> fro 67kN) 78kN)	om chimney 0.8 n R _A	trimmer),	
adopt C16 timb Loading:	floor (o floor (i reactic reactic	d)) on (d) on (i) =	= = = 5.05	0.75 [#] x 0 2.00 [#] x 0 1.07 kN 2.85 kN <i>kN (c</i> <i>kN (c</i>	2000 ports flo .40m .40m ap d = 1.38k d = 0.67k → pr	or plus re = = plied at 0 plied at 0. :N & i = 3. :N & i = 1.	action fro 0.30 .55 <i>m froi</i> 67 <i>kN</i>) 78 <i>kN</i>)	om chimney 0.8 $n R_A$ $n R_A$ 75mm <u>C24</u>	trimmer),	
adopt C16 timb Loading:	floor (o floor (i reactic reactic	d)) on (d) on (i) =	= = = 5.05	0.75 [#] x 0 2.00 [#] x 0 1.07 kN 2.85 kN <i>kN (c</i> <i>kN (c</i>	2000 ports flo .40m .40m ap d = 1.38k d = 0.67k → pr	or plus re = = plied at 0 plied at 0 :N & i = 3. :N & i = 1.	action fro 0.30 .55 <i>m froi</i> 67 <i>kN</i>) 78 <i>kN</i>)	om chimney 0.8 $n R_A$ $n R_A$ 75mm <u>C24</u>	trimmer),	

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KEFA		476 Garstang	road, Brought	on	19	192
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Robert E Fry Associates Ltd 45 Bridgeman Terrace		ALTERATION	S & EXTENSIC	N	2	20
Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date
Tel: 01942-826020	P.Bithell	Jan. 2020				



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	Section	476 Garstang	road, broughto	on	Sheet no./rev.	9192
Robert E Fry Associates Ltd		AI TERATION	S & EXTENSIO	N	Sheet no./rev.	21
45 Bridgeman Terrace	Calc. by	Date	Chk'd by	Date	App'd by	Date
Wigan, WN1 1TT Tel: 01942-826020	P.Bithell	Jan. 2020	Office by	Duic	, the g pro-	Duic
Total load on beam;	W _{tot} = 7.495 kN					
Reactions at support A;	R _{A_max} = 5.044 k		R _{A_min} = 5.044	KN		
Unfactored dead load reaction	••	R _{A_Dead} = *				
Unfactored imposed load read Reactions at support B;	••		= 3.668 kN	LNI		
Unfactored dead load reaction	R _{B_max} = 2.451 k	$R_{B Dead} = 0$	R _{B_min} = 2.451	KIN		
Unfactored imposed load reaction		_	= 1.782 kN			
Timber section details						
Breadth of section;	b = 47 mm;		Depth of section	on;	h = 175 mm	
Number of sections;	N = 2 ;		Breadth of bea	ım;	b _b = 94 mm	
Timber strength class;	<u>C24</u>					
Member details						
Service class of timber;	1;		Load duration;		Long term	
Length of span;	L _{s1} = 3250 mm				-	
Length of bearing;	L _b = 50 mm					
Permiss.depth-to-breadth ratio	o; 5.00 ;		Actual depth-to		1.86 Lateral suppo	ort is adeq
Check bearing stress						
Permissible bearing stress;	σc adm = 2.090 N	l/mm²;	Applied bearing	g stress;	σc_a = 1.073	N/mm ²
•	SS - Applied com		••	•		
Bending parallel to grain	0.754.1	1/2	A		5 004	N1/
Permissible bending stress;	o _{m_adm} = 8.754 Ν		Applied bendin d bending stree	-	σ _{m_a} = 5.691 permissible k	
Shear parallel to grain						
Permissible shear stress;	τ _{adm} = 0.781 N/n		Applied shear		τa = 0.460 N	
		PASS - A	pplied shear st	tress is less th	an permissibl	e shear st
Deflection						
Permissible deflection;	δ _{adm} = 9.750 mn		Total deflectior ASS - Total def		δ_a = 9.036 m than permiss	

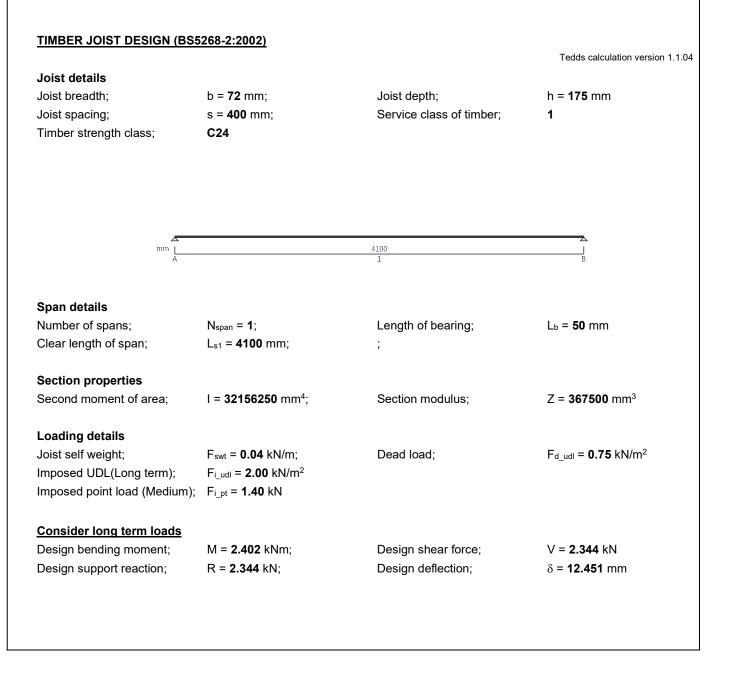
	Project				Job Ref.	
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FLOOR JOISTS

Consider joists over staff kitchen (i.e. council meeting room) with a max. span = 4.10m; applied loading as previous, dead = 0.75 kN/m^2 and imposed = 2.00 kN/m^2

Adopt <u>C24</u> timber joists at 400mm max. centres.

 → provide 47 x 175mm <u>C24</u> joists at 400mm centres throughout with midspan strutting



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Wigan, WN1 1TT	Calc. by	Date	Chk'd by	Date	App'd by	Date		
Tel: 01942-826020	P.Bithell	Jan. 2020						
Check bending stress Permissible bending stress;	σm_adm = 8.754	N/mm²;	Applied ber	nding stress;	σm_max = 6.5	5 37 N/mm ²		
			PASS - App	olied bending	stress within pe	rmissible lin		
Check shear stress								
Permissible shear stress;	τ _{adm} = 0.781 N/	′mm²;	Applied she PASS - A		τ _{max} = 0.279 stress within pe			
Check bearing stress								
Permissible bearing stress;	σ _{c_adm} = 2.090	N/mm²;		aring stress; plied bearing	σ _{c_max} = 0.6 stress within pe			
Check deflection								
Permissible deflection;	δ _{adm} = 12.300 r	nm;	Actual deflection; δ = 12.451 mmFAIL - Actual deflection exceeds permissible deflect					
			practica		eptable as 1.2% kely that partior room			
Consider medium term load	<u>s</u>							
Design bending moment;	M = 2.156 kNm	1;	Design she	ar force;	V = 2.104 k	N		
Design support reaction;	R = 2.104 kN;		Design defle	ection;	δ = 9.729 m	ım		
Check bending stress								
Permissible bending stress;	σ _{m_adm} = 10.94 2	2 N/mm²;		nding stress; blied bending	σ _{m_max} = 5.8 stress within pe			
Check shear stress								
Permissible shear stress;	τ _{adm} = 0.976 N/	′mm²;	Applied she PASS - A		τ _{max} = 0.250 stress within pe			
Check bearing stress								
Permissible bearing stress;	σc_adm = 2.613	N/mm²;	Applied bea PASS - Ap	-	σ _{c_max} = 0.5 stress within pe			
Check deflection								
Permissible deflection;	δ _{adm} = 12.300 r	nm;	Actual defle PAS		δ = 9.729 m ection within pe			