

	Project				Job Ref.	
		57 High Stre	eet, Fareham		190503	
Davies Torres Design Ltd	Section	Intro	Sheet no./rev.			
Clarence House		introc				
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

## **Proposals**

Resin Repairs to beams at 57 High Street, Fareham.

Calculations carried out in conjunction with information supplied by Property Repair Systems.

Calculations carried out assuming working load stresses, linear behaviour and assuming that all tension forces are resisted by the bars in tension and shear bond into timber and none carried by resin in tension below neutral axis.

# References

BS6399-1: 1996 Loading for Buildings – Code of Practice for dead and imposed loads
BS6399-2:1997 Loadings for buildings – Code of practice for wind loads
BS6399-3:1988 Loadings for Buildings – Code of practice for imposed roof loads
BS5268-2:2002 Structural use of timber – Code of practice for permissible stress design
BS449-2:1969 The use of structural steel in building
Structural Engineers Pocket Book, 2<sup>nd</sup> Ed. - Cobb

## **Calculations prepared by**

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	Project		Job Ref.			
		57 High Str	190503			
Davies Torres Design Ltd	Section				Sheet no./rev.	
Clarence House		Introd	2			
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

# Contents

Proposals1
References
Dead Loads
Imposed Loads
Beam Loadings4
Bending Moment at Repair Position
Beam Repair No1
Timber member design (BS5268) - Beam1
Timber Member design to bs5268-2:2002
Resin Repair Beam 1
Beam Repair No29
Timber member design (BS5268) - Beam2
Timber Member design to bs5268-2:20029
Resin Repair Beam 2
Beam Repair No3
Timber member design (BS5268) - Beam313
Timber Member design to bs5268-2:200213
Resin Repair Beam 3
Appendix
Resin Design Methodology17
Resin Repair proposals
Resin Data Sheet

	Project				Job Ref.	
		57 High Stre	eet, Fareham		190503	
Davies Torres Design Ltd	Section				Sheet no./rev.	
Clarence House		Dead and In	3			
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

# **Dead Loads**

Allow Dead Load of say 0.75kN/sqm for self weight of floor

Allow Partition Load of 0.25kN/sqm onto floor

# Imposed Loads

Domestic Loading 1.5kN/sqm

	Project		Job Ref.			
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GL6 0BP	RD	09/05/19				

# **Beam Loadings**

Refer to layout for potential loading onto beams

Load on beam = (0.75+0.25+1.50) = 2.5kN/sqm

Area of floor applying load onto beam = 13.0sqm

Total Load = 2.5x13 = 32.5kN

Maximum potential bending moment =  $\frac{WL}{8} = \frac{32.5x4.4}{8} = 17.9$ kNm at centre of beam

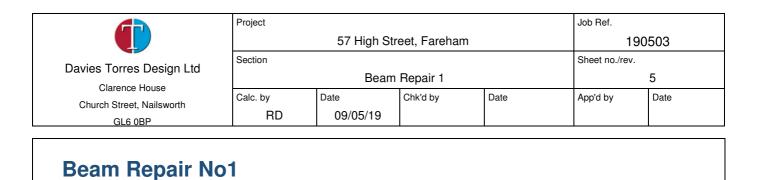
Maximum reaction = 32.5/2 = 16.3kN

# **Bending Moment at Repair Position**

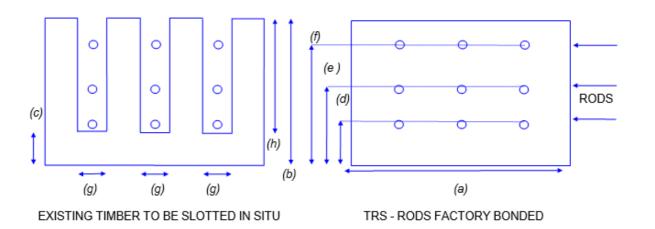
Assess at 300mm from bearing Width of loading onto beam = (3.75+2.15)/2 = 2.95m

 $M = Rx - w\frac{x^2}{2} = 16.3x0.3 - (3.0x2.95)x0.3^2/2 = 4.5kNm$ 

Assess repairs with lower value of bending moment of bending moment capacity of section or 4.5kNm

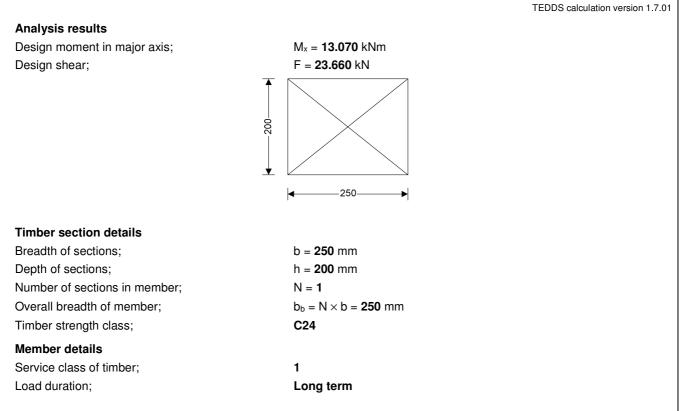


# TRS TYPE C, 9 SHEAR CONNECTORS, 3 SLOTS, CATEGORY +/-3mm



Adjust bending moment and shear force so that unity value is equal to 1.0 to determine section capacity

# Timber member design (BS5268) - Beam1

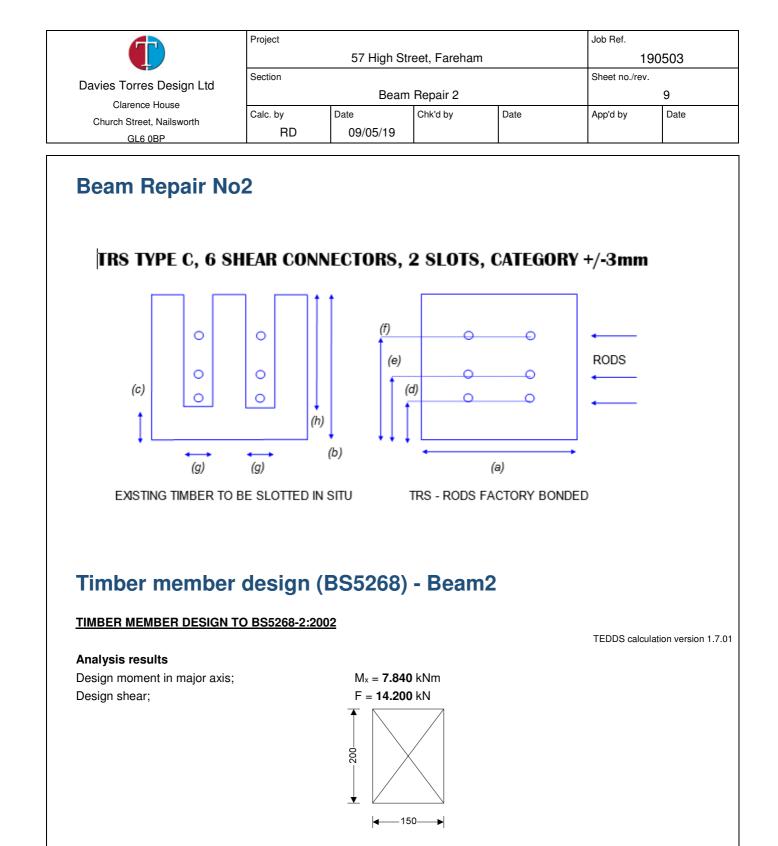


## TIMBER MEMBER DESIGN TO BS5268-2:2002

P	Project Job Ref.							
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Clarence House Church Street, Nailsworth	alc. by	Date	Chk'd by	Date	App'd by	Date		
GL6 0BP	RD	09/05/19						
		÷	•		L.			
Section properties								
Cross sectional area of member;		-	× h = <b>50000</b>					
Section modulus;			$h^{2} / 6 = 16$					
		$Z_y = h \times (h)$	$(1 \times b)^2 / 6 = 2$	<b>083333</b> mm <sup>3</sup>				
Second moment of area;		$I_x = N \times b$	× h³ / 12 = <b>16</b>	66666667 mm <sup>4</sup>				
		$I_y = h \times (N)$	$(\times b)^3 / 12 = 2$	2 <b>60416667</b> mm <sup>4</sup>	Ļ			
Radius of gyration;	$i_x = \sqrt{(I_x / A)} = 57.7 \text{ mm}$							
	$i_y = \sqrt{(I_y / A)}$	A) = <b>72.2</b> mm						
Modification factors								
Duration of loading - Table 17;		K <sub>3</sub> = <b>1.00</b>						
Total depth of member - cl.2.10.6;			mm / h) <sup>0.11</sup> =	1.05				
Load sharing - cl.2.9;		K <sub>8</sub> = <b>1.00</b>	,					
Lateral support - cl.2.10.8								
No lateral support								
Permissible depth-to-breadth ratio	- Table 19	; 2.00						
Actual depth-to-breadth ratio;		h / (N × b)	= 0.80					
-				PAS	S - Lateral supp	ort is adequa		
Bending parallel to grain								
Permissible bending stress;		$\sigma_{m}$ adm = $\sigma_{m}$	$\overline{s}_m  imes K_3  imes K_7  imes$	: K <sub>8</sub> = <b>7.842</b> N/m	im <sup>2</sup>			
Applied bending stress;		_	/ Z <sub>x</sub> = <b>7.842</b>					
		—	adm = <b>1.000</b>					
				tress is less th	an permissible	bending stre		
Shear parallel to grain								
Permissible shear stress;		$\tau_{adm}=\tau\times$	K <sub>3</sub> × K <sub>8</sub> = <b>0.7</b>	<b>10</b> N/mm²				
Applied shear stress;		$\tau_a = 3 \times F$	/ (2 × A) = <b>0.</b>	<b>710</b> N/mm²				
		$\tau_a / \tau_{adm} =$						
				r stress is less	than permissib	ole shear stre		

Etimber 7200 N/sqmm Modular Ratio 28.5 Tension Steel No of Bars per layer 3 Diameter 16 mm Total Area per layer 603.2 sqmm Equivalent Area 16570.9 sqmm Bending Moment 4.5 kNm Dimensions of Timber Depth 200 mm Breadth 250 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d x 61.77152 31.77151661 EquivArea x (d x) 1060866 545645.292 Solve for Neutral Axis Depth	
Clarence House Church Steel, Nailsworth GL6.08P         Church Steel RD         Date 09/05/19         Church by Church by 09/05/19         Date Church by Date         Apport by Apport by         Date           Resin Repair Beam 1           Esteel         205000         N/sqmm           Etimber         7200         N/sqmm           Modular Ratio         28.5           Tension Steel         000 of Bars per layer         3           Diameter         16         mm           Total Area per layer         603.2         sqmm           Equivalent Area         17174.0         sqmm           Bending Moment         4.5         kNm           Dimensions of Timber         200         mm           Depth         200         mm           Breadth         250         mm           Tension Bars         Row 1         Row 2         Row 3         Row 4         Row 5         Row 6         Row 7         Row 8           d         150         120         d-x         61.77152         31.77151661         EquivArea x           Glave for Neutral Axis Depth         Stote poth         Stote poth         Stote poth         Stote poth	
Onuch Street, Naleworth GL6 OBP         Calc. by RD         Date 09/05/19         Child by         Date         App'd by         Date           Resin Repair Beam 1           Esteel         205000         N/sqmm           Esteel         205000         N/sqmm         Modular Ratio         28.5           Tension Steel         0         28.5         Compression Steel         No of Bars         3           No dBars per layer         3         Diameter         16         mm         Total Area per layer         3         Diameter         16         mm           Total Area per layer         603.2         sqmm         Equivalent Area         16570.9         sqmm           Bending Moment         4.5         KNm         Depth to Steel         Compression         50         mm           Dimensions of Timber         200         mm         Equivalent Area         16570.9         sqmm           Dimensions of Timber         200         mm         Icargth of Steel Bars         700         mm           Slot Depth         250         mm         Slot Depth         163         mm           Tension Bars         Row 1         Row 2         Row 3         Row 4         Row 5         Row 6	
Esteel 205000 N/sqmm Etimber 2200 N/sqmm Modular Ratio 28.5 Tension Steel No of Bars per layer 3 Diameter 16 mm Total Area per layer 603.2 sqmm Equivalent Area 16570.9 sqmm Equivalent Area 16570.9 sqmm Bending Moment 4.5 kNm Dimensions of Timber 200 mm Breadth 250 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d x 61.77152 31.77151661 EquivArea x (d -x) 1060866 545645.292 Solve for Neutral Axis Depth	
Etimber 7200 N/sqmm Modular Ratio 28.5 Tension Steel No of Bars per layer 3 Diameter 16 mm Total Area per layer 603.2 sqmm Equivalent Area 16570.9 sqmm Bending Moment 4.5 kNm Dimensions of Timber Depth 200 mm Breadth 250 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d x 61.77152 31.77151661 EquivArea x (d-x) 1060866 545645.292 Solve for Neutral Axis Depth	
Modular Ratio       28.5         Tension Steel       So of Bars per layer       3         Diameter       16       mm         Total Area per layer       603.2       sqmm         Equivalent Area       17174.0       sqmm         Bending Moment       4.5       kNm         Dimensions of Timber       200       mm         Depth       200       mm         Breadth       250       mm         Tension Bars       Row 1       Row 2         d       150       120         d*       61.77152       31.77151661         EquivArea x       1060866       545645.292         Solve for Neutral Axis Depth       203	
Tension Steel       No of Bars per layer       3         Diameter       16       mm         Total Area per layer       603.2       sqmm         Equivalent Area       17174.0       sqmm         Equivalent Area       17174.0       sqmm         Bending Moment       4.5       kNm         Dimensions of Timber       200       mm         Depth       200       mm         Breadth       250       mm         Tension Bars       Row 1       Row 2         d       150       120         d       150       120         d-x       61.77152       31.77151661         EquivArea x       (d-x)       1060866       545645.292         Solve for Neutral Axis Depth       545645.292       5000000000000000000000000000000000000	
No of Bars per layer     3     No of Bars     3       Diameter     16     mm     Diameter     16     mm       Total Area per layer     603.2     sqmm     Sqmm     Total Area     603.2     sqmm       Equivalent Area     17174.0     sqmm     Equivalent Area     16570.9     sqmm       Bending Moment     4.5     kNm     Equivalent Area     16570.9     sqmm       Dimensions of Timber     200     mm     Equivalent Area     16570.9     sqmm       Dimensions of Timber     200     mm     Equivalent Area     16570.9     sqmm       Dimensions of Timber     200     mm     Equivalent Area     16570.9     sqmm       Tension Bars     Row 1     250     mm     Slot Depth     50     mm       Tension Bars     Row 1     Row 2     Row 3     Row 4     Row 5     Row 6     Row 7     Row 8       d     150     120	
No of Bars per layer     3     No of Bars     3       Diameter     16     mm     Diameter     16     mm       Total Area per layer     603.2     sqmm     Sqmm     Total Area     603.2     sqmm       Equivalent Area     17174.0     sqmm     Equivalent Area     16570.9     sqmm       Bending Moment     4.5     kNm     Equivalent Area     16570.9     sqmm       Dimensions of Timber     200     mm     Depth to Steel     Compression     50     mm       Breadth     250     mm     Length of Steel Bars     700     mm       Slot Depth     163     mm     Slot Width     25     mm       Tension Bars     Row 1     Row 2     Row 3     Row 4     Row 5     Row 6     Row 7     Row 8       d     150     120	
Total Area per layer603.2sqmmTotal Area603.2sqmmEquivalent Area17174.0sqmmEquivalent Area16570.9sqmmBending Moment4.5kNmEquivalent Area16570.9sqmmDimensions of Timber Depth200mmDepth to Steel Compression50mmBreadth250mmLength of Steel Bars700mmSlot Depth163mmSlot Width25mmTension BarsRow 1Row 2Row 3Row 4Row 5Row 6Row 7Row 8d150120	
Equivalent Area       17174.0 sqmm       Equivalent Area       16570.9 sqmm         Bending Moment       4.5 kNm       Equivalent Area       16570.9 sqmm         Dimensions of Timber       200 mm       Depth to Steel       Compression       50 mm         Breadth       250 mm       1060 f Steel Bars       700 mm       Slot Depth       163 mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120	
Bending Moment 4.5 kNm Dimensions of Timber Depth 200 mm Breadth 250 mm Tension Length of Steel Bars 700 mm Slot Depth 163 mm Slot Width 25 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d-x 61.77152 31.77151661 EquivArea x (d-x) 1060866 545645.292 Solve for Neutral Axis Depth	
Dimensions of Timber Depth 200 mm Breadth 250 mm Breadth 250 mm Length of Steel Bars 700 mm Slot Depth 163 mm Slot Width 25 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d-x 61.77152 31.77151661 EquivArea x (d-x) 1060866 545645.292 Solve for Neutral Axis Depth	
Depth200 mmCompression50 mmBreadth250 mmTensionLength of Steel Bars700 mmLength of Steel Bars700 mmSlot Depth163 mmSlot Width25 mmSlot Width25 mmTension BarsRow 1Row 2Row 3Row 4Row 5Row 6Row 7Row 8d150120120A61.7715231.77151661FequivArea xFequivArea x	
Breadth250 mmTensionLength of Steel Bars700 mmLength of Steel Bars700 mmSlot Depth163 mmSlot Width25 mmTension BarsRow 1Row 2Row 3Row 4Row 5Row 6Row 7Row 4150120d150120d-x61.7715231.77151661EquivArea x(d-x)1060866545645.292Solve for Neutral Axis DepthSolve for Neutral Axis DepthSolve for Neutral Axis Depth	
Slot Depth       163       mm         Slot Width       25       mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120       120       120       100       120       100 </td <td></td>	
Slot Width       25 mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120       120       120       100       120       100 <td></td>	
d 150 120 d-x 61.77152 31.77151661 EquivArea x (d-x) 1060866 545645.292 Solve for Neutral Axis Depth	
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EquivArea x (d-x) 1060866 545645.292 Solve for Neutral Axis Depth	mn mn
(d-x) 1060866 545645.292 Solve for Neutral Axis Depth	
	mn
x = 88.22848 mm	
Qabove NA 1606512	
Qbelow NA 1606512	

Bavies Torres Design Ltd Clarence House Church Street, Nailsworth GL6 0BP     Section     Beam Repair 1     Street 0       Cale. by RD     Date 09/05/19     Chi'd by 09/05/19     Date     App'd by     Date       Cracked Section Moment of Inertia 164317063.8 mm^4     Stresses in Bars (Lowest Bars First)     Stresses in Bars (Lowest Bars First)     Stresses in Bars (Lowest Bars First)       Stresses in Bars (Lowest Bars First)     Stresses in Bars (Lowest Bars First)     Stresses in Bars (Lowest Bars First)       Actual Stresses from Bending Timber Compression     2.4 N/sqmm       Tension Steel     29.1 kN       Tension Force     29.1 kN       Tension per Bar     9.7 kN
Clarence House Church Street, Nailsworth GL6 0BP     Calc. by RD     Date 09/05/19     ChK'd by     Date     App'd by     Date       Cracked Section Moment of Inertia 164317063.8 mm^4
Church Street, Naliswork     RD     09/05/19       Cracked Section Moment of Inertia 164317063.8 mm^4       Stresses in Bars (Lowest Bars First)       Stress N/sqmm     48.2     24.8       Force per row kN     29.1     14.9       Actual Stresses from Bending Fimber Compression     2.4     N/sqmm       Fension Steel     29.8     N/sqmm
Cracked Section Moment of Inertia 164317063.8 mm^4 Stresses in Bars (Lowest Bars First) Stress N/sqmm 48.2 24.8 Stresses N/sqmm Force per row kN 29.1 14.9 Actual Stresses from Bending Timber Compression 2.4 N/sqmm Tension Steel (Max) 48.2 N/sqmm Compression Steel 29.8 N/sqmm Compression Steel 29.8 N/sqmm
164317063.8       mm^4         tresses in Bars (Lowest Bars First)         tress N/sqmm       48.2       24.8         orce per row kN       29.1       14.9         actual Stresses from Bending imber Compression       2.4       N/sqmm ension Steel (Max)         d8.2       N/sqmm         compression Steel       29.8       N/sqmm         compression Force       29.1       kN
Stresses in Bars (Lowest Bars First)         Stress N/sqmm       48.2       24.8         Force per row kN       29.1       14.9         Actual Stresses from Bending
Stress N/sqmm48.224.8Force per row kN29.114.9Actual Stresses from Bending Timber Compression2.4N/sqmmTension Steel (Max)48.2N/sqmmCompression Steel29.8N/sqmmTension Force29.1kN
Stress N/sqmm       48.2       24.8         Force per row kN       29.1       14.9         Actual Stresses from Bending
Actual Stresses from Bending Timber Compression 2.4 N/sqmm Tension Steel (Max) 48.2 N/sqmm Compression Steel 29.8 N/sqmm Tension Force 29.1 kN
Actual Stresses from Bending Timber Compression 2.4 N/sqmm Tension Steel (Max) 48.2 N/sqmm Compression Steel 29.8 N/sqmm Tension Force 29.1 kN
Actual Stresses from Bending Timber Compression 2.4 N/sqmm Tension Steel (Max) 48.2 N/sqmm Compression Steel 29.8 N/sqmm Tension Force 29.1 kN
Actual Stresses from Bending Timber Compression 2.4 N/sqmm Tension Steel (Max) 48.2 N/sqmm Compression Steel 29.8 N/sqmm Tension Force 29.1 kN
Fimber Compression2.4N/sqmmFension Steel (Max)48.2N/sqmmCompression Steel29.8N/sqmmFension Force29.1kN
Timber Compression2.4N/sqmmTension Steel (Max)48.2N/sqmmCompression Steel29.8N/sqmmTension Force29.1kN
Tension Steel (Max)48.2N/sqmmCompression Steel29.8N/sqmmTension Force29.1kN
Tension Force 29.1 kN
Tension per Bar 9.7 kN
Allowable for C24 Timber
Bond Stress into New Timber0.49N/sqmm0.71N/sqmm
Bond Stress into Old Timber0.49N/sqmm0.71N/sqmm



### Timber section details

Breadth of sections;	b = <b>150</b> mm
Depth of sections;	h = <b>200</b> mm
Number of sections in member;	N = <b>1</b>
Overall breadth of member;	$b_b = N \times b = 150 \text{ mm}$
Timber strength class;	C24
Member details	
Service class of timber;	1
Load duration;	Long term

	Project		Job Ref.					
		57 High S	1	90503				
Davies Torres Design Ltd	Section				Sheet no./rev			
Clarence House		Bear	n Repair 2		10			
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date		
GL6 0BP	RD	09/05/19						
Section properties								
Cross sectional area of memb	or:		× h = <b>30000</b>	mm <sup>2</sup>				
Section modulus;	er,	-						
Section modulus,			$b \times h^2 / 6 = 10$					
		,	$N \times b)^2 / 6 = 7$					
Second moment of area;	$I_x = N \times b \times h^3 / 12 = 10000000 \text{ mm}^4$							
Dedition of sums?	$I_y = h \times (N \times b)^3 / 12 = 56250000 \text{ mm}^4$ $i_x = \sqrt{(I_x / A)} = 57.7 \text{ mm}$							
Radius of gyration;								
		$I_{y} = \sqrt{(I_{y} / I_{y})}$	A) = <b>43.3</b> mm					
Modification factors								
Duration of loading - Table 17		K <sub>3</sub> = <b>1.00</b>						
Total depth of member - cl.2.1	er - cl.2.10.6; $K_7 = (300 \text{ mm} / \text{h})^{0.11} = 1.05$							
Load sharing - cl.2.9;		K <sub>8</sub> = <b>1.00</b>						
Lateral support - cl.2.10.8								
No lateral support								
Permissible depth-to-breadth	atio - Table 19;	2.00						
Actual depth-to-breadth ratio;		$h / (N \times b)$	) = <b>1.33</b>					
				PAS	5 - Lateral supp	ort is adequa		
Bending parallel to grain								
Permissible bending stress;		$\sigma_{m_{adm}} = 0$	$5_m  imes K_3  imes K_7  imes$	: K <sub>8</sub> = <b>7.842</b> N/m	m <sup>2</sup>			
Applied bending stress;		$\sigma_{m a} = M_x / Z_x = 7.840 \text{ N/mm}^2$						
-		$\sigma_{m_a}  /  \sigma_{m_a}$	adm = <b>1.000</b>					
				tress is less th	an permissible	bending stre		
Shear parallel to grain								
Permissible shear stress;		$ au_{adm} =  au  imes$	K <sub>3</sub> × K <sub>8</sub> = <b>0.7</b>	<b>10</b> N/mm²				
Applied shear stress;		$\tau_a = 3 \times F$	/ (2 × A) = <b>0</b> .	<b>710</b> N/mm²				
		$\tau_a / \tau_{adm} =$						
				r strass is lass	than permissit	olo choar ctro		

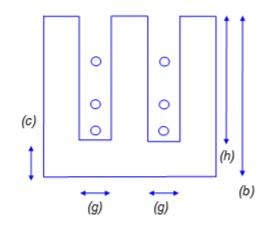
Etimber     7200     N/sgmm       Wodular Ratio     28.5       Tension Steel No of Bars per layer     2       Diameter     16       rotal Area per layer     402.1       squivalent Area     11449.4       squivalent Area     11449.4       squivalent Area     11047.2       squivalent Area     11047.2       Sending Moment     4.5       KNm     Depth to Steel Compression       Dimensions of Timber Depth     200       Depth     200       Baradth     150       Tension Bars     Row 1       d     150       gatose Ar     60.39959       Golve for Neutral Axis Depth       (c=     89.60041       mm			Project	57 High	Street, Fa	ireham		Job Ref.	0503	
Date Polate Church Steel, Naijwerch GL6 BP         Date RD         Date Object         Other by Child by RD         Date         Appril by Appril by         Date           Resin Repair Beam 2         205000         N/sqmm         Image: Child by RD         Date         Appril by         Date         Appril by         Date           Resin Repair Beam 2         205000         N/sqmm         Image: Child by         Date         Appril by         Date         Image: Child by	Davies Torres	Design Ltd	Section							
RD       09/05/19         Resin Repair Beam 2         Esteel       205000       N/sqmm         Etimber       7200       N/sqmm         Modular Ratio       28.5         Tension Steel       Compression Steel       No of Bars       2         No of Bars per layer       2       Diameter       16 mm       Total Area       402.1 sqmm         Equivalent Area       11449.4 sqmm       Samm       Depth to Steel       Compression       Somm         Bending Moment       4.5       KNm       Depth to Steel       Compression       50 mm         Slot Depth       200 mm       Bending Moment       4.5       KNm         Dimensions of Timber       200 mm       Length of Steel Bars       750 mm         Depth       150 mm       Slot Depth       163 mm         Slot Depth       163 mm       Slot Depth       163 mm         Slot Width       25 mm       Solve for Neutral Axis Depth       Kew 3       Row 4       Row 5       Row 6       Row 7       Row 8         Solve for Neutral Axis Depth       x =       89.60041 mm       Mm       Subsequence       Subsequence       Subsequence         Qabove NA       1039593       1039593       Subsequence							1_			
Image: I			-			у	Date	App'd by	Date	
Esteel     205000     N/sqmm       Etimber     7200     N/sqmm       Modular Ratio     28.5       Tension Steel     2       No of Bars per layer     2       Diameter     16       Total Area per layer     402.1       sqmm     5       Equivalent Area     11449.4       sqmm     Equivalent Area       Bending Moment     4.5       KNm     50       Dimensions of Timber     200       Depth     200       Steedth     150       Readth     150       Tension Bars     Row 1       Row 2     Row 3       Row 4     Row 5       Row 6     Row 7       Row 8       Compression       Solve for Neutral Axis Depth       K<=     89.60041       Max       Diapets       Autor       Autor <t< th=""><th></th><th></th><th></th><th></th><th>·</th><th></th><th></th><th></th><th></th><th></th></t<>					·					
Etimber     7200     N/sqmm       Modular Ratio     28.5       Tension Steel     28.5       Diameter     16     mm       Total Area per layer     402.1     sqmm       Equivalent Area     11449.4     sqmm       Equivalent Area     11449.4     sqmm       Bending Moment     4.5     kNm       Dimensions of Timber     200     mm       Depth     200     mm       Breadth     150     mm       Tension Bars     Row 1     Row 2     Row 3     Row 4     Row 5     Row 6     Row 7     Row 8       Tension Bars     Row 1     Row 2     Row 3     Row 4     Row 5     Row 6     Row 7     Row 8       Equivalent Axis Depth     x =     89.60041     mm		opun D								
Modular Ratio     28.5       Tension Steel No of Bars per layer     2       Diameter     16 mm       Total Area per layer     402.1 sqmm       Equivalent Area     11449.4 sqmm       Bending Moment     4.5 kNm       Dimensions of Timber     200 mm       Depth     200 mm       Breadth     150 mm       Tension Bars     Row 1       d     150	Esteel		205000	N/sqmm						
Tension Steel No of Bars per layer       2         Diameter       16       mm         Total Area per layer       402.1       sqmm         Equivalent Area       11449.4       sqmm         Equivalent Area       11449.4       sqmm         Bending Moment       4.5       kNm         Dimensions of Timber       200       mm         Depth       50       mm         Breadth       150       mm         Store for Neutral Axis Depth       200       Row 3         K       60.39959       30.39959204         Equivaler for Neutral Axis Depth       48055.8699         Solve for Neutral Axis Depth       1039593	Etimber		7200	N/sqmm						
No of Bars per layer 2 Diameter 16 mm Total Area per layer 402.1 sqmm Equivalent Area 11047.2	Modular Ratio		28.5							
No of Bars per layer 2 Diameter 16 mm Total Area per layer 402.1 sqmm Equivalent Area 11047.2 sqmm Equivalent Area 1047.2	Tension Steel					Compr	ression Steel			٦
Diameter16mmTotal Area per layer402.1sqmmEquivalent Area11449.4sqmmEquivalent Area11449.4sqmmBending Moment4.5kNmDimensions of Timber200mmDepth200mmBreadth150mmSolve for Neutral Axis DepthTension BarsRow 1Row 2Row 3Row 4Row 5Row 6Row 7Row 8d150120d-x60.3995930.39959204Solve for Neutral Axis DepthsqmmSolve for Neutral Axis Depthx103959310395931039593		ayer	2			-		2		
Equivalent Area       11449.4       sqmm       Equivalent Area       11047.2       sqmm         Bending Moment       4.5       kNm       Equivalent Area       11047.2       sqmm         Dimensions of Timber       200       mm       Depth to Steel       Compression       50       mm         Bending Moment       150       mm       Depth to Steel       Compression       50       mm         Breadth       150       mm       Equivalent Area       1047.2       sqmm         Tension Sof Timber       200       mm       Equivalent Area       1047.2       sqmm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120       Area       60.39959       30.39959204       EquivArea x       EquivArea x       EquivArea x       691536.7       348055.8699       Solve for Neutral Axis Depth       x =       89.60041       mm         Qabove NA       1039593       1039593       1039593       1039593       1039593	Diameter			mm					mm	
Bending Moment 4.5 kNm Dimensions of Timber Depth 200 mm Breadth 150 mm Tension Length of Steel Bars 750 mm Slot Depth 163 mm Slot Depth 163 mm Slot Width 25 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d-x 60.39959 30.39959204 EquivArea x (d-x) 691536.7 348055.8699 Solve for Neutral Axis Depth x = 89.60041 mm Qabove NA 1039593	Total Area per la	iyer	402.1	sqmm		Total A	Area	402.1	sqmm	
Dimensions of Timber Depth 200 mm Breadth 150 mm Length of Steel Bars 750 mm Slot Depth 163 mm Slot Depth 163 mm Slot Width 25 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d-x 60.39959 30.39959204 EquivArea x (d-x) 691536.7 348055.8699 Solve for Neutral Axis Depth x = 89.60041 mm	Equivalent Area		11449.4	sqmm		Equiva	lent Area	11047.2	sqmm	
Dimensions of Timber Depth 200 mm Breadth 150 mm Length of Steel Bars 750 mm Slot Depth 163 mm Slot Depth 163 mm Slot Width 25 mm Tension Bars Row 1 Row 2 Row 3 Row 4 Row 5 Row 6 Row 7 Row 8 d 150 120 d-x 60.39959 30.39959204 EquivArea x (d-x) 691536.7 348055.8699 Solve for Neutral Axis Depth x = 89.60041 mm										
Depth       200 mm       fm       50 mm         Breadth       150 mm       rension       50 mm         Length of Steel Bars       750 mm       mm         Slot Depth       163 mm       mm         Slot Width       25 mm       mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120       120       requivArea x       reqa a a a a a a a a a a a a a a a a a a	Bending Momer	nt	4.5	kNm						
Breadth         150 mm         Tension           Length of Steel Bars         750 mm           Slot Depth         163 mm           Slot Width         25 mm           Tension Bars         Row 1         Row 2         Row 3         Row 4         Row 5         Row 6         Row 7         Row 8           d         150         120		imber				-				
Length of Steel Bars       750       mm         Slot Depth       163       mm         Slot Width       25       mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120				mm		-		50	mm	
Slot Depth       163 mm         Slot Width       25 mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120	Breadth		150	mm						
Slot Width       25 mm         Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120						-				
Tension Bars       Row 1       Row 2       Row 3       Row 4       Row 5       Row 6       Row 7       Row 8         d       150       120       <										
d       150       120         d-x       60.39959       30.39959204         EquivArea x       691536.7       348055.8699         Solve for Neutral Axis Depth x =       89.60041       mm         Qabove NA       1039593										
d-x       60.39959       30.39959204         EquivArea x       691536.7       348055.8699         Solve for Neutral Axis Depth       mm         Qabove NA       1039593				Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	
EquivArea x       48055.8699         Solve for Neutral Axis Depth       mm         Qabove NA       1039593										n
(d-x)       691536.7       348055.8699         Solve for Neutral Axis Depth       mm         x =       89.60041       mm         Qabove NA       1039593		60.39959	30.39959204							n
x = 89.60041 mm Qabove NA 1039593		691536.7	348055.8699							n
x = 89.60041 mm Qabove NA 1039593	Solve for Neutra	Axis Denth								
		-								
Qbelow NA 1039593										
	Qbelow NA		1039593							

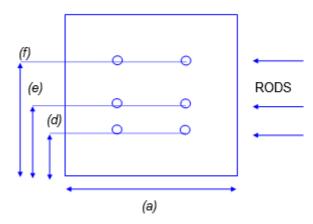
		Project		57 Uiah St	oot Earoban	2	Job Ref.	00502
		Section		57 High St	reet, Farehan	1	Sheet no./rev	90503
Davies Torres Design	Ltd	Beam Repair 2					011001110./101	. 12
Clarence House Church Street, Nailsworth		Calc. by Date Chk'd by Date					App'd by	Date
GL6 0BP	11	R	D	09/05/19				
Cracked Section Mome	ont of Inc	rtia						
105640127.7		itia						
105040127.7								
Stresses in Bars (Lowes	st Bars Fii	rst)						
Stress N/sqmm	73.3	36.9						
Force per row kN	29.5	14.8						
Actual Stresses from B	ending			7				
Timber Compression	enung	3.8	N/sqmm					
Tension Steel (Max)		73.3	N/sqmm					
Compression Steel		48.0	N/sqmm					
				_				
Tension Force		29.5	kN					
Tonsion por Par		14.7	kN					
Tension per Bar		14./	KIN					
						Allowable f	or C24	
Bond Stress into New 1	Timber		0.69	N/sqmr	n		N/sqmm	
	mber		0.69	N/sqmr	n	0.71	N/sqmm	

	Project				Job Ref.	
		57 High Str	eet, Fareham	1	19	90503
Davies Torres Design Ltd	Section		Sheet no./rev.			
		Beam	Repair 3			13
Clarence House Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

# **Beam Repair No3**

# TRS TYPE C, 6 SHEAR CONNECTORS, 2 SLOTS, CATEGORY +/-3mm





EXISTING TIMBER TO BE SLOTTED IN SITU

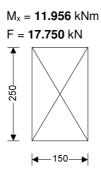


# Timber member design (BS5268) - Beam3

### TIMBER MEMBER DESIGN TO BS5268-2:2002

## Analysis results

Design moment in major axis; Design shear;



### Timber section details

Breadth of sections; Depth of sections; Number of sections in member; Overall breadth of member; Timber strength class; Member details

Service class of timber; Load duration; b = 150 mm h = 250 mm N = 1  $b_b = N \times b = 150 \text{ mm}$ C24

1 Long term TEDDS calculation version 1.7.01

F	Project				Job Ref.				
		57 High St	reet, Farehar	n	1	90503			
Davies Torres Design Ltd	Section				Sheet no./rev	Sheet no./rev.			
Clarence House		Beam	Repair 3			14			
	Calc. by	Date	Chk'd by	Date	App'd by	Date			
GL6 0BP	RD	09/05/19							
					•				
Section properties				0					
Cross sectional area of member;		-	× h = <b>37500</b>						
Section modulus;			$\times$ h <sup>2</sup> / 6 = <b>15</b>						
			$(1 \times b)^2 / 6 = 9$						
Second moment of area;				<b>95312500</b> mm <sup>4</sup>					
		•	$I_y = h \times (N \times b)^3 / 12 = 70312500 \text{ mm}^4$						
Radius of gyration;		$i_x = \sqrt{(I_x / A)} = 72.2 \text{ mm}$							
		$i_y = \sqrt{(I_y / A)}$	$i_y = \sqrt{(I_y / A)} = 43.3 \text{ mm}$						
Modification factors									
Duration of loading - Table 17;		K <sub>3</sub> = <b>1.00</b>							
Total depth of member - cl.2.10.6	K7 = (300	K <sub>7</sub> = (300 mm / h) <sup>0.11</sup> = <b>1.02</b>							
Load sharing - cl.2.9;		K <sub>8</sub> = <b>1.00</b>	K <sub>8</sub> = <b>1.00</b>						
Lateral support - cl.2.10.8									
No lateral support									
Permissible depth-to-breadth ratio	o - Table 19	; 2.00							
Actual depth-to-breadth ratio;		h / (N × b) = <b>1.67</b>							
				PAS	S - Lateral supp	oort is adequa			
Bending parallel to grain									
Permissible bending stress;		$\sigma_{m}$ adm = $\sigma_{m}$	$m \times K_3 \times K_7 \times K_7$	≪K <sub>8</sub> = <b>7.652</b> N/m	1m <sup>2</sup>				
Applied bending stress;		$\sigma_{m a} = M_x / Z_x = 7.652 \text{ N/mm}^2$							
rr,		—	adm = 1.000						
				tress is less th	an permissible	bending stre			
Shear parallel to grain		<i>,</i> -,				3			
Permissible shear stress:		<b>T</b> + - <b>T</b> ×	Ka v Ka - 0 7	<b>10</b> N/mm <sup>2</sup>					
,		$\tau_{adm} = \tau \times K_3 \times K_8 = 0.710 \text{ N/mm}^2$ $\tau_a = 3 \times F / (2 \times A) = 0.710 \text{ N/mm}^2$							
Applied shear stress;									
		$\tau_a / \tau_{adm} =$							
		PASS - A	ppiled shea	r stress is less	than permissil	bie snear stre			

	Project	57 High Str	eet, Fareham		Job Ref. 190	0503	
Davies Torres Design Ltd	Section	_			Sheet no./rev.		
Clarence House		Beam Repair 3			15		
Church Street, Nailsworth GL6 0BP	Calc. by RD	Date 09/05/19	Chk'd by	Date	App'd by	Date	
Resin Repair Be	am 3						
Esteel	205000	N/sqmm					
Etimber	7200	N/sqmm					
Modular Ratio	28.5						
Tension Steel			Compre	ession Steel			
No of Bars per layer	2		No of E		2		
Diameter	16	mm	Diamet		16	mm	
Total Area per layer	402.1	sqmm	Total A		402.1	sqmm	
Equivalent Area	11449.4	sqmm	Equival	lent Area	11047.2	sqmm	
Bending Moment	4.5	kNm					
Dimensions of Timber			Depth	to Steel			
Depth	250	mm	Compr	ession	50	mm	
Breadth	150	mm	Tensio	n			
			-	of Steel Bars	825	mm	
			Slot De		213	mm	
			Slot Wi	dth	25	mm	
Tension Bars Row 1 R d 200	low 2 170	Row 3 Roy	w 4 Row 5	Row 6	Row 7	Row 8	
	57.0971345						
EquivArea x	57.0571345						
-	53725.6417						
Solve for Neutral Axis Depth							
-	nm						
Qabove NA	1650932						
Qbelow NA	1650932						

		Project 57 High Street, Fareham				-	Job Ref.	00502
		Section		or high St	eei, raienan	I	T Sheet no./rev	90503
Davies Torres Design	Ltd	200000		Beam	Repair 3		511002 110./164	16
Clarence House	th	Calc. by	[	Date	Chk'd by	Date	App'd by	Date
Church Street, Nailswort GL6 0BP	.n	RI	D	09/05/19				
Cracked Section Mome 239850025		rtia						
239850025	mm^4							
Stresses in Bars (Lowes	st Bars Fir	rst)						
Stress N/sqmm		30.5						
Force per row kN	18.7	12.3						
Actual Stresses from B	ending		• • •					
Timber Compression			N/sqm					
Tension Steel (Max)		46.5	N/sqm					
Compression Steel		33.6	N/sqm	im				
Tension Force		18.7	kN					
		-						
Tension per Bar		9.4	kN					
						Allowable for		
Bond Stress into New <sup>-</sup> Bond Stress into Old Ti				40 N/sqmr			N/sqmm	
	mber		0.4	40 N/sqmr	n	0.71	N/sqmm	

	Project				Job Ref.	
		57 High Stre	eet, Fareham		190	503
Davies Torres Design Ltd	Section				Sheet no./rev.	
Clarence House		Арр	pendix			17
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

# Appendix

Resin Design Methodology

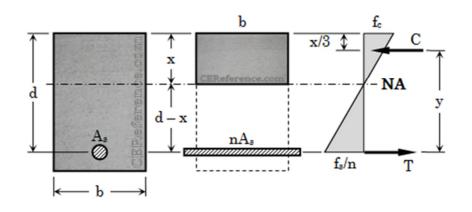
Resin Repair proposals

Resin Data Sheet

	Project				Job Ref.	
		57 High Str	190503			
Davies Torres Design Ltd	Section		Sheet no./rev.			
Clarence House		App	pendix			18
Church Street, Nailsworth	Calc. by	Date	Chk'd by	Date	App'd by	Date
GL6 0BP	RD	09/05/19				

## **Transformed Section Method**

Convert steel area to equivalent concrete area by multiplying  $A_s$  with modular ratio, n.



Location of the neutral axis from extreme compression fiber

Singly reinforced:  $\frac{1}{2}bx^2 = nA_s(d-x)$ Doubly reinforced:  $\frac{1}{2}bx^2 + (2n-1)A'_s(x-d') = nA_s(d-x)$ Cracked section moment of inertia ( $I_{NA} = I_{CT}$ ) Singly reinforced:  $I_{NA} = \frac{bx^3}{3} + nA_s(d-x)^2$ Doubly reinforced:  $I_{NA} = \frac{bx^3}{3} + (2n-1)A'_s(x-d')^2 + nA_s(d-x)^2$ 

Actual stresses (calculate using Flexure Formula)

Concrete  

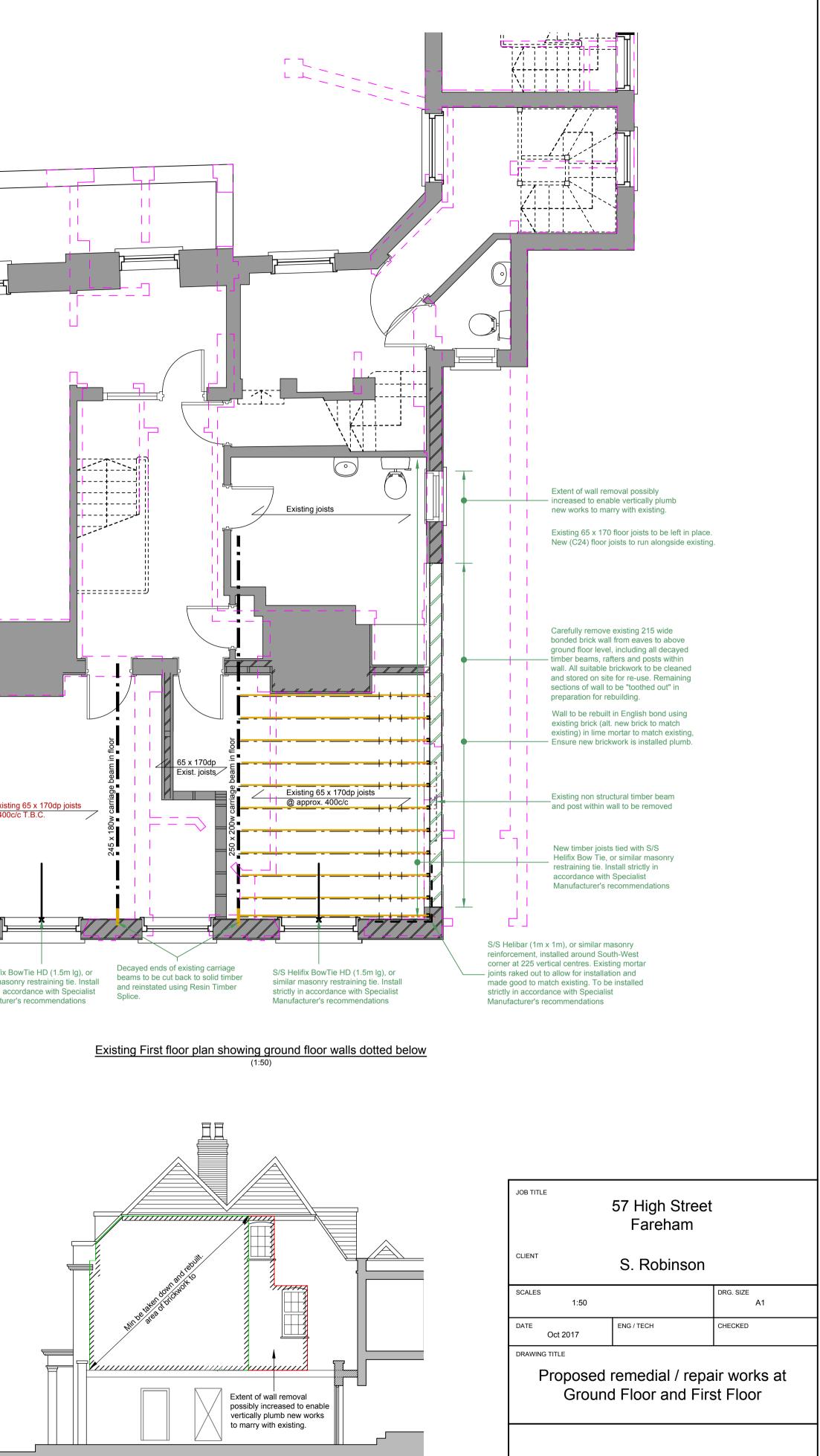
$$f_c = \frac{Mx}{I_{NA}}$$
  
Tension steel  
 $\frac{f_s}{n} = \frac{M(d-x)}{I_{NA}}$   
Compression steel for doubly reinforced  
 $f'_s = M(x-d')$ 

 $I_{NA}$ 

 $\frac{2n}{2}$ 



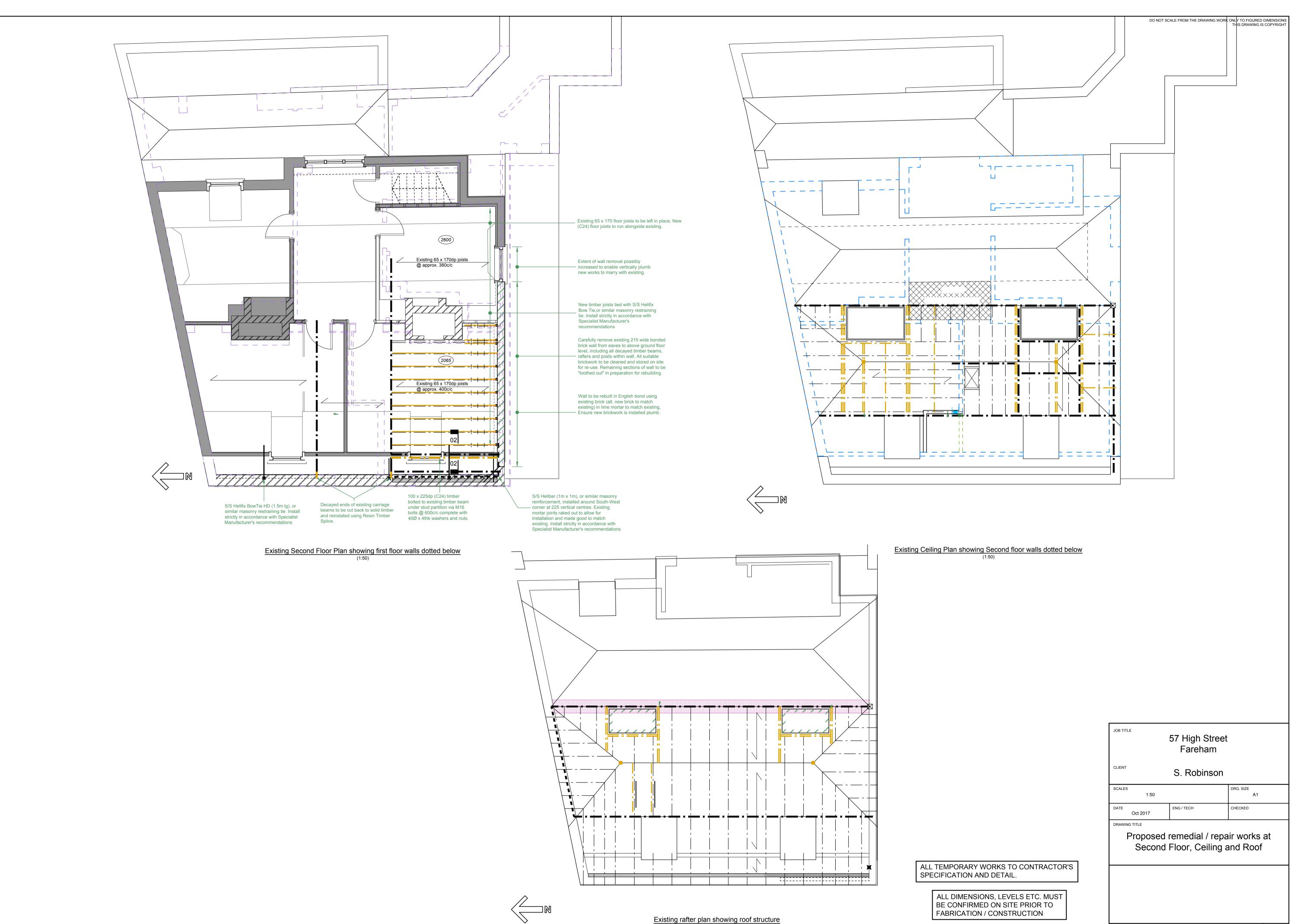
Floor Joist Splice - Plan



South Elevation Extent of Masonry to be Rebuilt Scale 1:100

DRAWING No.	

3602 / 0.3



(1:50)

WORKS TO CONTRACTOR'S	
AND DETAIL.	

IONS, LEVELS ETC. MUS
IED ON SITE PRIOR TO
N / CONSTRUCTION

DRAWING No.	

9<sup>th</sup> February 2019

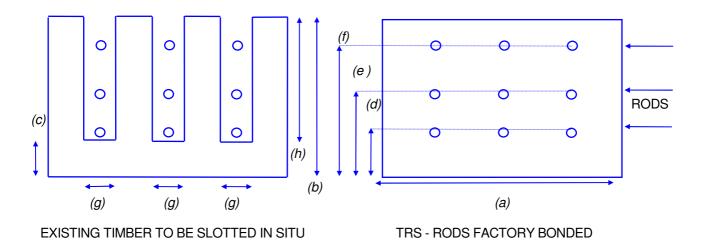
# 57 HIGH STREET FAREHAM HAMPSHIRE PO16 7BG

## <u>Remedial/Repair works to southern elevation</u> external wall, 1<sup>st</sup> floor and 2<sup>nd</sup> floor.

# **PROPOSED SEQUENCE OF WORKS**

- 1. At 1st and 2nd Floor level South Elevation Prop existing ceiling joists and carriage beams at West Elevation with Acrow Props. All propping must be taken down to basement level (i.e. not supported on upper floors).
- 2. At 1st Floor Level Introduce new C24 ceiling Joists adjacent existing. Removing rotten timber wall plate and replacing with brick and mortar, matching original (as analyzed by The Lime Centre). Existing ceiling joists to remain in situ.
- 3. At 1st and 2nd Floor level, HeliBar SS or similar masonry reinforcement to be installed around South-west corner at 225mm vertical centres.
- 4. 1st floor carriage beam bearings into 330mm solid brickwork wall (West elevation) have decayed. Cut back carriage beams to sound timber.
- 5. Timber resin splice to be joined to end of carriage beams and sat on masonry bed in front (West) elevation wall.
- 6. At 1st floor level, West Elevation, Helifix Bow Tie HD or similar masonry tie inserted through brickwork into first two parallel joists, masonry end to be resin grouted in place.
- 7. At 1st Floor level, South Elevation, Helifix Bow Tie or similar masonry tie inserted through brickwork into perpendicular joists, masonry end to be resin grouted in place.
- 8. At 1st Floor level, West Elevation, Helifix Bow Tie HD or similar masonry tie inserted through brickwork into carriage beams, masonry end to be resin grouted in place.

- 9. At 2nd Floor Level Introduce new C24 ceiling joists adjacent existing. Removing rotten timber wall plate and replacing with brick and mortar, matching original surruounding (as analyzed by The Lime Centre). Existing ceiling joists to remain in situ.
- 10. At 2nd Floor level, West Elevation, Helifix Bow Tie HD or similar masonry tie inserted through brickwork into first two parallel joists, masonry end to be resin grouted in place.
- 11. At 2nd Floor level, West Elevation, Helifix Bow Tie HD or similar masonry tie inserted through brickwork into carriage beams, masonry end to be resin grouted in place.
- 12. Provide weather tight cover at high level over south elevation scaffold, down to neighbour's roof/party wall and to cover gap between properties full height of front elevation.
- 13. Carefully remove 215mm South wall from eaves level to ground floor along with decayed timber beams and posts within solid wall.
- 14. All suitable brickwork is to be cleaned off and stored on site to be reused. Any additional bricks required must match existing
- 15. Existing mortar has been analysed by the Lime Centre, Winchester and matched for new works.
- 16. "Tooth out" existing masonry at each end of the remaining sections of wall.
- 17. Rebuild South elevation wall between remaining masonry in English bonded brickwork and ensure new masonry is now plumb.
- 18. During the construction of the South elevation wall, at 2nd Floor level, Helifix Bow Tie or similar masonry tie inserted through rebuilt brickwork into perpendicular joists, masonry end to be resin grouted in place.



# TRS TYPE C, 9 SHEAR CONNECTORS, 3 SLOTS, CATEGORY +/-3mm



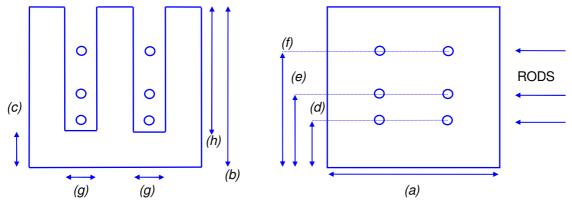
BEAM REFERENCE NO. 1	NO. TO REPAIR 2
DIMENSIONS (NOT TO SCALE)	
WIDTH (mm) (a)	250
DEPTH (mm) (b)	200
OVERALL LENGTH (mm)	600
BASE THICKNESS (mm) (c)	37
SHEAR CONNECTOR (ROD) CENTRES (mm) (d/e/f)	50/80/150
SHEAR CONNECTORS (RODS)	
LENGTH OVERALL (mm) (50:50 EXISTING/TRS)	700
DIAMETER (mm)	16
NUMBER	9
MATERIAL	HT/BZP/STEEL
SLOTS (DO NOT SCALE FROM SKETCH)	
NUMBER	3
WIDTH (mm) (g) (MAX. FOR RESIN VOLUME ALLOWED)	25
DEPTH (mm) (h) (MAX. FOR RESIN VOLUME ALLOWED)	163

SCHEMATIC ONLY - NOT TO SCALE

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ALL PROPOSALS TO BE VERIFIED BY A STRUCTURAL ENGINEER

TRS TYPE C, 6 SHEAR CONNECTORS, 2 SLOTS, CATEGORY +/-3mm



EXISTING TIMBER TO BE SLOTTED IN SITU

TRS - RODS FACTORY BONDED

**CONTACT -** Steve Robinson



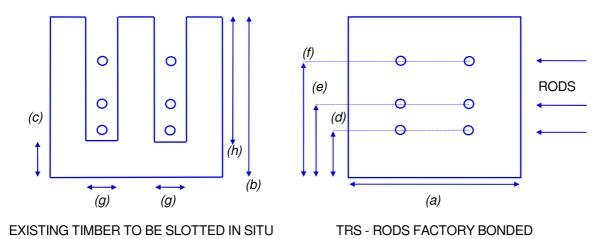
<b>BEAM REFERENCE NO.</b> 2	NO. TO REPAIR 1
DIMENSIONS (NOT TO SCALE)	
WIDTH (mm) (a)	150
DEPTH (mm) (b)	200
OVERALL LENGTH (mm)	600
BASE THICKNESS (mm) (c)	37
SHEAR CONNECTOR (ROD) CENTRES (mm) (d/e/f)	50/80/150
SHEAR CONNECTORS (RODS)	
LENGTH OVERALL (mm) (50:50 EXISTING/TRS)	600
DIAMETER (mm)	16
NUMBER	6
MATERIAL	HT/BZP/STEEL
SLOTS (DO NOT SCALE FROM SKETCH)	
NUMBER	2
WIDTH (mm) (g) (MAX. FOR RESIN VOLUME ALLOWED)	25
DEPTH (mm) (h) (MAX. FOR RESIN VOLUME ALLOWED)	163

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ALL PROPOSALS TO BE VERIFIED BY A STRUCTURAL ENGINEER

TRS TYPE C, 6 SHEAR CONNECTORS, 2 SLOTS, CATEGORY +/-3mm



**CONTACT -** Steve Robinson



BEAM REFERENCE NO. 3	NO. TO REPAIR 1
DIMENSIONS (NOT TO SCALE)	
WIDTH (mm) (a)	150
DEPTH (mm) (b)	250
OVERALL LENGTH (mm)	600
BASE THICKNESS (mm) (c)	37
SHEAR CONNECTOR (ROD) CENTRES (mm) (d/e/f)	50/80/200
SHEAR CONNECTORS (RODS)	
LENGTH OVERALL (mm) (50:50 EXISTING/TRS)	825
DIAMETER (mm)	16
NUMBER	6
MATERIAL	HT/BZP/STEEL
SLOTS (DO NOT SCALE FROM SKETCH)	
NUMBER	2
WIDTH (mm) (g) (MAX. FOR RESIN VOLUME ALLOWED)	25
DEPTH (mm) (h) (MAX. FOR RESIN VOLUME ALLOWED)	213

SCHEMATIC ONLY - NOT TO SCALE

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ALL PROPOSALS TO BE VERIFIED BY A STRUCTURAL ENGINEER

# THIXOTROPIC EPOXY RESIN

An Ultra Low Disturbance Building Solution

# DESCRIPTION

THIXOTROPIC EPOXY RESIN is a two part, nonslump gel adhesive, designed to bond materials together or to inject into cracks, fissures and holes. THIXOTROPIC EPOXY RESIN can be injected from a standard 400cc cartridge or applied directly from the mixing pot in a film as thin as 0.2mm. THIXOTROPIC EPOXY RESIN does not contain solvent or water, so can be applied to difficult substrates.

# TYPICAL USES

For bonding timber, stone and metal and for injecting into cracks and holes in timber and masonry. For bonding dowels into timber and masonry. For laminating timbers and repairing Glulam beams. Suitable for high humidity environments.

## **PREPARATION & METHOD**

Cut out all rotted, loose or flaking material and vacuum to remove dust. Abrade or grind as necessary to provide clean, stable surfaces free of all contaminants.

Mix the two components thoroughly with a stiff, square edged pallet knife until the two colours blend into an even colour.

Approximate spreading 'open' time is 5 - 10 minutes at 15 - 20 degrees centigrade, initial set in 1 - 2 hours. Initial cure minimum 12 hours, full cure 5 -7 days.

Either apply the adhesive to both surfaces to be bonded, or dispense into a cartridge kit for injection.

Ensure that the temperature is above 5 degrees Centigrade, or pre-warm the materials, otherwise curing may be delayed or prevented.

## THIXOTROPIC EPOXY RESIN INJECTION & LAMINATING 400cc & 1000cc



Property Repair Systems 01626 331351

## **Features**

- Adhesion greater than the cohesive strength of timber
- Solvent and water free
- Impermeable to vapour
- Working pot life: 5 10 minutes at 15 20 C.
- Set time: 1 2 hours initial at 15 – 20 degrees C, 5 - 7 days full cure.

# TECHNICAL DATA

Active Substance Bisphenol A/F epoxy & Aliphatic Amines **Other Components** Glycidyl ether and inert fillers Mix ratio - Do not vary the mix ratio - 2:1 2 measures of Base to 1 measure of Activator Bond Strength/Tensile Shear Adhesion - $6 \text{ N/mm}^2$ Compressive Strength - 30 N/mm<sup>2</sup> Tensile Strength - 16 N/mm<sup>2</sup> Flexural Strength - 20 N/mm<sup>2</sup> Flexural Modulus - 503 N/mm<sup>2</sup> Young's Modulus >370 N/mm<sup>2</sup> Aggressivity to other materials No known aggressivity Classification Irritant and corrosive Packaging Optional 400cc cartridge, skeleton guns Colour Blue/Cream – Mixed = Off White

Property Repair Systems - 01626 331351 Unit 3, Olympus Business Park, TQ12 2SN DCM – 08/18