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Structural Calculations

Project Title	Project Ref
Sonning Cricket Club Pavilion Pound Lane Sonning Berks RG4 6XE	22-079

Document	Revision			
Structural Calculations	A			
	11			
	06			
	24			
Issued to	e			
Enza Architects	e			
Client	e			
Purpose of Issue	C			

P = Preliminary, C = Construction, A = Approval, CT = Comment, T = Tender, I = Information, R = Record
e = e-mail issue, d = CD or DVD issue (e.g. 3/e denotes 3 paper copies + e-mail)


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Project Title SONNINA PAULION		Job Ref 22-079	
Part of structure LOADING		Calc sheet no. 01	Revision A
Drawing Ref	Calc by MM	Date 06/24	Checked by Date

Ref	Calculations	Output
	<u>LOADING</u>	
	<u>Roof (39)</u>	
	Single Ply 0.1	
	OSB 0.1	
	Battens 0.05	
	Rafters 0.15	
	$0.4 \div \cos 39 = 0.51$	0.72
	$\frac{60-39}{30} \times 0.75 = 0.53$	0.84
		<u>1.04 kN/m²</u>
		<u>1.56 kN/m²</u>
	<u>Flat Roof</u>	
	Single Ply 0.1	
	OSB 0.1	
	Kirriings 0.05	
	Joists 0.15	
	Insulation 0.05	
	Pbd & skin 0.2	
		<u>0.65</u>
		0.91
	Snow 0.75	1.2
		<u>1.4 kN/m²</u>
		<u>2.11 kN/m²</u>
	<u>Ext wall</u>	
	Block 1.5	
	Render / plaster 0.25	
		<u>1.75 kN/m²</u>
		2.45 kN/m ²

	Project Title Sonning CC Pavilion			Job Ref 22-079	
	Part of structure Roof			Calc sheet no. 02	Revision A
	Drawing Ref	Calc by MM	Date 06/24	Checked by	Date

Timber Flat Roof Joist Design

Design Criteria

Design Span	3.70 m		
Usage	Flat Roof (no access)		
Dead Load g_k	0.65 kN/m ²	Imposed Load w	0.30 kN/m
Imposed Load q_k	0.75 kN/m ²	Imposed Load Q_k	0.9 kN
Joist Centres	400 mm	Dead Load w	0.26 kN/m

Loadcase 1

Dead & Live Load UDL

Total End Reaction R	1.04 kN
Maximum Moment M	0.96 kNm
Total UDL w	0.56 kN/m

Loadcase 2

DL UDL + Q_k Point Load

Max. End Reaction R	1.38 kN
Maximum Moment M	1.28 kNm
Total Equivalent UDL w	0.75 kN/m

Member Design

Timber Grade	C24
Grade Stress σ	7.50 N/mm ²
Design Stress σ_{adm}	10.31 N/mm ²
Grade E_{mean}	10800 N/mm ²
Design $E_{mean,adm}$	10800 N/mm ²

K Factors

K_2 (service class 3)	1.0
K_3 (load duration)	1.25
K_8 (load sharing systems)	1.1

Breadth	47 mm
Depth	170 mm

Section Modulus Z_{xx}	2.26E+05 mm ³
Second Moment of Area I_{xx}	1.92E+07 mm ⁴

Stress σ_{ma}	5.64 N/mm ²	55 % capacity
Deflection δ	8.8 mm	Span x 0.003 = 11.1 mm


DL Reaction as UDL	1.20 kN/m
LL Reaction as UDL	1.39 kN/m

Provide 47w x 170d C24 joists @ 400mm centres



Project Title SODNINK PAVILION		Job Ref 22-079
Part of structure BEAMS / LINTELS		Calc sheet no. Revision 05 A
Drawing Ref	Calc by MM	Date 06/24
Checked by	Date	

Ref	Calculations	Output
B1-1	span = 2.7m	
Loading	Roof (39) $1.04 \times 1.3/2 = 0.7$ Flat Roof $1.4 \times 3.7/2 = 2.6$ 3.3 kN/m	
	Refer to calc sheet p. 04	
	<u>PROVIDE DOUBLE 47x170 C24 TIMBER AS B1-1 TO B1-4</u>	
	* Beams to span between existing walls of truss support posts	
	<u>Lintels</u>	
L1-4	span = 1.3m	
Loading	Flat Roof $1.4 \times 3.7/2 = 2.6$ Ext wall $2 \times 1.75 \times 0.4 = 1.4$ $4.0 \times 1.3 = 5.2 \text{ kN}$	
	Try 1G L1/S 150 SWL = 13 kN OK	
	By inspection ok for all other openings in new cavity walls	
	<u>PROVIDE 1G L1/S 150 AS L1-1 TO L1-5</u>	

	Project Title		Sonning CC Pavilion		Job Ref	22-079	
	Part of structure		Roof		Calc sheet no.	Revision	
	Drawing Ref		Calc by	Date	Checked by	Date	
			MM	06/24		04	A

TIMBER BEAM DESIGN

Design Criteria

Design Span	2.70	m
Angle of Incline	0	°

Loadcase 1

Dead & Live UDL

Load w	3.30	kN/m
End Reaction R	4.46	kN
Load w _x	3.30	kN/m
Maximum Moment M _x	3.01	kNm

Member Criteria

Timber Grade	C24
Grade Stress σ	7.50 N/mm ²
Design Stress σ_{adm}	10.31 N/mm ²
Grade E _{min}	7200 N/mm ²
Design E _{min,adm}	8208 N/mm ²

K Factors

K ₂ (service class 3)	1.0
K ₃ (load duration)	1.25
K ₈ (load sharing systems)	1.1
K ₉ (multiple members)	1.14

Member Design

Member Quantity	2	No.	Section Modulus Z _{xx}	4.53E+05	mm ³
Breadth	47	mm	Second Moment of Area I _{xx}	3.85E+07	mm ⁴
Depth	170	mm			

Stress σ_{ma}	6.64	N/mm ²	64 % capacity
Bending Deflection $\delta_{M,x}$	7.2	mm	

Total Deflection δ_{\perp}	7.2	mm	Span x 0.003 = 8.1 mm
End Reaction R	4.46	kN	

Provide 2No. 47w x 170d C24