LOADS USED	KN/m2	ALL CALCS.
FLOOR / FLAT ROOF	2.0	
DORMER CHEEK / FACE	1.0	
DWARF WALL	1.0	
PARTITIONS	0.3	
SLOPING ROOF	1.5	

DESCRIPTION LINTEL OVER EXTENSION DOORS SPAN 3.4M

		LOAD NAME	LOADING W1	START x 1	LOADING W2	END x 2	R1 COMP	R2 COMP
U	T	D W	0.5	0		L	0.85	0.85
U	T	ROOF	20x3.73/2	0		L	6.34	6.34
						TOTAL	7.19	7.19

MAXIMUM B.M. = 6.11 kNm AT 1.70 m FROM R1
MAXIMUM S.F. = 7.19 kN AT R1
TOTAL DEFLECTION = 7.36 X 1e8/E1 AT 1.70 m FROM R1
Steel calculations to BS449 part 2 using grade 43 (S275) steel
SECTION SIZE : 152 X 89 X 16 UB GRADE 43
D = 152.4 mm B = 88.7 mm t = 4.5 mm T = 7.7 mm
Ix = 834 cm^4 ry = 2.10 cm Zx = 109 cm^3
Le = 1.2L = 4.08 M Le/ry = 4.08x100/2.1 = 194 D/T = 19.8
PERMISSIBLE BENDING STRESS Pbc = 84.2 N/mm^2 (TABLE 3a)
ACTUAL BENDING STRSS Fbc = 6.11 x 1000 / 109.0 = 56.1 N/mm^2 O.K
MAXIMUM SHEAR IN WEB fs = 7.19 x 1000/(4.5 x 152.4) = 10.5 N/mm O.K
CHECK UNSTIFFENED WEB CAPACITIES WITH LOADS OF 7.19 kN AND kN
BEARING: Pb = 210 N/mm^2 (table 9); C1 = 25.0 kN; C2 = 0.945 kN/mm
BUCKLING; Pc = 146 N/mm^2 (table 17a); C1 = 50.1 kN; C2 = 0.657 kN/mm
R1 : UNSTIFFENED WEB BEARING CAPACITY, Pw = 25.0 kN: NO MIN STIFF BEARING LENGTH REQUIRED
R2 : DITTO.
TOTAL DEFLECTION = 7.36 x1e8/205,000 x 834 = 43 mm (U 790) O.K
COMBINED BENDING AND SHEAR CHECK (14.c): $(fbc/Pbc)^2 + (fs/Ps)^2$ = 0.443 at 1.70 m. (<= 1.25 O.K)
BEARING DETAILS (bearing plate sizing to BS5950 : 2000)
152 x 89 x 16 UB STIFF BEARING LENGTH, b1 = t + 1.6r + 2T = 32.1 mm
FACTOR REACTIONS BY 1.55 (user selected value)
LOCAL DESIGN STRENGTH OF MASONARY (FACTORED) = 0.70 N/mm^2 (user entered value)
R1 (7.19 kN UNFACTORED): mm M.S. BEARING PLATE, SIZE X mm BEARING PLATES NOT REQD.
FACTORED STRESS UNDER PLATE = X X / X = N/mm
REQUIRED PLATE THICKNESS = (X X X) = mm: use mm
FACTORED BENDING STRESS IN PLATE = X X (/)/(X /) = N/mm (Py = N/mm)
R2 (kN UNFACTORED): mm M.S BEARING PLATE, SIZE X mm
FACTORED STRESS UNDER PLATE = X X / X = N/mm
REQUIRED PLATE THICKNESS = (X X X /) = mm : use mm
FACTORED BENDING STRESS IN PLATE = X X (/)/(X /) = N/mm (Py = N/mm)

- 9 MAR 2020

SUPPORT BRACKETS

CALCULATION - (SUPERBEAM 4)

USE -

152x89x16UB GR 43
TACKWELDED TO 340 x 8mm THK
MILD STEEL PLATE
SEE DRAWING SHEET 5.

(STEEL BEAM [redacted] / WITHOUT M.S BEARING PLATES)

EXTENSION CALCULATIONS
46 GROVE ROAD, RAYLEIGH
ESSEX. SS6 8HN

CALC NO. 21325
SHEET 1

DESCRIPTION - ROOF RAFTERS SPAN 3.73M

		LOAD NAME	LOADING W1	START x 1	LOADING W2	END x 2	R1 COMP	R2 COMP
UT		ROOF	2.0X0.4	0		L	1.49	1.49

- 9 APR 2020

SUPPORT SERVICES

MAXIMUM B.M. = 1.39 kNm AT 1.87 m FROM R1

MAXIMUM S.F. = 1.49 kN AT R1

TOTAL DEFLECTION = 2.02 X 1e8/E1 AT 1.87 m FROM R1

Timber beam calculations to BS5268 Part 2 : 2002 using C24 timber

USE 47 X 170 C24

z = 226.4 cm^3 I = 1924 cm^4

TIMBER GRADE : C24 LOAD SHARING SYSTEM: K_6 = 1.1

K_3 (LOADING DURATION FACTOR) = 1.0 K_7 (DEPTH FACTOR) = 1.064 K_6 (LOAD SHARING FACTOR) = 1.1

E.= 10800 N/mm^2 (Emean)

PERMISSIBLE BENDING STRESS =7.5 X 1.0 X1.064 X 1.1 =8.78 N/mm^2

APPLIED BENDING STRESS, = 1.39 X 1000/226.4 = 6.15 N/mm^2 O.K

PERMISSIBLE SHEAR STRESS, =0.71 X 1.0 X 1.1 = 0.78 N/mm^2

APPLIED SHEAR STRESS, =1.49 X1000 X 3/2 X47 X170 =0.28 N/mm^2 O.K

BENDING DEFLECTION = 2.02 X 1e8/10800 X1924 = 9.7 mm

MID-SPAN SHEAR DEFLECTION = 1.2 X 1.39 X 1e6/ ((E/16) X47 X170) = 0.31 mm

TOTAL DEFLECTION = 9.70 +0.31 =10.01 mm (0.0027L) <= 0.003 L O.K

CALCULATION - (FROM S/BEAM 4)

USE -

47 x 170 C24

AT 400 CENTRES

(TIMBER BEAMS LOAD SHARING SYSTEM)

CALC NO. 21325

SHEET 2

LOADS USED	KN/m2	ALL CALCS.
FLOOR / FLAT ROOF	2.0	
DORMER CHEEK / FACE	1.0	
DWARF WALL	1.0	
PARTITIONS	0.3	
SLOPING ROOF	1.5	
REAR WALL	5.6	

DESCRIPTION HOUSE REAR WALL BEAM — SPAN 5.0M

		LOAD NAME	LOADING W1	START x 1	LOADING W2	END x 2	R1 COMP	R2 COMP
U	T	OW	0.5	0		L	1.25	1.25
U	T	ROOF (EXT)	2.0x3.73/2	0		L	9.32	9.32
U	T	REAR WALL	5.6x2.42	0		L	33.88	33.88
U	T	FIRST FLOOR HOUSE	2.0x3.57/2	0		L	8.93	8.93
V	T	WALL ABOVE WINDOWS	0	0	5.6x1.3	2.5	6.07	3.03
V	T	" " "	5.6x1.3	2.5		L	3.03	6.07
						TOTAL	62.48	62.48

MAXIMUM B.M. = 81.9 kNm AT 2.5 m FROM R1
MAXIMUM S.F. = 62.5 kN AT R1
TOTAL DEFLECTION = 211.7 X 1e8/E1 AT 2.5 m FROM R1
Steel calculations to BS449 part 2 using grade 43 (S275) steel
SECTION SIZE : 203 x 203 x 71 UC GRADE 43
D = 215.8 mm B = 206.4 mm t = 10.0 mm T = 17.7 mm
Ix = 7,620 cm^4 ry = 5.3 cm Zx = 706 cm^3
Le = 1.2L = 6.0 M Le/ry = 6.0x100/5.3 = 113 D/T = 12.5
PERMISSIBLE BENDING STRESS Pbc = 145.2 N/mm^2 (TABLE 3a)
ACTUAL BENDING STRSS Fbc = 81.89x1000/706.0 = 116.0 N/mm^2 O.K
MAXIMUM SHEAR IN WEB fs = 62.48x1000/(10x215.8) = 29.0 N/mm^2 O.K
CHECK UNSTIFFENED WEB CAPACITIES WITH LOADS OF 62.48 kN AND kN
BEARING: Pb = 210 N/mm^2 (table 9); C1 = 100 kN; C2 = 2.10 kN/mm
BUCKLING; Pc = 155 N/mm^2 (table 17a); C1 = 167 kN; C2 = 1.55 kN/mm
R1 : UNSTIFFENED WEB BEARING CAPACITY, Pw = 100 kN: NO MIN STIFF BEARING LENGTH REQUIRED
R2 : DITTO.
TOTAL DEFLECTION = 212 x 1e8/205,000 x 7,620 = 13.5 mm (L/369) O.K
COMBINED BENDING AND SHEAR CHECK (14.c): $(fbc/Pbc)^2 + (fs/Ps)^2$ = 0.639 at 2.5 m. (<= 1.25 O.K)
BEARING DETAILS (bearing plate sizing to BS5950 : 2000)
203 x 203 x 71 UC STIFF BEARING LENGTH, b1 = t + 1.6r + 2T = 60.9 mm
FACTOR REACTIONS BY 1.55 (user selected value)
LOCAL DESIGN STRENGTH OF MASONARY (FACTORED) = 1.83 N/mm^2 (user entered value) 7N/mm² SOLID CONCRETE BLOCKS
R1 (kN UNFACTORED): [redacted], SIZE 260 X 260 mm PILLAR - BOTH ENDS
FACTORED STRESS UNDER PLATE = X X / X = N/mm
REQUIRED PLATE THICKNESS = (X X X) = mm: use mm
FACTORED BENDING STRESS IN PLATE = X X (/) / (X /) = N/mm (Py = N/mm)
R2 (kN UNFACTORED): mm M.S BEARING PLATE, SIZE X mm
FACTORED STRESS UNDER PLATE = X X / X = N/mm
REQUIRED PLATE THICKNESS = (X X X /) = mm : use mm
FACTORED BENDING STRESS IN PLATE = X X (/) / (X /) = N/mm (Py = N/mm)

- 9 APR 2020
SUPPORT SERVICES

CALCULATION - (SUPERBEAM 4)
USE -
203 x 203 x 71 UC GR. 43

(STEEL BEAM [redacted] WITHOUT M.S BEARING PLATES)

CALC NO. 21325
SHEET 3