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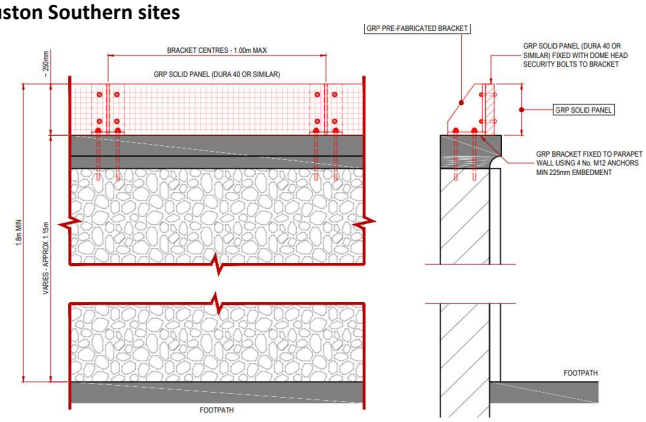
Euston Southern sites



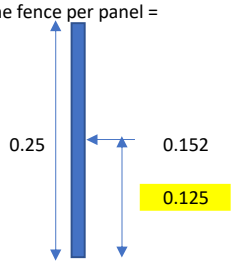
TYPICAL PARAPET ELEVATION TYPICAL PARAPET SECTION

Site Wind pressure

Distance from Sea	50	km
Site elevation	33	m
Structure height	2.4	m
Basic wind speed - Vb,0 =	21.7	m/s
Cdir	1	
Cseason =	1	
Altitude factor =	1.033	
Probability factor	1	
Wind speed Vb	22.4161	m/s
Exposure factor Ce(Z)	1.6	
Exposure correction Ce,T	0.82	
Basic velocity pressure qb = 1/2 . P . Vb^2	0.31	kN/m2
Peak velocity pressure qp(z) = Ce(z) . Ce,T . qb =	0.41	kN/m2

Pallisade fence post

Fence height =	0.25	m		
Fence panel width =	1	m		
Fence post =	200x150x12	UEA		
Dura panel thickness =	40	mm	(Say)	
Dura Panel width =	1000	mm	(say)	
Weight of 1m panel =	18.6	kg		
Wind area exposure =	100.0%		F.O.S	Factored (kN)
Wind load on the fence per panel =	0.101	kN	1.5	0.152



Base Forces

Fence post OTM =	0.019	kNm		
Shear =	0.152	kN		
Vertical =	1.0	kN	(Say)	
Base angle size =	200x100x12			
Grade	275	N/mm2		
Thickness =	12	mm		
length of angle =	120	mm		
Bending capacity of the angle =	1.07	kNm, OK		
Shear capacity =	213.84	kN, Ok		

200x100x12 angle

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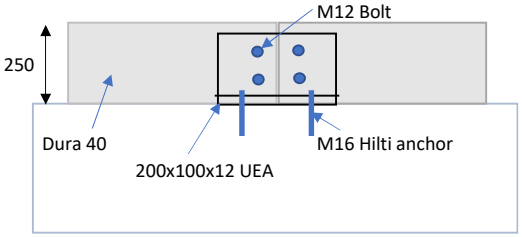
lateral load on the panel

Wind load per panel = 0.15 kN (Factored)

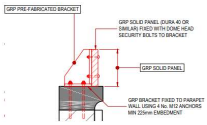
Nos. of support per panel = 2 nos. (Say)

Load per connection = 0.076 kN

use nominal size bolts per panel to fix the panel to the support member.



M16 Hilti Anchor at the top of Brick Wall.



Design tension and shear resistances – Pull-out failure of the anchor, brick breakout failure and local brick failure at edge distance (c ≥ c*) for single anchor applications

Load type	Anchor size		h_{ef} [mm]	f_b [N/mm²]	w/w and w/d Ta	w/w and w/d Tb	d/d Ta	d/d Tb
					Loads [kN]			
	SC2 – Solid clay brick Mz, NF (ETA data)							
$N_{Rd,p} = N_{Rd,b}$ (c ≥ 50 mm)	HIT-V, HAS-U	M8, M10, M12, M16	≥ 50	10	0,6 (0,6²)			
				20	0,8 (0,8²)			
	HIT-V, HAS-U HIT-V + HIT-SC HAS-U + HIT-SC	M8, M10, M12, M16 M8, M10, M12, M16 M8, M10, M12, M16	≥ 80	10	1,0 (1,2²)			
				20	1,4 (1,6²)			
$N_{Rd,p} = N_{Rd,b}$ (c ≥ 150 mm)	HIT-IC HIT-IC + HIT-SC	M8, M10, M12 M8, M10, M12	≥ 100	10	1,6 (1,8²)			
				20	2,2 (2,4²)			
$V_{Rd,b\perp}$ (c ≥ 50 mm)	HIT-V, HAS-U	M8, M10, M12, M16	≥ 50	10	1,2			
				20	1,8			
	HIT-V, HAS-U HIT-V + HIT-SC HAS-U + HIT-SC HIT-IC HIT-IC + HIT-SC	M8, M10, M12, M16 M8, M10, M12, M16 M8, M10, M12, M16 M8, M10, M12 M8, M10, M12	≥ 80	10	1,6			
				20	2,2			
$V_{Rd,b\perp}$ (c ≥ 1,5 h_{ef})	HIT-V, HAS-U	M8, M10, M12, M16	≥ 50	10	1,2			
				20	1,8			
	HIT-V, HAS-U HIT-V + HIT-SC HAS-U + HIT-SC HIT-IC HIT-IC + HIT-SC	M8, M10 M8, M10 M8, M10 M8 M8	≥ 80	10	2,0			
				20	2,8			
	HIT-V, HAS-U HIT-V + HIT-SC HAS-U + HIT-SC	M8, M10 M8, M10 M8, M10	≥ 100	10	3,2			
				20	4,4			
	HIT-V, HAS-U HIT-V + HIT-SC HAS-U + HIT-SC HIT-IC HIT-IC + HIT-SC	M12, M16 M12, M16 M12, M16 M10, M12 M10, M12	≥ 80	10	3,6			
				20	4,8			

Uplift load to the anchor = 0.38 kNm (OTM / 50mm)

From the above table (for the brick type noted), hef - Embedment depth

Tension capacity = 2.2 kN > 0.38kN, OK C - edge distance

Shear capacity = 2.2 kN > 0.152kN, OK

The the above solution is suitable

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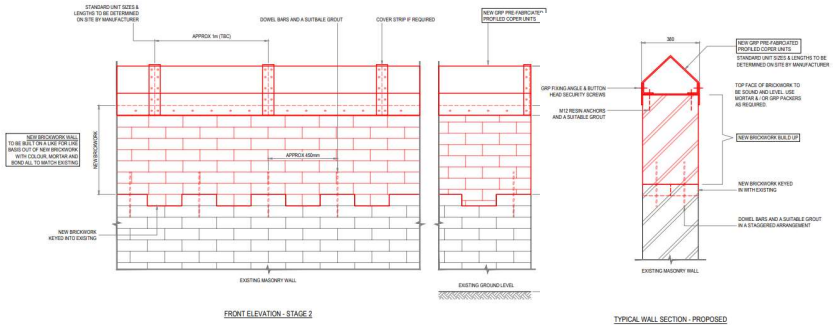
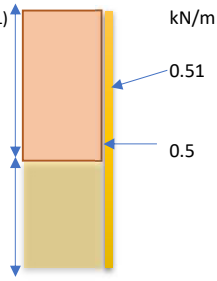


Forces and connection design at the joint

Total height of the wall	1.8	m	
Height of new Brick work (H)=	1.25	m	
Assume width of the wall =	1	m	
Wind load =	0.51	kN	
Lever arm (above joint)=	0.625	m	
Lateral load from pedestrian =	0.5	kN/m	
Lateral load applied at above joint	0.55	m (1.1m above GL)	kN/m width
OTM at the base of the wall	0.59	kNm	
Shear at the base of wall =	1.01	kN	
Thickness of the brick wall (T)=	380	mm	
height of existing brick wall = (Say)	0.55	m	



Shear Resistance - New proposed wall

Shear area (vertical plane) of the wall (H x T)=	475000	mm2
Shear stress (vertical plane) in the wall =	0.0021	N/mm2

Shear strength of masonry Fvk = fvk0 + 0.4σd < = 0.045fb

Assume σd = "0" since no load perpendicular to the shear plane.

Table 3 — Therefore Shear strength = Fvk0 = 0.15 > 0.0021N/mm2, OK

Dowel bar - Shear and Moment at the bottom of the new brick work (top of existing wall)

OTM at the base of new brick work =	0.59	kNm	
Shear at the base of new brick work =	1.01	kN	
Spacing between dowel bars =	150	mm (Say)	
Weight of new brick work =	9.98	kN	(Assumed brick density as 21kN/m3)
Tension in the dowel bars =	-1.06	kN	(No tension in the brickwork)

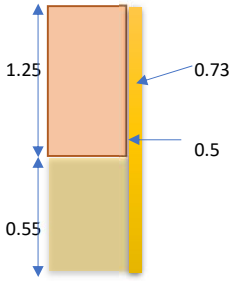
Tension =(OTM/spacing
wt of half width brick

No dowel bars are required.

However, use 2 x M12 dowel bars @ 450mm spacing for crack control in the joint.

Forces and capacity of full height wall.

Total height of the wall (H)=	1.8	m	
Assume width of the wall (W)=	1	m	
Thickness of the brick wall (T)=	380	mm	kN/m width
Wind load =	0.73	kN	
Lever arm =	0.9	m	
Lateral load from pedestrian =	0.5	kN/m	
Lateral load applied at	1.1	m	
OTM at the base of the wall	1.207	kNm	
Shear at the base of wall =	1.23	kN	



Shear Resistance - overall height of the wall

Shear area of the wall (W x T)=	380000	mm2
Shear stress in the wall =	0.0032	N/mm2

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Shear and moment resistance calculated from - **How to design masonry structures using Eurocode 6, Chapter 3. Lateral resistance**
By Eur Ing, Prof. J J Roberts BSc(Eng), PhD, CEng, FIStructE, FICE, FIMS, FCMI, MICT O Brooker BEng, CEng, MICE, MIStructE

Shear strength of masonry Fvk = fvk0 + 0.4σd < = 0.045fb
Assume σd = "0" (Conservative)

Table 3 Therefore Shear strength = Fvk0 = 0.15 Nmm2 > 0.0032N/mm2, OK

OTM at the base of brick wall = 1.207 kNm

Table 1 Moment resistance of the brick parapet Mrd = ((fxk1 / Ym) + σd) Z

Mrd (for 1m width of wall) = 3.9 kNm > 1.207kNm, OK

fxk1	0.25N/mm2	
Ym	2	
σd	3.7E-02	Assumed brick density =
Z = bd2/6 =	2.4E+07mm3	2100 kg/m3

The 1.8m x 380mm thick wall is suitable for the lateral load applied to its full height.

It is assumed that the foundation is suitable to take the additional load from the proposed extension.

The pre-fabricated GRP coper is fixed to the top of the new brick work using GRP profile angle and M12 resin anchors at equal spacing.
The coper is not subjected to any significant load except for the wind load and by comparison, the GRP profile angle with the M12 resin anchor is suitable.