CON	SULTING	Engineerin	n Calculatio	n Sheet		Job No.	Sheet No.		Rev.
ENGI	NEERS	Consulting	Engineers	II Sheet		iXXX		1	
			5			J			
						Nember/Location			
Job Title	Member De	esign - Rein	forced Cond	crete Corbe	I BS8110 v	Dig.	Dete -		h
Member D	esign - RC (Corbel					Date 21	/11/2021	ina.
Material F	Properties								
						2	 		
Characteri	stic strengt	h of concret	e, f _{cu} (≤ 60	N/mm ² ; HS	SC N/A)	3:	• ▼	N/mm ²	OK
Yield stren	gth of longi	tudinal stee	el, f _y			40	60 •	N/mm ²	
Yield stren	gtn of snea	r link steel,	т _{уv}			40		N/mm ²	
Elastic mod	Julus of ste	el, E _s					205000	N/mm ²	
Ultimate si	rain of con	crete, ε _{cc}					0.0035		
D ¹									
Dimensio	ns								
- r-									
I	L	a _v							
		Ì							
╞──┨┃	L	•							
			a ₁						
┝──┨┃									
			a ₂						
	ſ	✓							
		a ₃							
	-								
							1000		
Width, b							1000	mm	
Dimension	, a ₁						450	mm	
Dimension	, a ₂						450	mm	
Dimension	, a ₃	<u> </u>		C 1			300	mm	
Distance of	r centreline	or applied i			in, a _v	300	425	mm	CI.5.2.7.1
(Note a_v s	$\frac{1}{2}$	$\frac{1}{1}$	or stiff bea	ring and a_3	/2 for flexi	ble bearing)		BS8110
(<i>Note cl.6</i> .	2.3(8) EC2	which state	s that a _v s	noula de ta	ken as grea	ater than U.	50 IS		
neverthele	ss consider	ed even as	that clause	presumabl	y applies to	o vertical sh	ear reinfor	cement)	
Effective d	eptn to ten	slie steel, d	$= a_1 + a_2 - a_2 - a_1 + a_2 - a_$	$\frac{1}{2}$ cover - ϕ_t	2		849	mm	01/
Shear spar	n to depth r	atio, a _v /d (s	≤ 1.00 <i>cl.5.</i>	2.7.1 BS81	10)		0.50		ОК
D · C									
Reinforce	ment								
			((005) 0	0 (040) : 1	1 40			
cover to a	ii reinforcen	nent, cover	(usually 35	(C35) or 3	u (C4U) int	ernal; 40 e	35	mm	
Tanala i	a al mater f		atan 1 (10		~	 		0.1/
Tension ste		ement diam	eter, ϕ_t (>=	= 10mm)		3.	∠ ▼	Imm	OK
rension ste	eel reinforce	ement num	ber, n _t	214			10	2	
i ension ste	eel area pro	ovided, A _{s,pro}	$p_{v,t} = n_t \cdot \pi \cdot \phi_t$	/4			8042	mm ²	
	abasu linti	liamatar				-	 -		
norizontal	snear link (liameter, φ _{li}	nk	1	n of las-	2		mm	
Number of		nnks in a cr	oss section,	, i.e. numbe	er of legs, r	leg	4		
				within a, n _s		d a 10 t l-	4		
(Note horiz	zontal links	to be provid	aea within l	upper 2/3 0		uepth as pe	er ci.5.2.7.2	.3 BS8110)	
Area provi	ued by all h	orizontal lin	ks within d	, $A_{sv,prov} = \tau$	ι.φ _{link} ⁻/4.n _{leg}	.n _{sec}	7854	mm ⁻	
L = = -11									
Loading									
	al la! - !!						1000	LaNI	
ULS applie	a load, N						1800	KIN	
						1			

CONSULTING ENGINEERS		Engineerin	a Calculatia	n Chaot		Job No.	Sheet No.		Rev.
		Consulting	y Calculatio Fnaineers	II Sheet		iXXX	-)	
LNGI	NEEKS	consulting	Linginicers]^^^	4	<u>×</u>	
						Member/Location			
Job Title	Member De	esign - Rein	forced Con	crete Corbe	l BS8110 v	Drg.			
Member De	esign - RC (Corbel				Made by XX	Date 21	/11/2021	hd.
Executive	Summary								
	Item					UT	Remark		
	Bearing str	ess utilisati	on			49%	OK		
	lension rei	inforcement	utilisation			30%	OK		
	Ultimate sr	iear stress	utilisation			45%	OK OK		
	Design sne] .itch.utilicat	ion	28%	OK		
	Min tension	sion roinfor	orcement p			00%0 42%			
	% Max ton	sion reinfor		isation		73%			
	% Min she	ar reinforce	ment utilisa	ation		11%	OK OK		
	% Min com	bined tensi	on and she	ar reinforce	ment utilis:	38%	OK		
	% Max con	nbined tens	ion and she	ar reinforce	ement utilis	94%	OK		
	Total utili	sation				94%	ОК		
								ļ	
					<u> </u>				
				<u> </u>			<u> </u>		

CONSULTING Engineering Calculation Shoot					Job No).	Sheet No.		Rev.
	Consulting	y Calculatio Fnaineers	n Sheet		iVV	<	-	2	
ENGINEEKS	consulting	Lingineers			Jvv	^	-	5	
					Member/Lo	cation			
Job Title Member De	esign - Rein	forced Con	crete Corbe	l BS8110 v	Drg.				
Member Design - RC (Corbel				Made by	XX	Date 21	/11/2021	lhd.
Bearing Stress Limi	t								
Bearing area, $A = b.(a$	 a₂-r)						265000	mm ²	
Reduction	of dimensio	n a₂ due to	chamfer ar	nd gap, r			35	mm	
Bearing stress $\sigma = N_{c}$	/Δ			5.5.67			7	N/mm ²	
Bearing stress limit o	= 0.4f						14	N/mm^2	
Bearing stress utilisati	$\sin \sigma/\sigma$						/10%	11/11111	OK
							-1370		ÖK
Tension Beinforcom	ont Dociar								
Tension Reinforcem									
Domomotor 1/ N/(0							0.10		
Parameter, $\kappa = N / (0)$.91 _{cu} .D.a _v)	24	222 4 4 4 1 2				0.13		
Lever arm, $z = d.(0.5)$	+ v(0.25 - (1))	.+к).к.а _v -́/с	i))/(1+k)				/19	កាកា	
Deptn to neutral axis,	x = (d-z) /	0.45					290	mm	
Ratio x/d							0.342		
Tension steel yielded	or not ?						Yielded		
(Note if x/d > 0.615,	tension stee	el not yielde	ed; and vice	e versa)					
Steel stress, f _{st}							437	N/mm ²	
(Note if not yielded, f	$st = E_s \cdot \varepsilon_{cc}$	(d-x)/x; els	$se f_{st} = 0.9$	5f _y)					
Tension force, $F_t = N$.	a _v /z (>= 0.	5N)					1063	kN	
Area of tension steel r	equired, A _s	$= F_t / f_{st}$					2433	mm ²	
Area of tensile steel re	einforcemer	nt provided,	A _{s,prov,t}				8042	mm ²	
Tension reinforcement	t utilisation	$= A_s / A_{s,pro}$	ov.t				30%		ОК
			.,.						
% Min tension reinfor	cement = 0	.4%.bd					3396	mm ²	
% Min tension reinford	rement utili	sation					42%		ОК
% Max tension reinfor	rement = 1	3% hd					11037	mm ²	
% Max tension reinfor	coment util	isation					73%		ОК
							13/0		ΟK
Tonsion rainforcomon	t nitch – (h	-2 covor $-$	2 4	(n_1)			04	mm	
Min tonsion stool rainf	i pitti – (D	- Z.COVEI -	$2 \varphi_{\text{link}} = \varphi_{\text{t}} / ($	$(\Pi_t^- I)$. :f T 4 0	`	94	111111	01/
			1011 (>751111	11, >1001111	111 140)	80%	<u>م</u> ا)	UK
(Note no allowance na	is been mad	de for laps l	n the min p	ntch as not	aeeme	εά το	be required	a)	
							<u> </u>		

E N G I NE E R S Consulting Engineers	CONSUL	TING	Engineerin	a Calculatio	n Sheet		Job No).	Sheet No.		Rev.
Memote Design - Reinforced Concrete Carble BSS110 v We moment Design 3.4.5.8 Shear Reinforcement Design Value XX Small 21/11/2021 ^{2-4.} Shear Reinforcement Design Value XX Small 21/11/2021 ^{2-4.} Utimate shear stress, value N/bd (< 0.8f (0 ⁻⁵ & 5N/mm ²) 2.12 N/mm ² OK Design shear stress, value N/bd (< 0.8f (0 ⁻⁵ & 5N/mm ²) 2.12 N/mm ² OK Design shear stress, value N/bd (< 0.8f (0 ⁻⁵ & 5N/mm ²) 2.12 N/mm ² OK Design shear stress, value N/bd (< 0.8f (0 ⁻⁵ & 5N/mm ²) 2.12 N/mm ² OK Design shear stress, value N/bd (Stress (0.8f (0 ⁻¹) 2.12 N/mm ² Ar of the support sci class 3.4.5.8 BS110 or applicable;) Ara of the support sci class 3.4.5.8 BS110 or applicable;) Ara of the support sci class 3.4.5.9 BS110 or applicable;) Are a copacity, 2dv/Ja, (< 0.45, (0.400/1 ^{VA})	ENGINE	ERS	Consulting	Engineers	II Sheet		jXX	х		4	
Jab Title Member Design - RC Corbel New WX Sear Member Design - RC Corbel New WX Sear 21/11/2021 ¹ Shear Relinforcement Design				-			Member/Lo	cation			
Job Tile Preside Design * Reinforce Conceler Concele	Joh Title Mon	nhor De	cian Doin	forced Con	croto Corbo		Dra.	Cation			
And Control Shear Reinforcement Design 3.4.5.8 Shear Reinforcement Design 3.4.5.8 Uttimate shear stress, v_{ij} =N/bd (< 0.8% ^{0.0} a SN/mm ²) 2.12 Diffusion Shear stress, v_{ij} =N/bd 4.5% Oxegin shear stress, v_{ij} =N/bd 2.12 Mittimate shear stress, v_{ij} =N/bd 2.12 Mittimate shear stress, v_{ij} =N/bd 2.12 Stear capacity enhancement by calculating v_e at support and comparing against enhanced v_e within 20 of the support as cause 3.4.5.8 BSB10 employed, that of clause 3.4.5.10 BSB110 on to applicable;) Area of tensile steel reinforcement provided, A_{expox} 8.042 [nm ²] $v_e = 10.0791.25(r_{eff}/252)^{1/2}(400/d)^{1/1}$; $p_e<3 f_m<40; (400/d)^{1/2} > 0.67 5.5% Finhanced shear capacity, 24v_i / a_v_i (0.1 0.35 Wmm2 Note that the enhanced shear capacity is limited 0.8fm-5 8.5% (N/mm2); 1.21 Mm2 Concrete and esign horizontal links VALID VALID 1.21 Provided by all horizontal links within (2/3).d. A_{expox} 5.236 [nm2 5.236 [nm2 (hote cl.6.2.3(8) EC2 which states that only inks within the central 0.75a, effectively cross the 1.21 1.21 Mit combined tension and shear reinforc$	Mombor Dosign		Corbol		crete Corbe	1 DS0110 V	Made by	vv	Date 71	/11/2021	hd.
Shear Reinforcement Design 3.4.5.6 Shear Reinforcement Design 3.4.5.6 Ultimate shear stress, v _{ua} =N/bd (2.12 Wirmate shear stress, v _{ua} =N/bd 2.12 Cishear capacity enhancement by calculating v _a at support and comparing appinst enhanced v _a within 2.20 of the support as clause 3.4.5.8 B58110 employed, that of clause 3.4.5.10 B58110 not applicable;) Area of tensile steel reinforcement provide, A _{sume} 8042 mm ² ne = 100A _{sume} /bd 0.55 % v _a = 0.0, 2.00, 2.00, 2.01, 2.04, 4.00 (A) ^{1/4} > 0.67 0.55 % Enhanced steer capacity, 2.04, 4.00 0.55 % Enhanced steer capacity, 2.04, 4.00 (A) ^{1/4} > 0.67 0.55 % Check v _a < 0.5.(2.04v, J _a) for no horizontal links N/A Note that the enhanced shear capacity 2.04, 4.00 (A) 1.934 kN Check v _a < 0.5.(2.04v, J _a) for no horizontal links VALD Provide horizontal shear links A _m > a.b(v _a /2.04, J _b)(0.05 f _b) i.e. A 1.217 mm ² Check v _a < 0.5.(2.04v, J _a) for design horizontal links VALD Provide horizontal links shear capacity (A _{sume} /2.04, J _b)(0.05 f _b) i.e. A 1.217 mm ² Check v _a < 0.5.(2.04v, J _a) for design horizontal links VALD Concrete and design horizontal links sh	Member Design		LOIDEI					~~	21	/11/2021	
Since in classifier Set of the set of	Shear Reinfor	rcemer	t Design								3458
Ultimate shear stress, $v_{ut} = N/bd$ (< 0.8 $f_{ut}^{0.2}$ 8 S/N/mm ²) 2.12 N/mm ² Ultimate shear stress, $v_{ut} = N/bd$ (0.8 Design shear stress, $v_{u} = N/bd$ (2.12 N/mm ² OK 0.12 0.12 Design shear stress, $v_{u} = N/bd$ (0.12 0.12 Chear capacity 2.40, 2.45,8 BSS110 employed, that of clause 3.4.5.10 BSD110 not applicable;) Area of tensils testel reinforcement provided, A _{carrox} , 0.042 $w_{u} = (0.7.971.25)(p_{v_{u}}(2.5)^{1/2}(400/d)^{1/4}, w_{u}^{-3}, f_{u}^{-4}(40) (400/d)^{1/4} > 0.67 0.35 N/mm2 Enhanced shear capacity, 2.40, 4, (0.8fw-5 8.5/Mm2 ; 2.30 N/mm2 Check v_{d} = 0.5.(2dv_{d}/a_{d}) for no horizontal links N/A 1.00 Concrete shear capacity 2.40, 4, (bd) 1.954 k/N Provide horizontal shear links A_{w} > a_{w} b_{v} c_{w} 2.40, f_{w}(10)^{1/4}, b_{w} c_{w} 2.40, f_{w}(10)^{1/4} 0.530 Concrete shear capacity 2.40, A_{w} = 0.40, f_{w} c_{w} 2.40, f_{w}(10)^{1/4} 1.954 k/N Check v_{g} = 0.5.(2dv_{g}/a_{s}) for no horizontal links VALID 1.00 Concrete shear capacity 2.40, A_{w} = 0.40, f_{w} c_{w} 2.40, f_{w} c_{w} c_{w} 2.40, f_{w} c_{w} c_$		center	it Design								BS8110
Ultimate shear stress utilisation 445% OK Design shear stress, $v_e = N/bd$ 2.12 N/mm ² (Shear capacity enhancement by calculating v_a at support and comparing against enhanced v_e within 204 the support as clause 3.4.5.8 BSB110 net applicable;) Area of tensile steel reinforcement, provided, A_{strout} 8042 mm ² 8042 mm ² $v_u = (0.791, L25)(v_{a}(u/25)^{1/2}(400/d)^{1/4}; v_e, 3; t_u<40; (400/d)^{1/4} > 0.67 2.30 N/mm2 Enhanced shear capacity, 2dv_a/a_e, (colds, v_e^{5.2} & SN/mm2) 2.30 N/mm2 Check v_a < 0.5.(2dv_a/a_a) (colds, v_e^{5.2} & SN/mm2) 2.30 N/mm2 Check v_a < 0.5.(2dv_a/a_a) (colds, v_e^{5.2} & SN/mm2) 2.30 N/mm2 Check v_a < 0.5.(2dv_a/a_a) (colds, v_e^{5.2} & SN/mm2) 2.30 N/mm2 Check v_a < 0.5.(2dv_a/a_a) (colds, v_e^{5.2} & SN/mm2) 1.321 mm2 Check v_a < 0.5.(2dv_a/a_a) for no horizontal links N/A Uprovide horizontal links shear capacity (A_{surperv}) 5.510 kN Concrete and design horizontal links shear capacity (A_{surperv}) 5.530 kN Concrete and design horizontal links within (2/3). A_{surperv} 5.530 kN Area provided by all horizontal links within (2/3). A_{surperv} 5.236 mm2 (Not condicated stare thorinformement = 0.78, v_e effectively cross the$	Ultimate shear	stress	v=N/bd (< 0.8f ^{0.5}	& 5N/mm ²)				2.12	N/mm ²	000110
Design shear stress, $v_a = N/bd$ Design shear stress, $v_a = N/bd$ 2d of the support as clause 3.4.5.8 BS310 employed, that of clause 3.4.5.10 BS3110 not applicable;) Area of tensile steel reinforcement provided, $A_{a,gave,t}$ $B_{a,g} = 100A_{a,gave,t}/bd$ $B_{a,g} = 10A_{a,gave,t}/bd$ $B_{a,g} = 10A_{a,gave,t}/bd$ $B_{a,g} = 10A_{a,gave,t}/bd$ $B_{a,g} = 10A_{a,gave,t}/bd$ $B_{a,g} = 0.5(2dv_a/a_a)$ for no horizontal links VALID $B_{a,gave,t}/bd$ $B_{a,g} = 0.5(2dv_a/a_a)$ for design horizontal links VALID $B_{a,gave,t}/bd$ $B_{a,g} = 0.5(2dv_a/a_a)$ for design horizontal links $B_{a,g} = 0.5(2dv_a/a_a)$ for $A_{a,g}$ $B_{a,g} = 0.5(2dv_a/a_a)$ for $A_{a,g}$ ($B_{a,g} = 0.5(2dv_a/a_a)$	Ultimate shear	stress	utilisation						45%	N <i>y</i> 11111	ОК
Design shear stress, v_a=N/bd 2.12 N/mm² (Shear capacity enhancement by calculating v_a at support and comparing against enhanced v_ within 20 of the support as Cause 3.4.5.8 BS8110 employed, that of Cause 3.4.5.10 BS8110 not applicable;) Area of tensile steel reinforcement provided, A _{surox} , e. 8042 [mm² 8042 ps. = 100A _{sprov} /bd 0.95 % 8042 e. (0.75):L25)(paf ₀ /25) ¹⁷ (400/d) ^{1/4} ; pa<2; f ₀ <40; (400/d) ^{1/4} >0.67 0.58 N/mm² Enhanced shear capacity, 2dv/a, (< 0.67 (main state capacity, 2dv/a, (< 0.61 (main state capacity, 2dv/a, (
(Shear capacity enhancement by calculating v _a at support and comparing against enhanced v _a within 20 of the support as clause 3.4.5.8 BS110 encloses 3.4.5.10 BS110 encloses; 3.4.5.10 BS110 enclose; 3.4.5.10 Enclose; 3	Design shear s	tress, v	d=N/bd						2.12	N/mm ²	
2d of the support as clause 3.4.5.8 BS8110 employed, that of clause 3.4.5.10 BS8110 not applicable;) Area of tensile steel reinforcement provided, $A_{strevck}$ 8.042 mm ³ $w_e = (100, a_{strevck}/(25))^{12} (400/d)^{14}; w_e < 3; f_e < 40; (400/d)^{14} > 0.67 0.58 N/mm3 Enhanced shear capacity, 2dv/Ja, (< 0.8f_or 53 & 5N/mm3) 2.30 N/mm3 Enhanced shear capacity, 2dv/Ja, (< 0.8f_or 53 & 5N/mm3) 2.30 N/mm3 Check vg < 0.5.(2dv/Ja,) for no horizontal links$	(Shear capacity	y enhar	cement by	calculating	v _d at supp	ort and cor	nparing	g aga	ainst enhan	ced v_c with	nin
Area of tensile steel reinforcement provided, $A_{sprov,k}$ 8042 [mm²] $\omega_{\mu} = 100A_{sprov,l}/bd$ 0.95 % $\omega_{\mu} = (0.77).25(p_{\mu}(x_{\mu}/25))^{1/2}(400/d)^{1/4}, p_{\mu}/3; f_{\mu}<40; (400/d)^{1/4}, p_{\mu}/3; f_{\mu}$	2d of the suppo	ort as c	lause 3.4.5	.8 BS8110	employed, i	that of clau	se 3.4.	5.10	BS8110 nc	ot applicable	e;)
$p_{u} = 100A_{spect}/bd 0.95 % 0.$	Area of tensile	steel re	einforcemer	nt provided,	A _{s,prov,t}				8042	mm ²	
v., = (0.79/1.25) ^{1/2} (400/d) ^{1/4} ; p _{ex} <3; f _m <40; (400/d) ^{1/4} >0.67 0.55 N/mm ² Enhanced shear capacity, 2dv,a, 1 2.30 N/mm ² Note that the enhanced shear capacity is limited 0.8f _m ^{0.5} & SN/mm ²) 2.30 N/mm ² Check v ₄ < 0.5.(2dv,/a,) for no horizontal links	$\rho_{\rm w} = 100 A_{\rm s, prov}$	_t /bd							0.95	%	
Enhanced shear capacity, $2dy/a_v$ (2.30 N/mm ² Enhanced shear capacity, $2dy/a_v$ (< $0.8f_w^{-2}$ & $8.5N/mm^2$) 2.30 N/mm ² Note that the enhanced shear capacity is limited $0.8f_w^{-2}$ & $8.5N/mm^2$;	$v_c = (0.79/1.25)$	5)(ρ _w f _{cu}	/25) ^{1/3} (400	/d) ^{1/4} ; ρ _w <3	3; f _{cu} <40; (400/d) ^{1/4} >0	0.67		0.58	N/mm ²	
Enhanced shear capacity, $2dy_{i}a_{i}$ ($0.8f_{cor}^{0.9} \& 8JN/mn^{2}$; 2.30 N/mn^{2} Note that the enhanced shear capacity is limited $0.8f_{cor}^{0.9} \& 8JN/mn^{2}$; 1 1 Check v _a < 0.5.($2dv_{i}a_{a}$) for no horizontal links N/A 1954 Concrete shear capacity $2dv_{i}a_{v}$ (bd) 1954 kN Provide horizontal shear links $Av_{a} > a_{b}(v_{i} < 2dv_{a})(0.95f_{rw})$ i.e. A 1217 Concrete and design horizontal links when $a_{xv} > a_{b}(v_{i} < 2dv_{a})(0.95f_{rw})$ i.e. A 1217 Concrete and design horizontal links within $(2/3) d_{a} Av_{a_{xy} rmv}}$ 5236 mm ² Concrete and design horizontal links within the central $0.75a_{v}$ effectively cross three mm ² (Note cl. 6.2.3(8) EC2 which states that only links within the central $0.75a_{v}$ effectively cross three mm ² OK 9 0K 9 Pitch of horizontal links, $s_{ink} = d / (n_{asc}-1)$ 2836 mm ² % Min shear reinforcement utilisation 1196 0K % Min combined tension and shear reinforcement utilisation 3856 0K % Max combined tension and shear reinforcement utilisation 3460 0K % Max combined tension and shear reinforcement utilisation 9460 0K <t< td=""><td>Enhanced shea</td><td>ir capac</td><td>tity, 2dv_c/a</td><td>1</td><td></td><td></td><td></td><td></td><td>2.30</td><td>N/mm²</td><td></td></t<>	Enhanced shea	ir capac	tity, 2dv _c /a	1					2.30	N/mm ²	
Note that the enhanced shear capacity is limited $0.8f_{\omega}^{0.5} \& SN/m^2$; Image: Construct of the second se	Enhanced shea	ir capac	city, 2dv _c /a _v	$(< 0.8 f_{cu}^{0.5})$	⁵ & 5N/mm ²	2)			2.30	N/mm ²	
Check $v_d < 0.5.(2dv_/a_v)$ for no horizontal links N/A N/A Concrete shear capacity $2dv_/a_v$.(bd) 1354 kN 1 Check $v_d > = 0.5.(2dv_/a_v)$ for design horizontal links VALID 1217 mm² Provide horizontal shear links $A_{w_v} > a_vb(v_a; 2dv_/a_v)/(0.95f_{v_v})$ i.e. A 1217 mm² (Ensure $v_a - 2dv_c/a_v > = 0.4$; Ensure $A_{w_v} > = 0.5A_v;$) 6530 kN Area provided by all horizontal links within (2/3). d, $A_{w_v,prov}$ 5236 mm² Area provided by all horizontal links within (2/3). d, $A_{w_v,prov}$ 5236 mm² Indicad shear reinforcement outlisation 2839 OK Pitch of horizontal links, $S_{ink} = d / (n_{wc}-1)$ 283 mm 0K % Min shear reinforcement = 0.2% b.b.s _{ink} 566 mm² 0K % Min combined tension and shear reinforcement = 0.6% bd 5094 mm² 0K % Max combined tension and shear reinforcement = 0.6% bd 5094 mm² 0K % Max combined tension and shear reinforcement utilisation 383% 0K % Max combined tension and shear reinforcement utilisation 944% 0K % Max combined tension and shear reinforcement utilisation 944% 0K % Max combined tension and shear reinforcement utilisation 16980 mm²	Note that the e	enhance	ed shear ca	pacity is lim	nited 0.8f _{cu}	^{0.5} & 5N/m	m²;				
Check $v_d < 0.5.(24v_d/a)$ for no horizontal links N/A Image: state capacity $24v_da_u$ (bd) Image: state capacit											
Concrete shear capacity $2dv_d/a_v$.(bd) 1954 kN Check $v_d \geq 0.5.(2dv_d/a_s)$ for design horizontal links VALID Provide horizontal shear links $A_{w} > a_v (V_u^-2dv_d a_v)/(0.95f_v)$ i.e. A 1217 (Ensure $v_d^2dv_c/a_v > = 0.4$; Ensure $A_{w} > = 0.5A_{x'}$) 530 Concrete and design horizontal links shear capacity ($A_{w_p prov}$) 5236 Area provided by all horizontal links within (2/3).d, $A_{w_p prov}$ 5236 More close.3/8) EC2 which states that only links within the central 0.75a_veffectively cross the 1 inclined shear cracks is not considered as that clause presumably applies to vertical shear reinforcement) 0K Design shear reinforcement = 0.2% b.5 _{mk} 566 mm ² % Min shear reinforcement = 0.2% b.5 _{mk} 566 mm ² % Min combined tension and shear reinforcement utilisation 38% 0K % Min combined tension and shear reinforcement utilisation 38% 0K % Max combined tension and shear reinforcement utilisation 94% 0K % Max combined tension and shear reinforcement utilisation 94% 0K % Max combined tension and shear reinforcement utilisation 94% 0K % Max combined tension and shear reinforcement utilisation 94% 0K	Check v _d < 0.	5.(2dv	_c /a _v) for n	o horizont	al links			_	N/A		
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CON	CONSULTING Engineering Calculation Sheet					Job No. Sheet No.			Rev.	
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						Member/Location				
lob Title	Member De	esian - Re	inforced Con	L crete Corbe	 BS8110 v	Drg.				
Member D	esign - RC (Corbel				Made by XX	Date 21	/11/2021	hd.	
·									<u> </u>	
9.2.7	Arrangeme	ent of Rei	nforcement							
	The arrange	ment of re	einforcement	is very close	ely related t	o the design	of corbels,	half joints		
-	and nibs, an	d the desig	gner must en	sure that the	detail desig	m is clearly	specified.	He should		
-	refer to the references a	OAP Desi, re given ii	gn Guidance n section 9.3.	Notes, Con	crete Constr	uction: 4, N	/lay 1976. (Other		
	In general s	mall bar d	iameters, i.e.	not larger th	ian 16mm, s Litic likely	should be us	sed when do	etailing		
-	However, th	ns. It larg	r should be a	ware that we	elding on sit	e is not enc	ouraged an	d if		
-	specified, o	ften causes	s the contract	or to sugges	t alternative	es.	2			
-										
9.2.7.1	Corbels (B	S 8110, CI	5.2.7; EC2,	Cl 5.4.4)						
	The use of	unall k	liomators b-	rizontal U.P.1	one on link-	with acres b	ands is me	formad		
4	shown in M	odel Detai	il MCB1. Ho	wever, whe	re the loadi	ng is high a	nd the geon	netry		
1	restrictive, l	arge bar d	iameters may	be necessa	ry, in which	case weldi	ng them to a	a cross bar		
-	This is show	y be the on yn in Mod	el Detail MC	B2.	uns may be	governed b	y the streng	in or weld.		
-										
	It is essentia the corbel a	al that the i s possible	main tensile i and that it ex	reinforceme: stends bevor	nt is extend	ed to as clos bearing area	se to the out	ter face of		
	distance sho	own on the	Model Deta	ils.	iu ine ioau	bearing area	i oy a ninini	num of the		
	Where long having stal former are required to be two with distributions the sould distribute									
-	where large norizontal forces are required to be transmitted into the corbel, a welded joint may be the only suitable solution. (See Park, R., and Paulay, T. Reinforced concrete									
-	structures.)	2			·					
-	1								4	
9.2.7.2	Half Joints	in Beams	5							
	The use of i	inclined ha	ars in half i où	nts provides	better contr	rol of cracki	ing than oth	er		
-	arrangemen	ts of reinf	orcement (Se	e Clark L.A	. and Thoro	good P.: Se	rviceability	behaviour		
-	of reinforce	d concrete	e half joints). of reinforcen	However s	uch bars are	often diffic	cult to fix co	practical		
	details with	inclined l	inks or bent b	pars, especia	lly when la	rge bar dian	neters are re	equired and		
	a welded so	lution is a	dopted.		-			~		
9.2.7.3	Continuou	s Nibs (BS	5 8110, CI 5.2	2.8)						
		(,							
-	The arrange Vertical 'L'	ement of re bars or lin	einforcement iks should be	tor continue used where	ous nibs maj ver nossible	y control the	e depth of n in Model D	ub. etail MN1		
1	However, w	where a sha	allow nib is re	equired, e.g.	for support	ing brickwo	ork, horizon	tal 'U' bars		
1	should be u	sed, as sho beam must	own in Model t be designed	l Detail MN	 The vert loads from 	ical leg of the nibe T	he links in f	he should		
_	note that it i	is necessar	ry to reduce t	he value of	d as the con	crete in the	nib below t	he vertical		
-	link does no	ot contribu	te to the resis	stance. See S	Structures N	lote <u>1992NS</u>	<u>ST_9</u> , conce	erning Strut		
	and the mo	ueis.	Tie	The posit	ion at which					
				this force be critical	is applied may l to the design					
]			▲ \							
-				N						
-			-	\	.					
-					æ					
1	\cap	}	(a)-f	the second se						
	\rightarrow	r		\						
4										
4				Compression s	rut					



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loh Titlo	Member D	esian - Poin	forced Con	rete Corbo	 BS8110 v/	Drg.				
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