AS 5100.5 -2017

Bending check - assumed pure flexure			named cell	
M*	kNm	297	mdesign0	
V*	kNm	275	vdesign0	
bv	mm	300	bv	
d	mm2	538	d	
h	mm	600	h	
ast_provided	mm2	2250	astf	
fsy	N/mm2	500	fsy	
fsyf	N/mm2	500	fsyf	
fcprime	N/mm2	50	fcprime	
es	N/mm2	200000	es	
phiv		0.7	phiv	
alpha2		0.850	alpha2	=MIN(MAX(1-0.003*fcprime,0.67),0.85), Eqn 8.1.3(1)
gamma		0.700	gamma	=MIN(MAX(1.05-0.007*fcprime,0.67),0.85), Eqn 8.1.3(2)
d_n	mm	126.05	dn	=fsy*ast_provided/(alpha2*fcprime*bv*gamma)
ku		0.234	ku	=dn/d, to be less than 0.36
ku0		0.234	ku0	=ku
phif		0.8	phif	=MIN(0.8,MAX(1.19-13/12*ku0,0.6)), table 2.30.2 (b)
mu	kNm	555.62	mu	=fsy*astf*d*(1-gamma*ku/2)*0.000001
phimu	kNm	444.49	phimu	=phif*mu
phiMu/M*	kNm	1.50	phimu/mdesign0	=phimu/mdesign0
dv	mm	484.2	dv	=MAX(0.72*h,0.9*d), Clause 8.2.1.9

		Doug's values										
Case		1		2		3		4		5		
M*	kNm	400	Doug's	297	M* changed	297	M* changed	297	M* changed	297	M* changed	m_design
V*	kN	275	values	275		275		275		275		v_design
ast_provided	mm2	2250		2250		2250		2250		2250		ast_provided
epsx		1.2234E-03		9.8749E-04		9.8749E-04		9.8749E-04		9.8749E-04		epsx =(ABS(m_design)/dv*1000000 + ABS(v_design)*1000)/ (2*es*ast_provided), Eqn 8.2.4.3(1)
is epsx < 0.3e-3 ?		Yes		Yes		Yes		Yes		Yes		IF(epsx<0.003,"Yes","No")
theta_v	deg	37.56		35.91		35.91		35.91		35.91		thetav = 29+7000*epsx, Eqn 8.2.4.2(5)
cot(theta_v)		1.3002		1.3808		1.3808		1.3808		1.3808		cotthetav =1/TAN(thetav*PI()/180)
k_v		0.1411		0.1612		0.1612		0.1612		0.1612		kv =0.4/(1+1500*epsx), Eqn 8.2.4.2(4)
square root f;c		7.0711		7.0711		7.0711		7.0711		7.0711		sqfc = MIN(8,SQRT(fcprime)) ,Cl 8.2.4.1
v_uc	kN	144.91		165.59		165.59		165.59		165.59		vuc = kv*bv*dv*sqfc/1000, Eqn 8.2.4.1
a_sv	mm2	160.00	2 legs N10	160.00	2 legs N10	220.00	2 legs N12	400.00	2 legs N16	620.00	2 legs N20	asv
s	mm	200.00		200.00		200.00		200.00		200.00		s
asv/s		0.8000		0.8000		1.1000		2.0000		3.1000		asvdivs=asv/s
v_us	kN	251.82		267.44		367.72		668.59		1036.32		vus = asvdivs*dv*fsyf*cotthetav/1000 , Eqn 8.2.5.2(1)
phivuc	kN	101.440		115.910		115.910		115.910		115.910		phivuc = phiv * vuc
phivus	kN	176.277		187.205		257.407		468.013		725.421		phivus = phiv * vus
phi v_u	kN	277.72		303.12		373.32		583.92		841.33		phivu=phiv*(vuc+vus)
v_u.max	kN	1737.38		1707.91		1707.91		1707.91		1707.91		vumax=0.55*(0.9*fcprime*bv*dv*cotthetav)/ (1+cotthetav*cotthetav)/1000, Eqn 8.2.3.3(1)
phi V_umax	kN	1216.16		1195.53		1195.53		1195.53		1195.53		phivumax
Is V* < phi_v V_u.max ?		Yes, okay		Yes, okay		Yes, okay		Yes, okay		Yes, okay		IF(v_design<phivumax, "Yes, okay", "No, not okay")
Del F_td	kN	242.96		250.48		202.01		56.60		0.00		delftd =MAX(cotthetav*(v_design-0.5*phiv*vus),0) Eqn 8.2.7(2), AS 5100.5
z = d_v/1000.0	mm	484.20		484.20		484.20		484.20		484.20		zvalue = dv
Ast_required	mm2	2759		2250		2112		1696		1534		ast_required =abs(m_design*1e6/(zvalue*phif*fsy) + delftd*1e3/(phiv*fsy), To satisfy clause 8.2.7
is Ast_prov >= Ast_req (okay) ?		not okay		okay		okay		okay		okay		IF(ast_provided>=ast_required, "okay","not okay")
stress	MPa	613.21		500.00		469.23		376.91		340.97		stress =abs(m_design*1e6)/(z*phi_f*ast_provided) + deltaF_td*1e3/(phi_v*ast_provided)
phi_v V_u/V*		1.01		1.10		1.36		2.12		3.06		=phivu/v_design
Ast_provided/ Ast_required		0.82		1.00		1.07		1.33		1.47		=ast_provided/ast_required

Case 2 reduced the design moment M* of 400 kNm to 297 kNm to give Ast_provided / A_st_required = 1.0 to satisfy adequacy of the longitudinal reinforcement provided to resist the force in the longitudinal steel from combined load effects for a section with N10 @ 200 mm shear reinforcement.