This check is for the section given in the blog
with N10 @ 200 ligature provided
AS 5100.5

```
 fpprintprec: 4$ ;
b_w : 300.0$;
b_v:b_w$;
 /*2 legs N10 @200 mm */
print ("b_v = ", b_v)$;
D: 600.0$;
print ("D = ", D)$;
cover: 50.0$;
print ("bottom cover= ", cover)$;
d : D−cover−24/2$;
print ("d = ", d)$;
```

b_v = 300.0
D = 600.0
bottom cover= 50.0
d = 538.0

```
m_design :297$;
print ("M* = ", m_design)$;
v_design:275$;
print ("V* = ", v_design)$
```

*M** = 297
*V** = 275

```
a_st : 5·450$; /* This the the area for 5N24 */
print ("A_st = ", a_st)$;
 /*2 legs N10 @200 mm */
asv:2·80.0$;
s:200.0$;
print ("A_sv = ", asv)$;
print ("s = ", s)$;
asvdivs:asv/s$;
f_sy:500.0$;
f_syf:f_sy$;
f_cprime:50.0$;
print ("f_sy=f_sy.f = ",f_sy)$;
print ("f'c = ",f_cprime)$;
alpha2 : min(max(1.0−0.003·f_cprime,0.67),0.85)$; /* Eqn 8.1.3(1) AS 5100.5 */
print ("alpha_2 = ",alpha2)$;
gamma : min(max(1.05−0.007·f_cprime,0.67),0.85)$; /* Eqn 8.1.3(2) AS 5100.5 */
print ("gamma = ",gamma)$;
d_n:a_st·f_sy/(alpha2·f_cprime·b_v·gamma)$;
print ("d_n = ",d_n)$;
k_u0 : d_n/d$; /* For singly reinforced,limit to 0.36. See Clause 8.1.5, AS 5100.5 */
k_u : k_u0$;
print ("k_u = ",k_u)$;
if (k_u > 0.36) then
    print ("k_u > 0.36, assumption of singly reinforced not correct, not okay")
else
    print ("k_u < = 0.36, assumption of singly reinforced okay")$;
```

A_st = 2250

A_sv = 160.0

s = 200.0

f_sy=f_sy.f = 500.0

f'c = 50.0

alpha_2 = 0.85

gamma = 0.7

d_n = 126.0

k_u = 0.2342

k_u < = 0.36, assumption of singly reinforced okay

```
mu:f_sy·a_st·d·(1−gamma·k_u/2)·0.000001$; /* assumed rectangular stress block */
print ("M_u = ", mu)$;
phi_f :  min(max(1.19−13/12·k_u0,0.60),0.8)$; /* Table 2.3.2 (b) AS 5100.5 */
print ("phi_f = ", phi_f)$;
mu_reduced: phi_f· mu$;
print ("phiM_u = ", mu_reduced)$;
print ("M* = ",m_design)$;
if round(mu_reduced) = round(m_design) then
   print ("phiM_u equals M*, pure flexure adequacy check okay")
else if round(mu_reduced) > round(m_design) then
   print("phiM_u > M*, pure flexure adequacy check okay")
else
   print("phiM_u < M*, pure flexure adequacy check okay")$;
```

M_u = 555.6
phi_f = 0.8
phiM_u = 444.4
*M** = 297
phiM_u > M, pure flexure adequacy check okay*

```
E_s : 200000.0$;  /* Clause 3.3.2, AS 3600 */
print ("E_s = ", E_s)$;
phi_v : 0.70$;  /*  Table 2.3.2(e) AS 5100.5 */
print ("phi_v = ", phi_v)$;
d_v: max(0.72·D,0.9·d)$; /* Clause 8.2.1.9, AS 5100.5 */
print ("d_v = ", d_v)$;
```

$E\_s = 2.0\ 10^{5}$
phi_v = 0.7
d_v = 484.2

```
eps_x:(abs(m_design)/d_v·1000000 + abs(v_design)·1000)/ (2·E_s·a_st)$;
/* Eqn 8.2.4.3(1) AS 5100.5 */

/* Clause 8.2.4.3 AS 5100.5 */
print ("eps_x = ", eps_x)$;
if eps_x <=3.0E-3 then
   print ("eps_x < = 3E-3, okay")
else
   print("eps_x  >3E-3, not okay")$;

theta_v: 29+7000·eps_x$;   /* Eqn 8.2.4.2(5), AS 5100.5 */
print ("theta_v (degrees) = ", theta_v)$;
cotthetav: 1.0 / tan(theta_v·3.14159265358979323 8/180.0)$;
k_v:0.4/(1+1500·eps_x)$; /* Eqn 8.2.4.2(4), AS 5100.5 */
print ("k_v = ", k_v)$;
sqroot_fcprime:min(8.0,sqrt(f_cprime))$;  /* Cl 8.2.4.1, AS 5100.5 */
v_uc : k_v·b_v·d_v·sqroot_fcprime/1000.0$;  /* Eqn 8.2.4.1, AS5100.5 */
v_us : asvdivs ·d_v·f_syf·cotthetav/1000.0$;  /* Eqn 8.2.5.2(1), AS 5100.5 */
phivuc : phi_v·v_uc$;
phivus: phi_v·v_us$;
phivu :phivuc+phivus$;
phivu_div_vdesign : phivu/v_design$;
print ("V_uc = ", v_uc)$;
print ("V_us = ", v_us)$;
print ("phiV_u = ", phivu)$;
print ("V* = ", v_design)$;
if round(phivu) >= round(v_design) then
   print ("phiV_u >= V*, section shear adequacy check okay")
else
   print("phiV_u  < V*, section shear adequacy check not okay")$;
print ("phiV_u/V* =",phivu_div_vdesign)$;
```

eps_x = $9.87\ 10^{-4}$
eps_x < = 3E−3, okay
theta_v (degrees) = 35.9
k_v = 0.1612
V_uc = 165.6
V_us = 267.4
phiV_u = 303.1
*V** = 275
phiV_u >= V, section shear adequacy check okay*
*phiV_u/V** = 1.102

```
phivumax:phi_v·0.55·(0.9·f_cprime·b_v·d_v·cotthetav)/(1+cotthetav·cotthetav)/1000.0$;
/* Eqn 8.2.3.3(1) , AS 5100.5 */
print ("phiV_u.max =" , phivumax)$;
if phivu <= phivumax then
   print ("phivu <= phivumax, okay")
else
   print("phivu > phivumax, not okay")$;

deltaF_td : max(cotthetav·(v_design−0.5·phi_v·v_us),0.0)$; /* Eqn 8.2.7(2), AS 5100.5 */
print ("delta F_td = ", deltaF_td)$;
z:d_v$;
print ("z (mm) = d_v =", z)$;



a_st_required:abs(m_design·1e6)/(z·phi_f·f_sy) +  deltaF_td·1e3/(phi_v·f_sy)$; /* To satisfy cla
print ("Total longitudinal steel required = ", a_st_required)$;
print ("A_st provided = ", a_st)$;
print ("A_st_required / A_st_provided = ", a_st /a_st_required)$;
if (a_st >= a_st_required) then
   print ("longitudinal steel provided adequate for the combined action effects,okay")
else
   print("longitudinal steel provided not adequate for the combined action effects, not okay")$;

stress:abs(m_design·1e6)/(z·phi_f·a_st) +  deltaF_td·1e3/(phi_v·a_st)$;
print ("Stress in longitudinal steel provided= ",stress)$;
```

phiV_u.max = 1.195 10^3
phivu <= phivumax, okay
delta F_td = 250.4
z (mm) = d_v = 484.2

Total longitudinal steel required = 2.249 10^3
A_st provided = 2250
A_st_required / A_st_provided = 1.0
longitudinal steel provided adequate for the combined action effects,okay

Stress in longitudinal steel provided= 499.8