V-Consult Limited ENGINEERING SOLUTIONS	Project: **BOLTED TEE CONNECTION**			Job Ref: -	
	Part of Structure: **VALIDATION**			Calc Sheet No. / Rev	
	Drawing Ref	Calc By: MJH	Date: 21 Dec 2006	Check By	Date

VALIDATION OF WEB BASED BOLTED TEE CONNECTION PROGRAM

BOLT CAPACITIES

Dia	$P_{nom\ 4.6}$	$P_{t\ 4.6}$	$P_{nom\ 8.8}$	$P_{t\ 8.8}$
M12	16.2 kN ✓	20.2 kN ✓	37.8 kN ✓	47.2 kN ✓
M16	30.1 kN ✓	37.7 kN ✓	70.3 kN ✓	87.9 kN ✓
M20	47.0 kN ✓	58.8 kN ✓	109.8 kN ✓	137.2 kN ✓
M24	67.8 kN ✓	84.7 kN ✓	158.1 kN ✓	197.7 kN ✓
M30	107.7 kN ✓	134.6 kN ✓	251.3 kN ✓	314.2 kN ✓
M36	156.9 kN ✓	196.1 kN ✓	366.0 kN ✓	457.5 kN ✓

STEEL STRESSES

Thickness	S275	S355	
15	275	355	✓
17	265	345	
39	265	345	
41	255	335	
62	255	335	
64	245	325	
81	235	315	

SIMPLIFIED RULES

See sample printout overleaf.

$b = 48mm \quad p = 118\ mm \quad T = 20mm. \quad p_y = 345 N/mm^2$

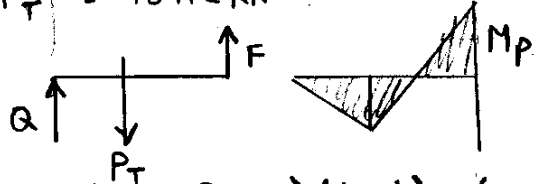
$p_y \times (pT^2/6) = 345 \times 118 \times 20^2/6000 = 2714\ kNmm$

Limiting force $P = 2714 \times 2/48 = 113.1\ kN$ ✓

MORE EXACT METHOD

$M_p = 1.5 \times 2714 = 4071\ kNmm \quad \frac{M_p \times 2}{48} = 169.6kN$ ✓

$P_T = 137.2\ kN$



$F = (M_p + P_T \times a)/(a+b) = (4071 + 1372.2 \times 40)/88 = 108.6kN$ ✓

CALCULATION OF BOLTED TEE CONNECTIONS | **Job Ref:**

Project: | **Page:**

Title: | **Date:**

INPUT DATA

Dimensional Data

Edge Distance	a' =	50	mm
Bolt Centres divided by Two	b' =	60	mm
Bolt Pitch	p' =	120	mm

Material Data

Steel Grade		S355
Bolt Grade		8.8
Bolt Size		M20

Section Data

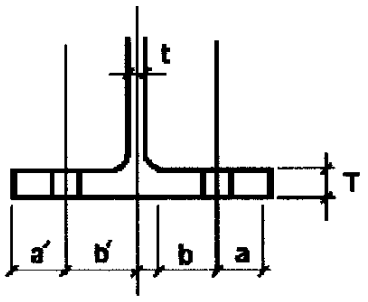
Flange/End Plate Thickness	T =	20	mm
Web Thickness	t =	12	mm
Root Radius or Leg Length	r =	6	mm

Applied Loads (Tension)

Factored Load per Bolt	F =	100	kN

Submit Data

Press Button — Calculate



DIMENSIONS

DESIGN OF BOLTED TEE CONNECTIONS

A program written in php as an example of a web based software application. Bolts, end plates and flanges in tee connections can be sized according to Clause 6.3.4 of BS 5950. The calculations allow for the prying forces in the bolts.

OUTPUT DATA

Dimensional Checks and Other Data

Effective Edge Distance	a =	40 mm	Lesser of a' and 2 x T
Effective Span	b =	48 mm	b' - t/2 - r
Effective Pitch	p =	118 mm	Lesser of pitch and (2 x b + dia + 2)
Yield Stress	Py =	345N/mm2	

BS5950 Clause 6.3.4.2 Simple Method

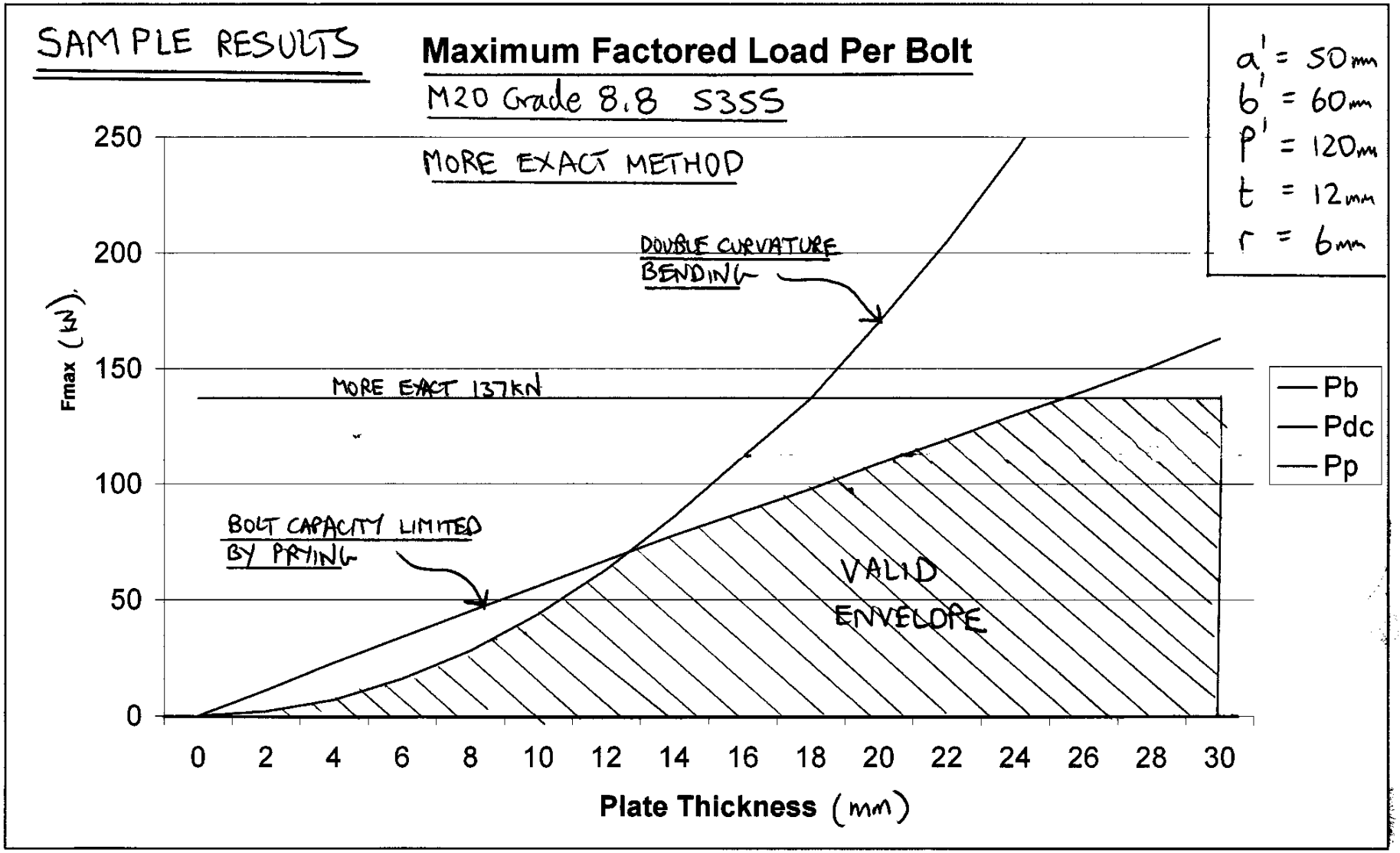
Bolt Capacity (0.8 x pt x At):	109.8 kN	Satisfactory
End Plate Capacity:	113.1 kN	Satisfactory

[Double curvature 2 x Mp / b using elastic modulus]

BS5950 Clause 6.3.4.3 More Exact Method

Bolt Capacity using Ys or 0.7UTS:	137.2 kN	Satisfactory
End Plate Capacity Double Curvature:	169.6 kN	Satisfactory
Bolt Capacity with Prying Allowance:	108.6 kN	Satisfactory

[(Mp + (Bolt Capacity x a)) / (a + b)]


SAMPLE RESULTS
Maximum Factored Load Per Bolt
M20 Grade 8.8 S355
MORE EXACT METHOD
a' = 50mm
b' = 60mm
p' = 120mm
t = 12mm
r = 6mm
DOUBLE CURVATURE BENDING
MORE EXACT 137kN
BOLT CAPACITY LIMITED BY PRYING
VALID ENVELOPE
Pb
Pdc
Pp
Fmax (kN)
Plate Thickness (mm)
0
50
100
150
200
250
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30