

Verification example – Shear block resistance

Type of connection: Gusset plate

Unit system: Metric

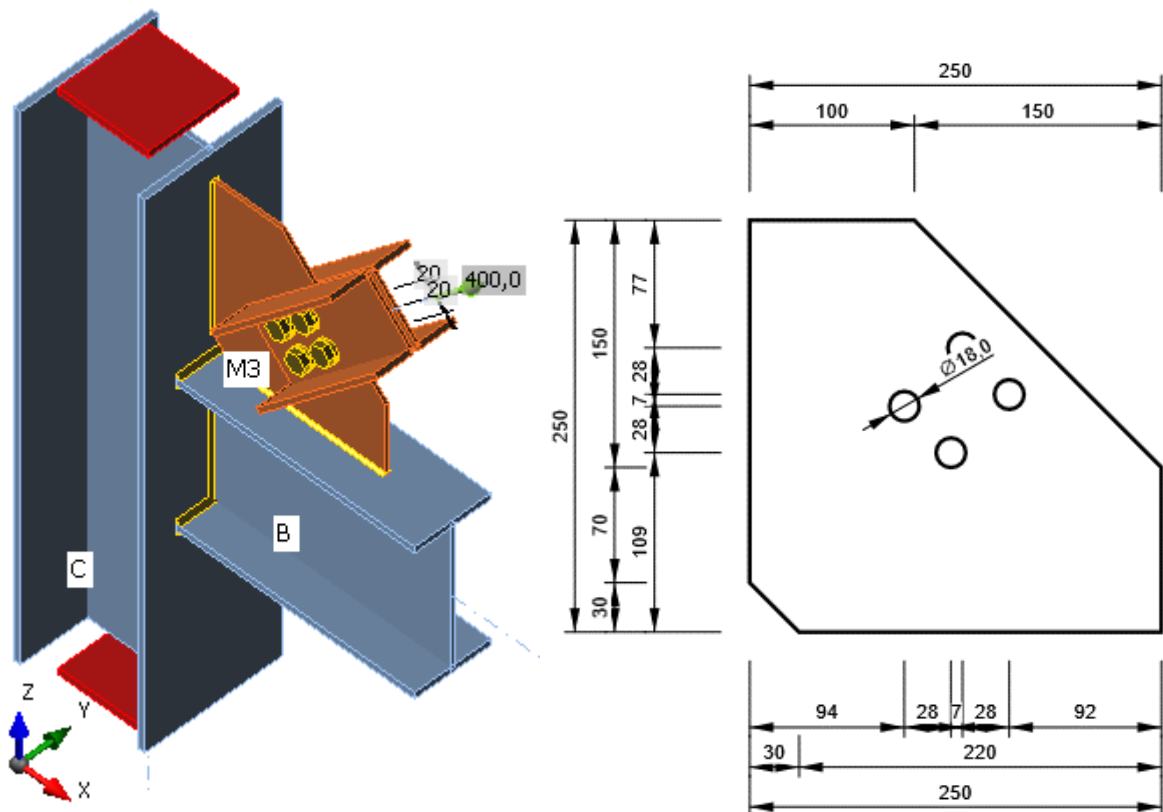
Designed acc. to: CSA S14-16

Investigated: Base material

Plate Materials: W series steel grade

Bolts: M16, grade A490

Geometry:



Applied forces:

$N = \text{variable}$

$V = 0 \text{ kN}$

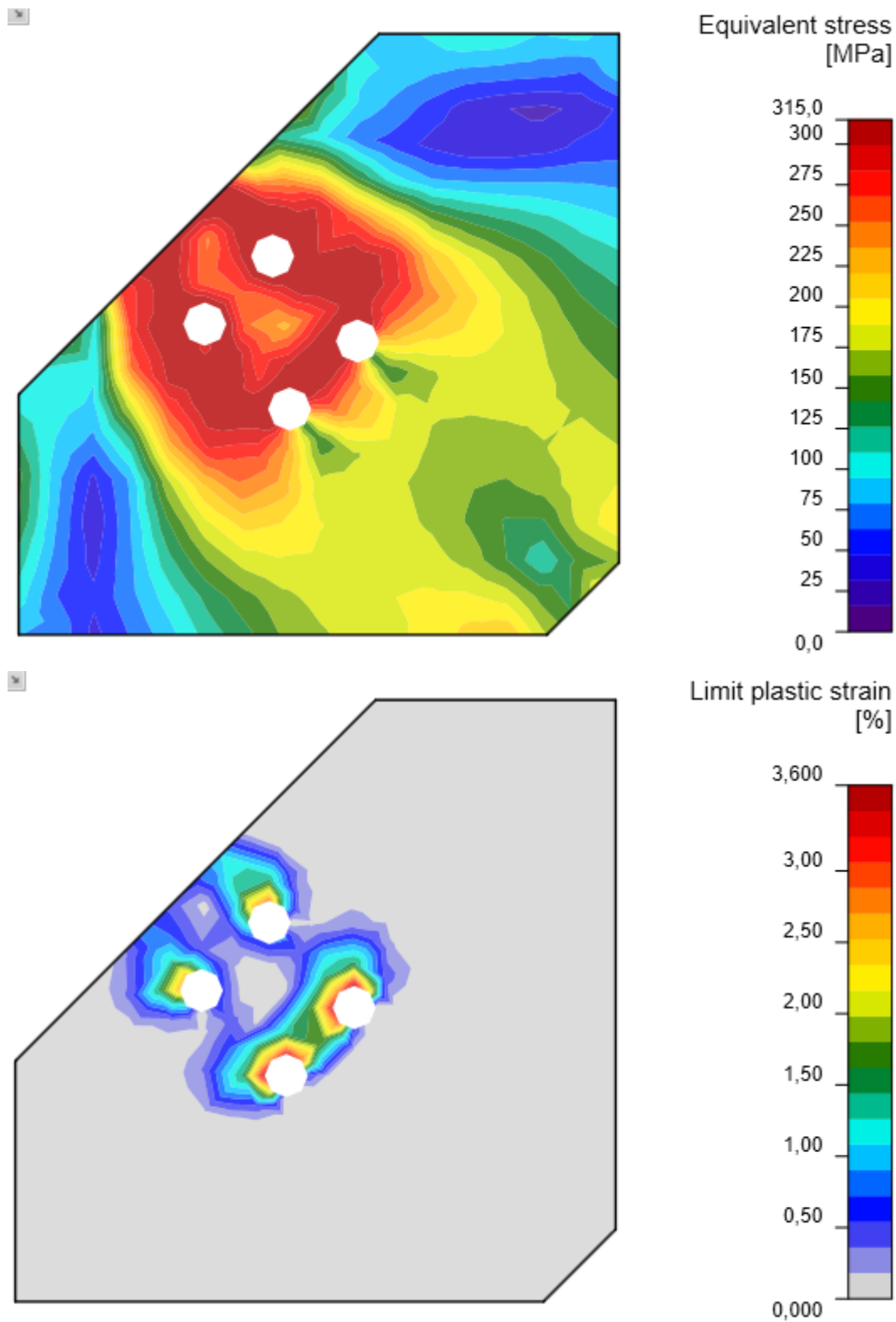
$M = 0 \text{ kNm}$

Procedure:

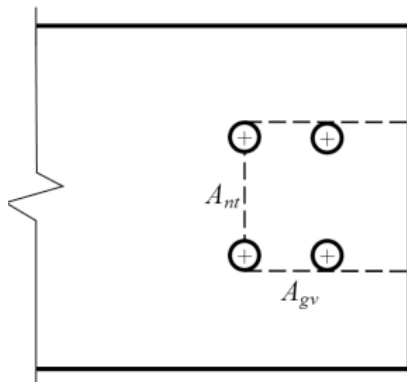
Block shear resistance is checked on a thin gusset plate (thickness 5 mm), which is designed to fail while other components are still undamaged.

IDEA StatiCa Connection

The resistance of plate in IDEA is determined at 5% limit strain.



CISC



- $t = 5 \text{ mm}$
- $w_n = 22 \text{ mm}$
- $w_{gv} = 823 \text{ mm}$
- $A_n = 110 \text{ mm}^2$
- $U_t = 1$
- $A_{gv} = 827 \text{ mm}^2$

$$T_r = \phi_u \cdot \left[U_t \cdot A_n \cdot F_u + 0.6 \cdot A_{gv} \cdot \frac{(F_y + F_u)}{2} \right]$$

For steel grades with $F_y > 460 \text{ MPa}$, $(F_y + F_u)/2$ is replaced with F_y .

Comparison:

Steel grade	F_y	F_u	Block shear resistance:		
			CISC	IDEA	IDEA/CISC
260W	260	410	159	149	94%
300W	300	450	177	168	95%
350W	350	450	186	190	102%
380W	380	480	200	204	102%
400W	400	520	214	215	100%
480W	480	590	227	252	111%
550W	550	620	256	281	110%

The results of IDEA StatiCa Connection design gives similar values of block shear resistance compared to manual computation according to CSA 16-14. The results differ more significantly (11 and 10 % for 480W and 550W, respectively) for high quality steel grades which use only yield strength F_y in the analytical formula.

Block shear

