Work no.		Prepared by:	Date:	Page:
07-153	**Bjørndalen Panorama** **Asker, Norway**	**TJP**	**3-maj-09**	**7**

Cantilevered UNP320 beam - with angled cut.

Point load:	F_5	=	95	kN	l	=	1100	mm

Data for the sections:

- Section 1:	x	=	0	mm				
	I_y	=	8,32E+06	mm4	M_1	=	0,0	kNm
	W_y	=	1,36E+05	mm3	V_1	=	95,0	kN
	A_1	=	5,84E+03	mm2				
- Section 2:	x	=	200	mm				
	I_y	=	2,02E+07	mm4	M_2	=	19,0	kNm
	W_y	=	2,32E+05	mm3	V_2	=	95,0	kN
	A_2	=	6,45E+03	mm2				
- Section 3:	x	=	400	mm				
	I_y	=	3,81E+07	mm4	M_3	=	38,0	kNm
	W_y	=	3,39E+05	mm3	V_3	=	95,0	kN
	A_3	=	7,07E+03	mm2				
- Section 4:	x	=	600	mm				
	I_y	=	6,28E+07	mm4	M_4	=	57,0	kNm
	W_y	=	4,57E+05	mm3	V_4	=	95,0	kN
	A_4	=	7,69E+03	mm2				
- Section 5:	x	=	800	mm				
	I_y	=	9,47E+07	mm4	M_5	=	76,0	kNm
	W_y	=	5,86E+05	mm3	V_5	=	95,0	kN
	A_5	=	8,30E+03	mm2				
- Section 6:	x	=	1000	mm				
	I_y	=	1,35E+08	mm4	M_6	=	95,0	kNm
	W_y	=	7,24E+05	mm3	V_6	=	95,0	kN
	A_6	=	8,92E+03	mm2				

Calculation of strength and stiffness:

Stress:	σ_	=	M_x / W_y	
	τ_	=	F_5 / A_x	
Deflection:	u_max	=	$1{,}2 \cdot \frac{1}{3} \cdot \frac{F_5 \cdot l^3}{E \cdot I}$	(*)

Cantilevered UNP320 beam - with angled cut, cont.

Demands:	σ_	<	f_yd	=	201	MPa
	τ_		$\frac{\sqrt{3}}{3} \cdot f_{yd}$	=	116	MPa
	u_max	<	l / 200	=	5,50	mm

- Section 1:	σ_		0	MPa	=>	OK!
	τ_	=	16,3	MPa	=>	OK!
- Section 2:	σ_		82,0	MPa	=>	OK!
	τ_	=	14,7	MPa	=>	OK!
- Section 3:	σ_		112,2	MPa	=>	OK!
	τ_	=	13,4	MPa	=>	OK!
- Section 4:	σ_4		124,8	MPa	=>	OK!
	τ_	=	12,4	MPa	=>	OK!
- Section 5:	σ_		129,8	MPa	=>	OK!
	τ_	=	11,4	MPa	=>	OK!
- Section 6:	σ_		131,1	MPa	=>	OK!
	τ_	=	10,7	MPa	=>	OK!

In order to get an estimate of the deflection of the beam, the deflection is calculated on basis of moment of inertia at the middle of the angled cut beam - i.e. in the middle of section 3 a

Section 1

	I_y	=	4,96E+07	mm4

Then the deflection it

	u_max	=	4,86	mm	=>	OK!

(*): I have added a factor 1,2 to the deflection formular for straight beams, in order to take into