

ELEMENT SELECTION MATTERS

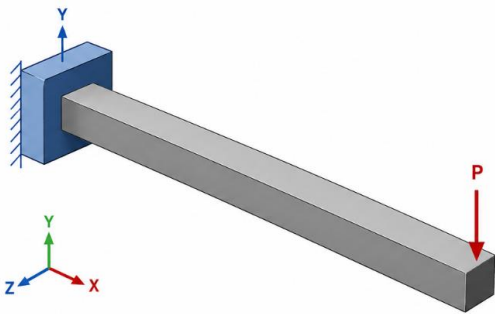
Same geometry. Same load. Different element formulations. Different results.

First Order Full Integration Element

✗ Shear Locking
too stiff

First Order Reduced Integration Element

✗ Hourglassing
Too flexible



Length	L	150 mm
Width	b	2.5 mm
Depth	h	5 mm
Load	P	5 N
Young's Modulus	E	70 GPa
Poisson's Ratio	ν	0.0

Normalized Tip Displacements with Fully Integrated Elements

Element	1 × 6	2 × 12	4 × 12	8 × 24
CPS4	0.074	0.242	0.242	0.561
CPS8	0.994	1.000	1.000	1.000
C3D8	0.077	0.248	0.243	0.563
C3D20	0.994	1.000	1.000	1.000

Normalized Tip Displacements with Reduced Integration Elements

Element	1 × 6	2 × 12	4 × 12	8 × 24
CPS4R	20.3*	1.308	1.051	1.012
CPS8R	1.000	1.000	1.000	1.000
C3D8R	70.1	1.323	1.063	1.015
C3D20R	0.999	1.000	1.000	1.000



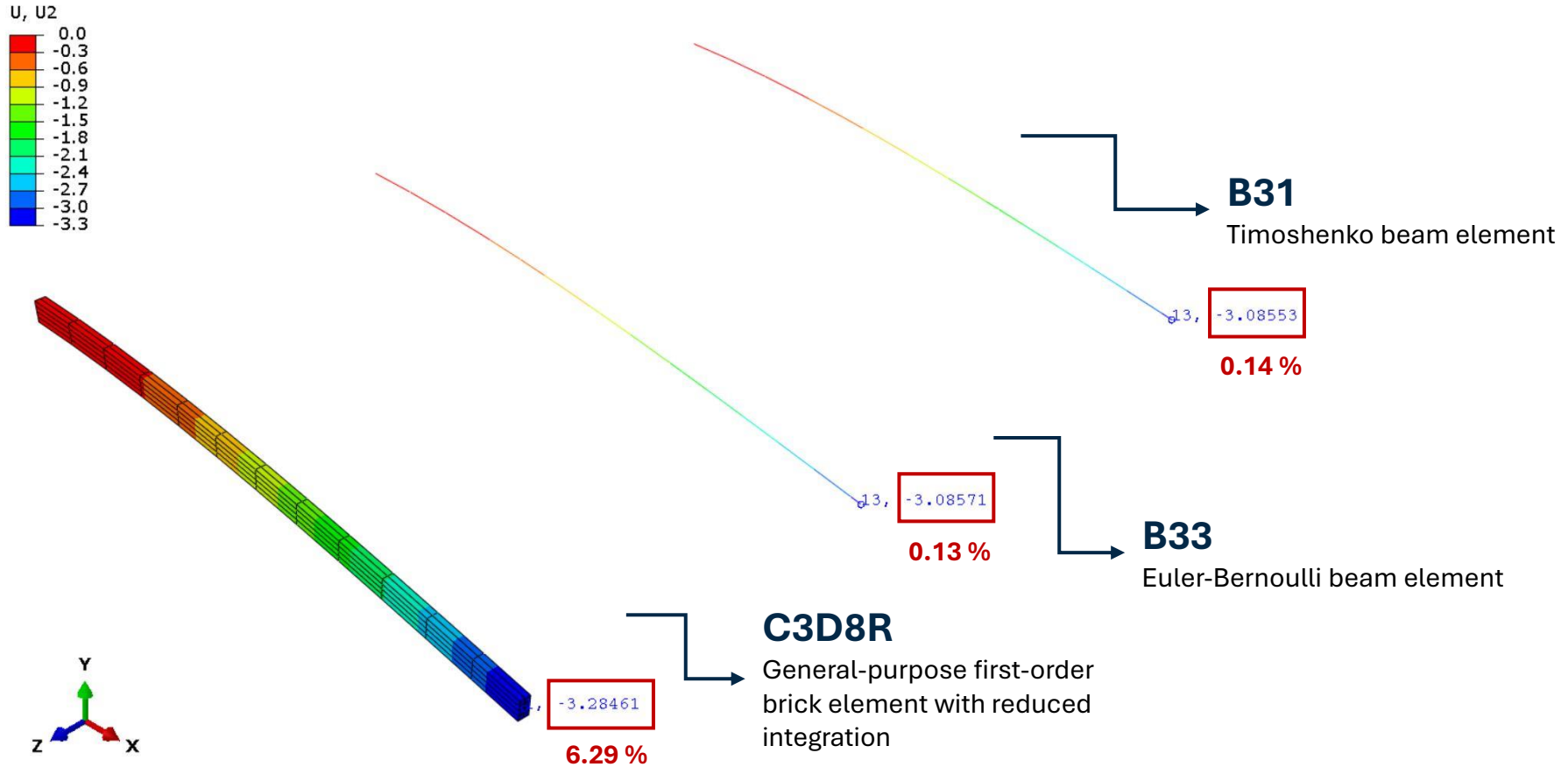
Getting **COLORFUL** contours **DOESN'T GUARANTEE** accurate results !

Dağhan Günhan

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Analytical Tip Displacement: $\delta_{tip} = \frac{Fl^3}{3EI} = 3.09 \text{ mm}$



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