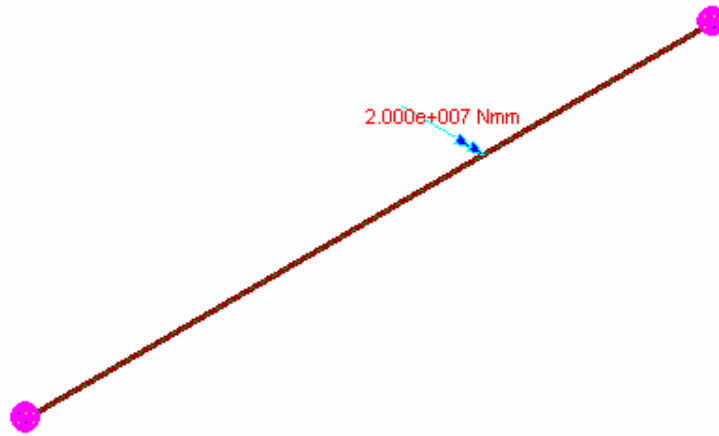
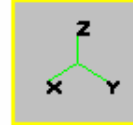


| TEST SCHEDULE<br>CASTALIA_STAT026BIS |              |                    |
|--------------------------------------|--------------|--------------------|
| SOLVING                              | BEAM PROBLEM | SOL.SAR.STAT026BIS |
| FINITE ELEMENT                       | SOLVER       | CLEVER (SARGON ©)  |



**Problem description:**

Simply supported beam with internal bending moment

**Keywords (english):** validation, benchmark, statics, finite elements, fem, solver, precision, reliability, quality control, beam, error measure

**Keywords (italian):** validazione, benchmark, statica, elementi finiti, fem, solutore, precisione, affidabilità, controllo qualità, travi, misura di errore

**Editorial note:**

Target values are based on theoretical values, cross check values or accepted values. Where “theoretical” values are used, target values have been computed using well known formulae and/or published results.

**Note:**

Shear area is not used, that is shear energy neglected. Dxi and Dzi are the offsets from lower Z alignment leftmost available node.

| TEST SCHEDULE<br>CASTALIA_STAT026BIS |              |                    |
|--------------------------------------|--------------|--------------------|
| SOLVING                              | BEAM PROBLEM | SOL.SAR.STAT026BIS |
| FINITE ELEMENT                       | SOLVER       | CLEVER (SARGON ©)  |

| GEOMETRY & CONSTRAINTS |          |   |   |             |
|------------------------|----------|---|---|-------------|
| Full Length [mm]       | Dx1 [mm] |   |   | Constraints |
| 3000                   | 1000     | - | - | As shown    |

| LOAD                |            |                      |  |
|---------------------|------------|----------------------|--|
| Type                | Value      | Point of application |  |
| moment concentrated | 2.000e+007 | Dx1                  |  |
|                     |            | -                    |  |
|                     |            | -                    |  |
|                     |            | -                    |  |

| MATERIAL                   |                            |                        |            |            | Fe360 |
|----------------------------|----------------------------|------------------------|------------|------------|-------|
| $f_y$ [N/mm <sup>2</sup> ] | $f_u$ [N/mm <sup>2</sup> ] | E [N/mm <sup>2</sup> ] | $\nu$      | $\alpha$   |       |
| 2.350e+002                 | 3.600e+002                 | 2.060e+005             | 3.000e-001 | 1.200e-005 |       |

| CROSS-SECTION                |                              |                          |                          |                          | IPE200                   |
|------------------------------|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A [mm <sup>2</sup> ]         | $J_2$ [mm <sup>4</sup> ]     | $J_3$ [mm <sup>4</sup> ] | $J_t$ [mm <sup>4</sup> ] | $W_2$ [mm <sup>3</sup> ] | $W_3$ [mm <sup>3</sup> ] |
| 2.981e+003                   | 2.051e+007                   | 1.540e+006               | 6.254e+004               | 2.051e+005               | 3.081e+004               |
| $W_{pl2}$ [mm <sup>3</sup> ] | $W_{pl3}$ [mm <sup>3</sup> ] | $i_2$ [mm]               | $i_3$ [mm]               | $i_t$ [mm]               |                          |
| 2.597e+005                   | 4.776e+004                   | 8.296e+001               | 2.273e+001               | 2.887e+001               |                          |

| OTHER DATA |  |  |  |  |  |
|------------|--|--|--|--|--|
|            |  |  |  |  |  |
|            |  |  |  |  |  |

| TARGET VALUES | vs | COMPUTED VALUES |
|---------------|----|-----------------|
|---------------|----|-----------------|

| Description                                    | $T_v$        | $T_{vK}$ | $C_v$        | $(C_v - T_v)$       | $100 \frac{T_v - C_v}{C_v}$ |
|--|--------------|----------|--------------|---------------------|-----------------------------|
| Shear T3, I extreme. Beam # 1. Load case # 1   | -6.6667e+003 | Th       | -6.6667e+003 | <b>3.3333e-007</b>  | <b>-0.0000</b>              |
| Shear T3, J extreme. Beam # 1. Load case # 1   | 6.6667e+003  | Th       | 6.6667e+003  | <b>-3.3333e-007</b> | <b>-0.0000</b>              |
| Bending M2, I extreme. Beam # 1. Load case # 1 | 0.0000e+000  | Th       | 1.5930e-010  | <b>1.5930e-010</b>  | <b>0.0000</b>               |
| Bending M2, J extreme. Beam # 1. Load case # 1 | 0.0000e+000  | Th       | -1.8626e-009 | <b>-1.8626e-009</b> | <b>-0.0000</b>              |

$C_v$  computed value  
 $T_v$  target value  
 $T_{vK}$  target value kind (theoretical, cross check, accepted).  
     Th theoretical value  
     Cr cross check value (theoretical target value is not known, results obtained with a different program are used as target values).  
     Ac accepted value (a value which, on the basis of some argument, can be considered acceptable).  
 $100(T_v - C_v) / C_v$  relative error percentage

Computational notes:

**Authors:** Ing. Marco Croci, Ing. Paolo Rugarli  
**Computed errors:** checksolvers.exe, by Castalia srl.

