

Discrete Beam Axis Systems

*SECTION_BEAM
SCOOR options

Mar 2017

For a discrete beam (ELFORM=6) the coordinate system is defined on the *SECTION_BEAM card using the CID option.

```
*SECTION_BEAM
      1      6      0.0      0.0      0.0     -3.0      0.0
    100.0      0.0      1      0.0      0.0      0.0      0.0      0.0
```

How this axis system updates during the analysis is controlled by the SCORR option on the *SECTION_BEAM card.

```
*SECTION_BEAM
      1      6      0.0      0.0      0.0     -13.0      0.0
    100.0      0.0      1      0.0      0.0      0.0      0.0      0.0
```

SCOOR

Affects the discrete beam formulation (see [Remark 7](#)) and also the update of the local coordinate system of the discrete beam element. This parameter does not apply to cable elements. The force and moment resultants in the output databases are output in the local coordinate system. See [Remark 9](#) for more on the local coordinate system update.

EQ.-13.0: Like -3.0, but with correction for beam rotation

EQ.-12.0: Like -2.0, but with correction for beam rotation

EQ.-3.0: beam node 1, the angular velocity of node 1 rotates triad,

EQ.-2.0: beam node 1, the angular velocity of node 1 rotates triad but the r-axis is adjusted to lie along the line between the two beam nodal points. This option is not recommended for zero length discrete beams.,

Bug – Do not use

EQ.-1.0: beam node 1, the angular velocity of node 1 rotates triad,

EQ.0.0: centered between beam nodes 1 and 2, the average angular velocity of nodes 1 and 2 is used to rotate the triad,

EQ.+1.0: beam node 2, the angular velocity of node 2 rotates triad.

EQ.+2.0: beam node 2, the angular velocity of node 2 rotates triad. but the r-axis is adjusted to lie along the line between the two beam nodal points. This option is not recommended for zero length discrete beams.

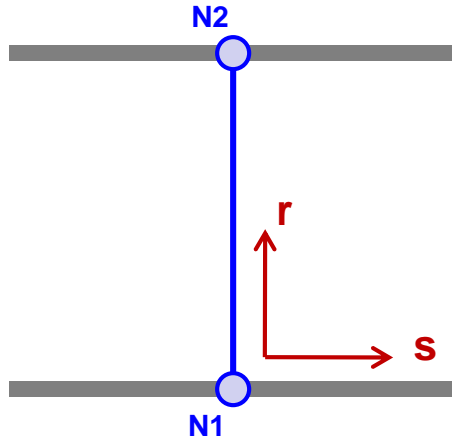
Bug – Do not use

EQ.+3.0: beam node 2, the angular velocity of node 2 rotates triad.

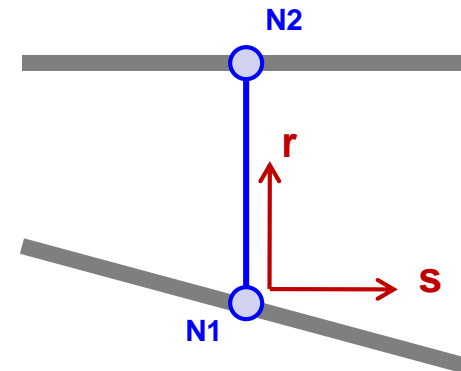
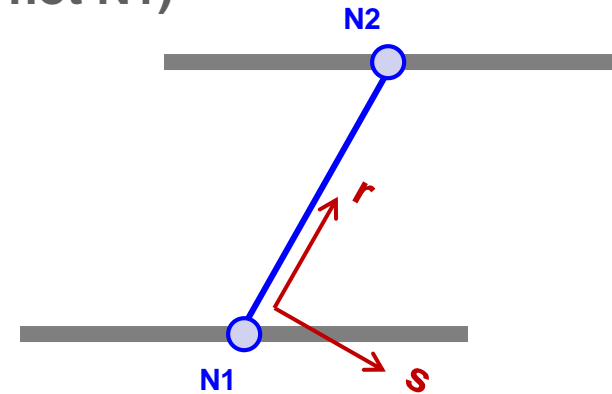
EQ.+12.0: Like +2.0, but with correction for beam rotation

EQ.+13.0: Like +3.0, but with correction for beam rotation

For a non zero length beam the SCOOR = -13, -12, 12, or 13 options should be used.
SCOOR = -12 (12 is the same but centred on N2 not N1)

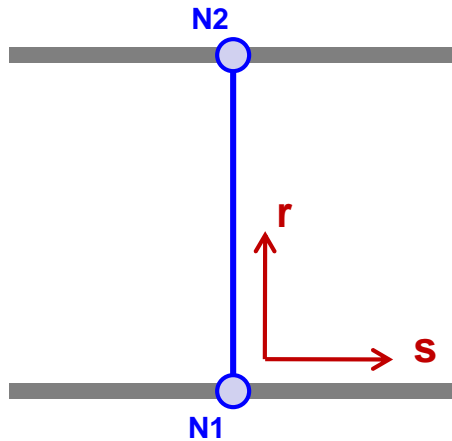


Initial State

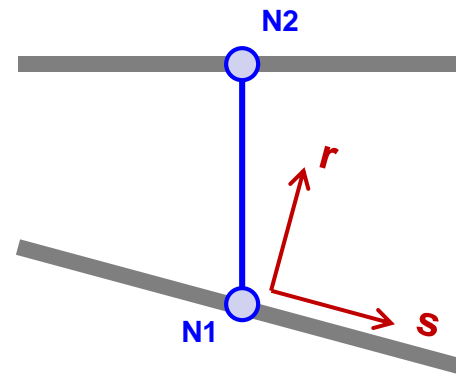
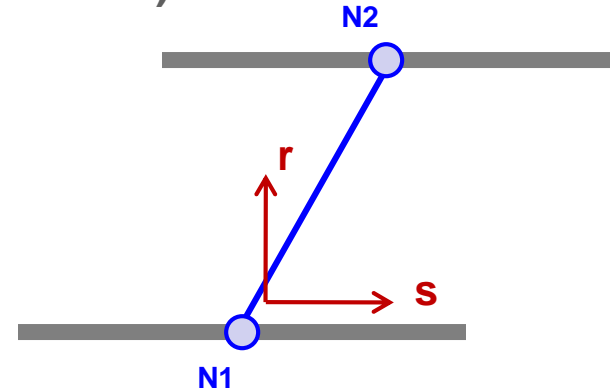
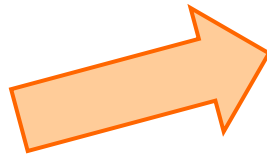


Deformed State

SCOOR = -13 (13 is the same but centred on N2 not N1)

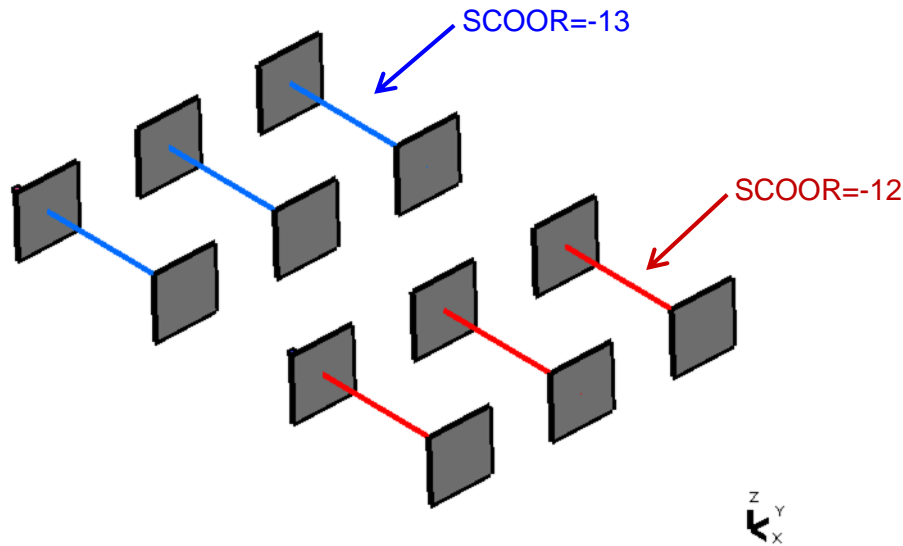


Initial State

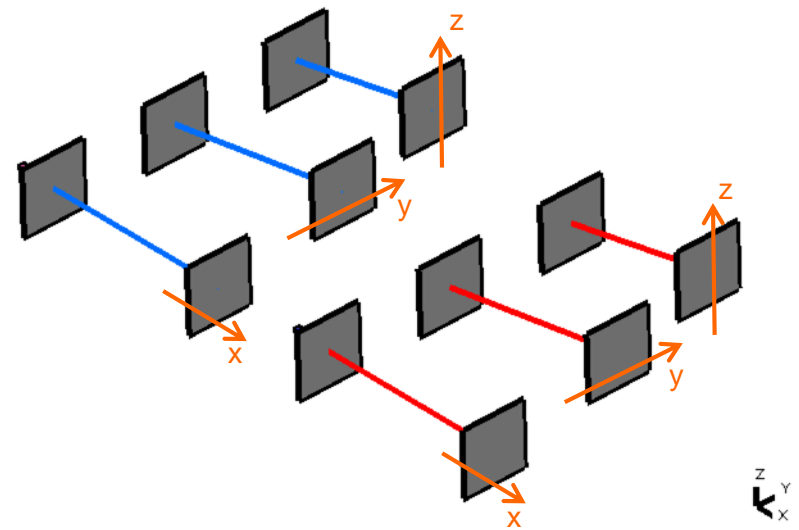


Deformed State

One set of beams has $\text{SCOOR}=-13$ and the other set has $\text{SCOOR}=-12$. A beam from each set is then displaced in the x, y and z axis



Initial State

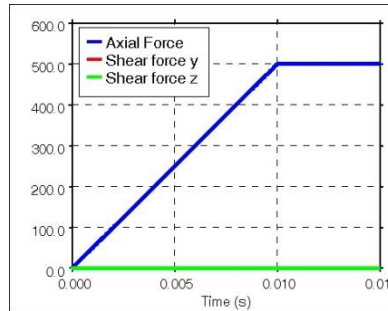


Deformed State

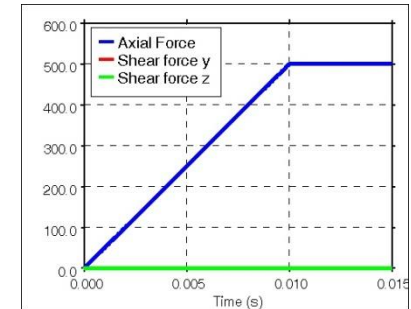
Simple Example

LS-DYNA®

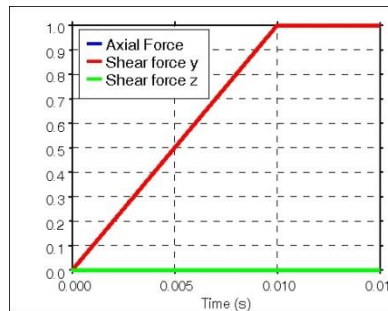
X Displacement
SCOR = -13



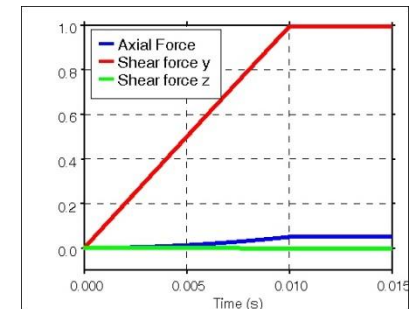
X Displacement
SCOR = -12



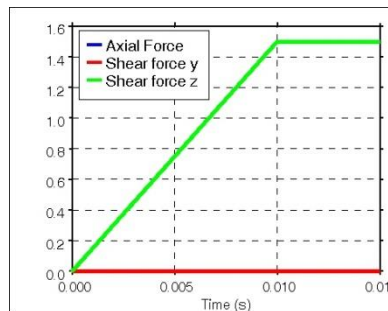
Y Displacement
SCOR = -13



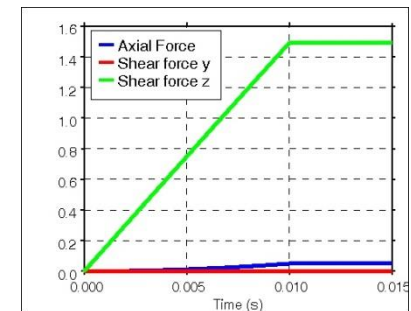
Y Displacement
SCOR = -12



Z Displacement
SCOR = -13

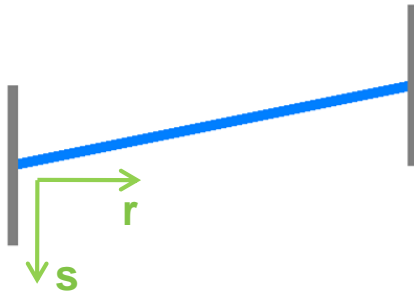
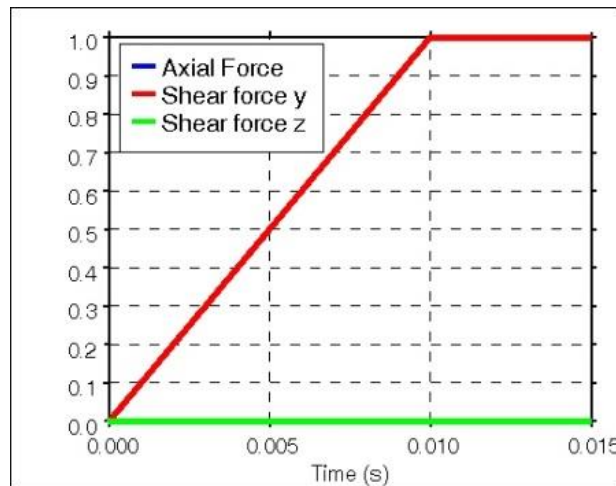


Z Displacement
SCOR = -12

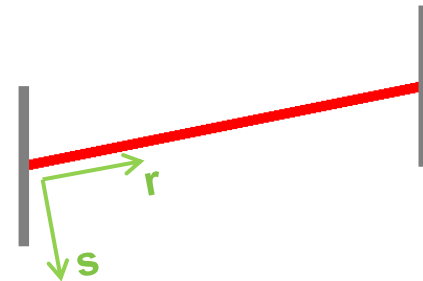
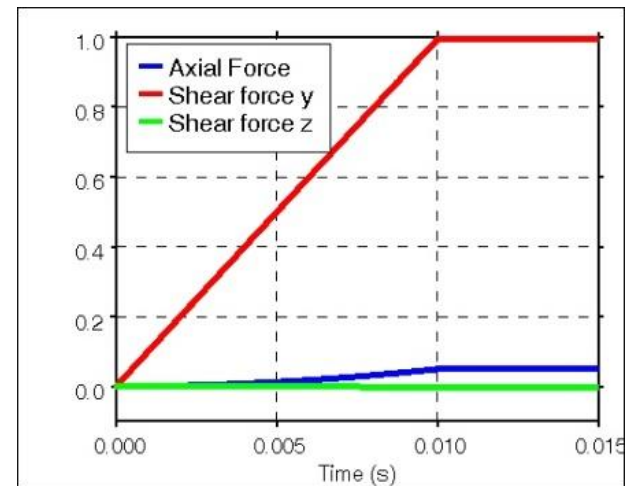


In the case of the y or z shear loading it can be seen that as the beam rotates with $SCOOR=-13$ no axial force is generated whereas with $SCOOR=-12$ a force is generated.

SCOOR = -13



SCOOR = -12





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