***CONSTRAINED_COORDINATE_{***OPTION***}**

To define constraints based on position coordinates the following options are available:

> **<BLANK>**
>
> **LOCAL**

Purpose: The keyword is developed to allow the definition of constraints in position coordinates in springback simulation. With the frequent application of adaptive mesh in stamping simulation, nodes needed for springback constraints are often unavailable until the last process simulation before springback is complete. On the other hand, if the nodes are available, their positions may not be exactly on the desired locations required for springback constraints. With this new keyword, the springback simulation is no longer dependent on the previous process simulation results and the exact springback constraint locations can be specified.

Card 1	1	2	3	4	5	6	7	8
Variable	ID	PID	IDIR	X1	Y1	Z1	CID	
Type	I	I	I	F	F	F	I	
Default	none	none	none	0.0	0.0	0.0	0	

VARIABLE	DESCRIPTION
ID	Identification number of a constraint.
PID	Part ID of the part to be constrained.
IDIR	Applicable degrees-of-freedom being constrained: EQ. 1: x translational degree-of-freedom, EQ. 2: y translational degree-of-freedom, EQ. 3: z translational degree-of-freedom.
X1, Y1, Z1	X, Y, Z coordinates of the location being constrained.
CID	Local coordinate system ID.

Remarks:

1. Identification number of a constraint must be unique.

2. Part ID of the part to be constrained must be input correctly.

3. When the option _LOCAL is invoked, local coordinate system ID (CID) should be input and defined using keyword *DEFINE_COORDINATE_{*OPTION*}. A local coordinate system can be created easily with *Coord* menu in page 5 of the LSPP v2.4. Under *Coord* menu, select *SYSTEM* under *Create,* and use *EPoint* and *alongZ* to define the system based on one straight line. For LSPP v3.1, in menu 'Model and Part' and under 'Create Entity', select 'Define / Coordinate", and check 'Cre' for create. Select *System in the pulldown menu next to 'Type', check 'Geopts' to define a local system based on two geometry points, pick two points and select the desired axis in the pulldown menu next to 'Direction', and hit 'Apply'.

4. An example of using the keyword is listed below. A part with PID 18 is constrained in 6 locations in local coordinate system ID 9, defined by keyword *DEFINE_COORDINATE_SYSTEM. Constrained DOFs are indicated by IDIR.

```
$---+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8
*CONSTRAINED_COORDINATE
$       ID     IDPT     IDIR        x        y        z      CID
         1       18        2 -555.128     86.6  1072.29        9
         2       18        3 -555.128     86.6  1072.29        9
         3       18        3 -580.334   -62.15  1068.32        9
         4       18        1  568.881  81.2945  1033.72        9
         5       18        2  568.881  81.2945  1033.72        9
         6       18        3  568.881  81.2945  1033.74        9
*DEFINE_COORDINATE_SYSTEM
$      CID       X0       Y0       Z0       XL       YL       ZL
         9      0.0      0.0      0.0      0.0     10.0      0.0
$       XP       YP       ZP
      10.0     10.0      0.0
```
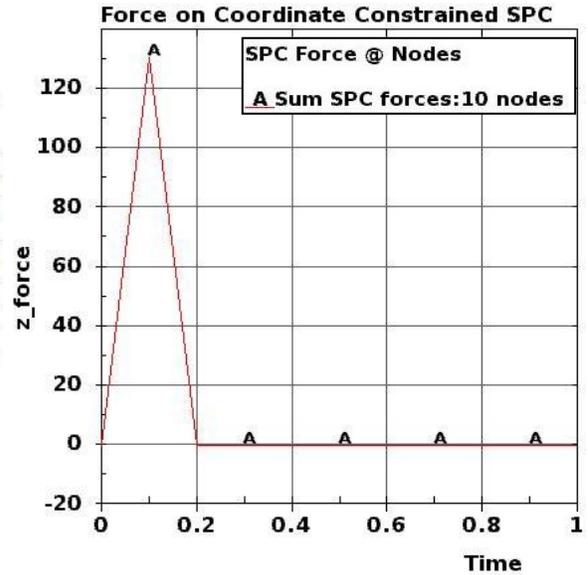
5. It is now possible to output SPC forces on the coordinates constrained. For each position coordinate set, an extra node will be generated and SPC forces are calculated and output to SPCFORC file, with frequency specified in keyword *DATABASE_SPCFORC. Shown in the following figures are the SPC forces calculated with multi-steps static implicit solution on a springback panel (NUMISHEET 2005 cross member) with over-constrained boundary conditions. This SPC output feature is available in LS-DYNA R5 Revision 62560 and later releases.

6. This feature is now available in LS-DYNA R5 Revision 52619 or later releases and is also supported by Metal Forming GUI in LSPP v3.1, under 'Springback'.
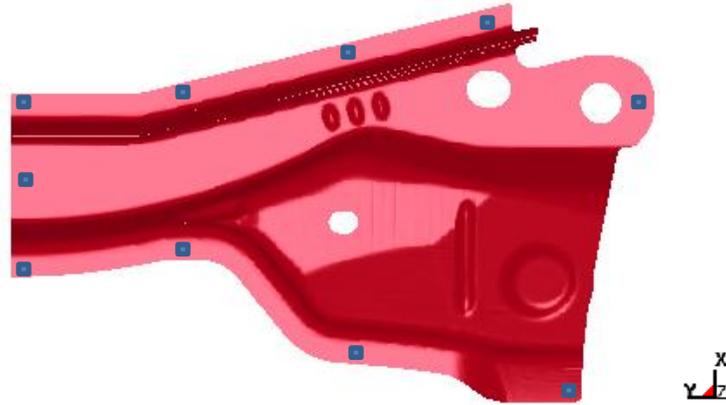
Constrained locations of a springback panel (NUMISHEET 2005 cross member).
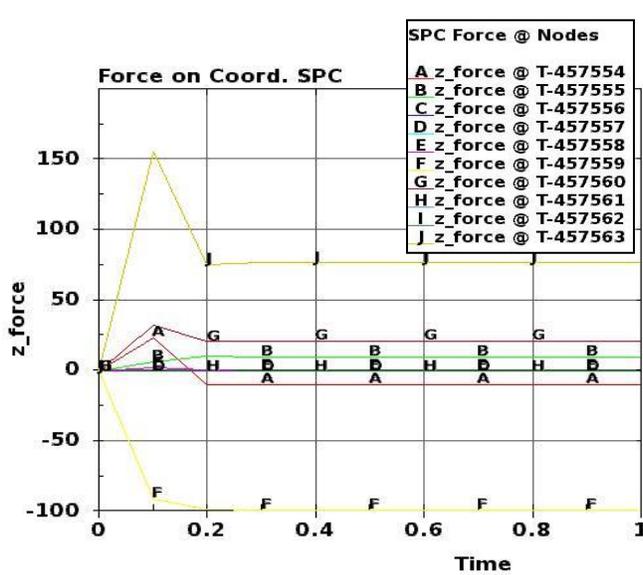
SPC Z-forces on 10 nodes.   Z-force summation.