

Create an LS-DYNA input deck for a metal-forming simulation.

1. Import geometry data

File → Import → IGES File

open srail.igs

note: all surfaces belong to die, 4 lines are blank edges (see Figure 1)

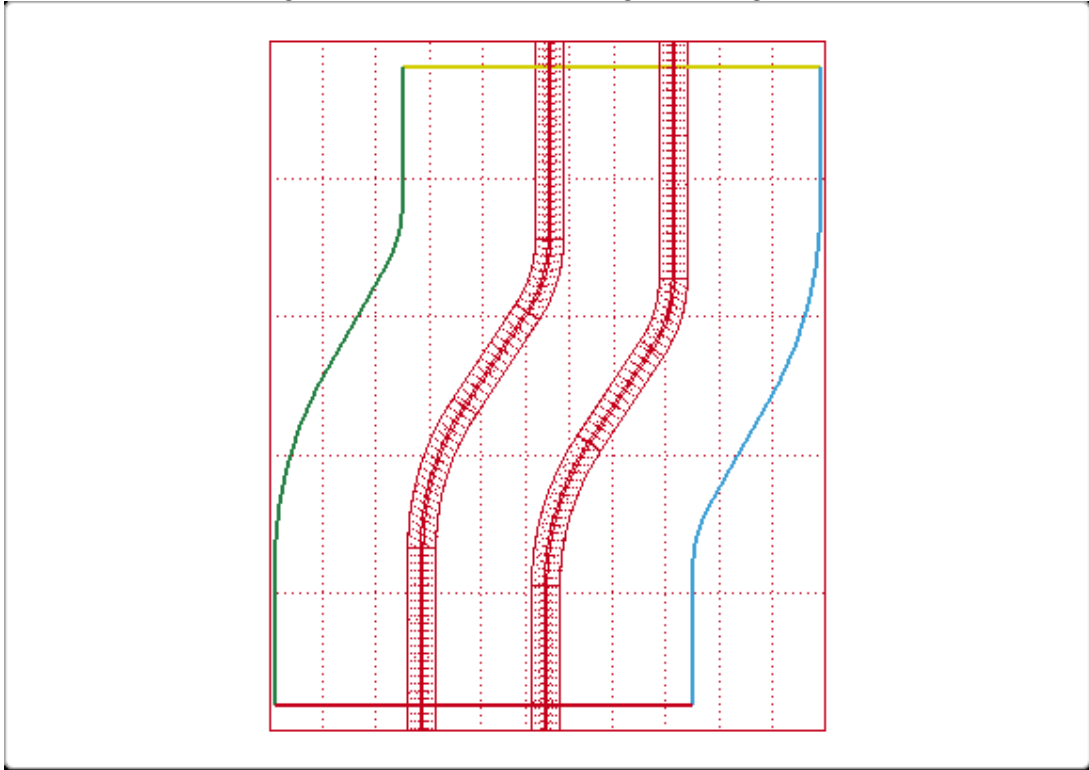


Figure 1

2. Mesh die surfaces

go to Page 7: SurMesh (see Figure 2)

select ☒ Tmesh

click *All Vis* in gen select panel

click *Mesh It*

click *Accept*

click *Mesh* render button

activate ☒ Blank All Surfaces (see Figure 3)

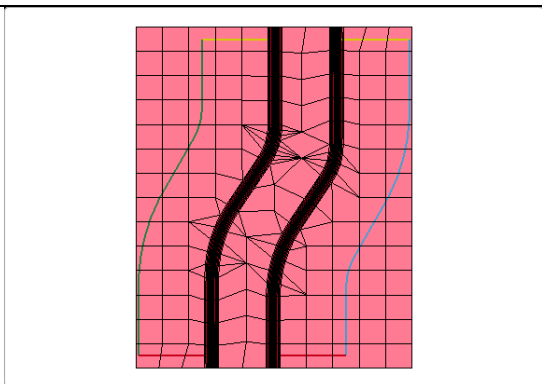


Figure 3

Surface Mesh Interface

☐ Amesh ☒ Tmesh ☐ Load

☒ In original cad part

☐ Surfaces gap check

Mesh Type:

☒ Connected

☐ UnConnected

Meshing Parameters

Max.Ele Size:

Min.Ele Size:

Chordal Dev.:

Min.Int. Ang:

Gap Tolerance:

☐ Setting by part

☒ Blank All Surfaces

Figure 2

3. Create mesh for blank

go to Page 7: BMesh (see Figure 4)

select ☒ By Curve

pick the blank outline in the graphics window

click *Create*

click *Accept*

click *Mesh* render button 2 times (see Figure 5)

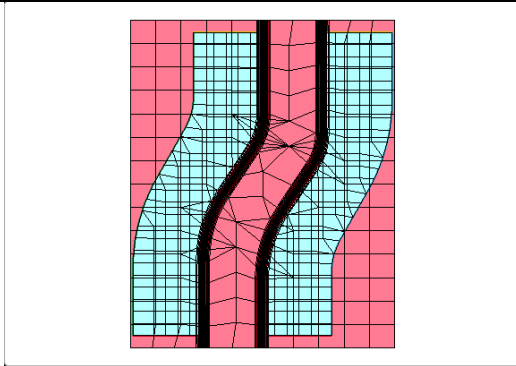


Figure 5

Blank Mesher

☐ Four Points New

☐ Rectangle PID 3

☒ By Curve

By Using Curves

Load Iges curve

☒ Outline

☐ Holes

☐ Smooth 5

☒ BoundarySmooth

☐ Jagged Edge

☐ Tria Fill

☐ No Trim

Element Alignment

X	Y	Z
1	0	0
Alpha:	0	
El. Size:	10	

Create Accept Reject Done

Figure 4

4. Adjust die element normals

go to Page 2: Normals (see Figure 6)

5. Create mesh for punch

go to Page 2: Offset (see Figure 9)

enter Offset Distance=1.1

activate ☒ Copy Elem

enter PID=3

select ☒ Area in gen select panel

select ☒ ByElem

draw box to select elements (see Figure 10)

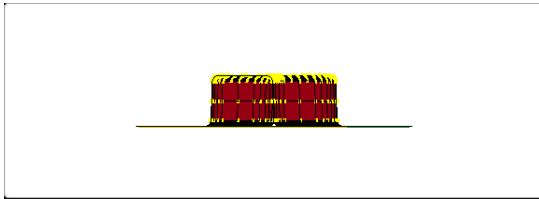


Figure 10

click *Offset +*

click *Accept*

click *Mesh* render button 2 times

click *Clear* in gen select panel (see Figure 11)

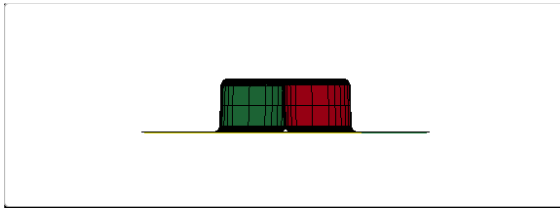


Figure 11

Offset Model

Offset Distance:

1.1

Offset - Offset +

Accept Reject Done

☒ Copy Elem ☐ Transfer

No. of Copies: 1

☐ PickPart 3 Plist

Starting EID: 2159

Starting NID: 2197

Figure 9

6. Create mesh for binder

enter PID=4

select ☒ Pick in gen select panel

activate ☒ Prop

set Ang: 1.0

click *Bottom* render button

pick an element on each side of the s-channel (see Figure 12)

click *Offset* +

click *Accept*

click *Mesh* render button 2 times (see Figure 13)

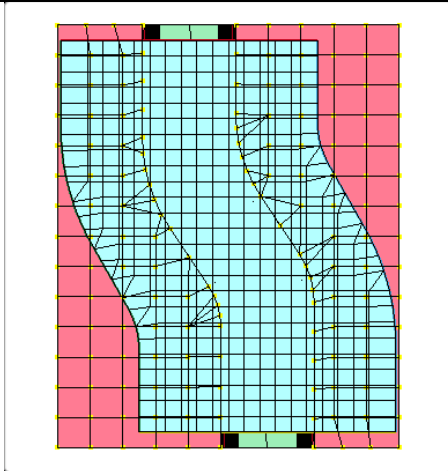


Figure 12

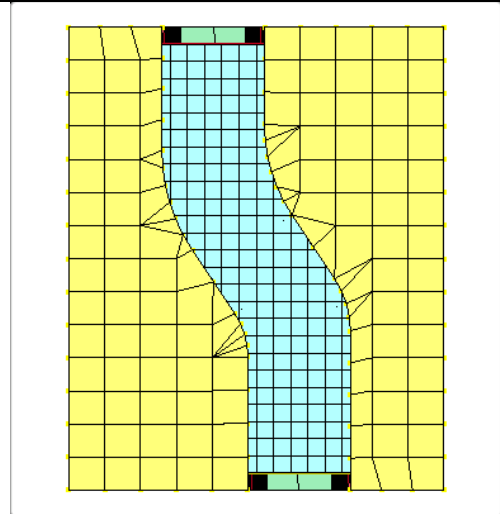


Figure 13

7. Define materials

go to page 3: *Mat

set GroupBy: All

set Sort: Type

a. deformable material for blank

select 037-TRANSVERSELY_ANISOTROPIC_ELASTIC_PLASTIC from the list

click *Edit*

click *NewID* in the KEYWORD INPUT popup form

enter TITLE: blank material

enter RO=7.83e-9

enter E=207000

enter PR=0.3

enter SIGY=210

enter ETAN=540

enter R=1.6

click *Accept*

click *Done*

b. rigid material for tools

select 020-RIGID from the list

click *Edit*

click *NewID* in the KEYWORD INPUT popup form

enter TITLE: rigid punch

enter RO=7.83e-9

enter E=207000

enter PR=0.3

set CMO: 1.0

enter CON1=7

enter CON2=7

click *Accept*

click *NewID*

enter TITLE: rigid die

enter CON1=4

click *Accept*

click *NewID*

enter TITLE: rigid binder

click *Accept*

click *Done*

8. Define section properties

go to page 3: *Section
select SHELL from the list
click *Edit*

a. blank section
click *NewID* in the KEYWORD INPUT popup form
enter TITLE: blank section
enter NIP=3
enter T1=1
click *Accept*

b. tool sections
click *NewID*
enter TITLE: rigid section
enter NIP=2
click *Accept*
click *Done*

9. Define parts, assign sections and materials

(go to page 5: PartD

select ☒ Modi

select S1 from the list

enter Part Title: die, click *Accept*

select S2 from the list

enter Part Title: blank, click *Accept*

select S3 from the list

enter Part Title: punch, click *Accept*

select S4 from the list

enter Part Title: binder, click *Accept*

select ☒ Assi

select S1 die from the list

click *SECID* in the bottom panel (text, not a button)

select "2 rigid section" from list in Link SECTION Dialog

click *Done*

click *MID* in the bottom panel (text, not a button)

select "3 rigid die" from list in Link MAT Dialog

click *Done*

click Assign Part: *Apply*

select S2 blank from the list

click *SECID* in the bottom panel

select "1 blank section" from list in Link SECTION Dialog

click *Done*

click *MID* in the bottom panel

select "1 blank material" from list in Link MAT Dialog

click *Done*

set ADPOPT: 1 (activate adaptivity)

click Assign Part: *Apply*

select S3 punch from the list

click *SECID* in the bottom panel

select "2 rigid section" from list in Link SECTION Dialog

click *Done*

click *MID* in the bottom panel

select "2 rigid punch" from list in Link MAT Dialog

click *Done*

set ADPOPT: 0 (deactivates this option)

click Assign Part: *Apply*

select S4 binder from the list

click *SECID* in the bottom panel

select "2 rigid section" from list in Link SECTION Dialog

click *Done*

click *MID* in the bottom panel

select "4 rigid binder" from list in Link MAT Dialog

click *Done*

click Assign Part: *Apply*

10. Automatically position parts

go to page 2: PTravel (see Figure 14)

pick the blank in the graphics window (cyan)
 activate ☒ Fixed Parts
 click *Right* render button
 pick the punch in the graphics window (green)
 set ☒ T1 ☐ T2
 enter Gap=0.1
 click *Z*
 click *Flip Dir.* (should now be Z=-1)
 click *AutoPos*
 click *Accept* (see Figure 15)

activate ☒ Moving Parts
 pick the die (red)
 activate ☒ Fixed Parts
 click *Top* render button
 pick the blank
 set ☐ T1 ☒ T2
 click *AutoPos*
 record distance (-40.100839) to be used as the
 stroke for the die travel
 click *Accept*

activate ☒ Moving Parts
 click *Bottom* render button
 pick the binder (yellow)
 activate ☒ Fixed Parts
 click *Right* render button
 click *+10* render button (changes to -10)
 click *Rx* render button
 pick the blank
 click *Flip Dir.* (should now be Z=1)
 click *AutoPos*
 click *Accept* (see Figure 16)

Part Travel

☒ Moving Parts
☐ Fixed Parts

☐ Allow rotation
☐ Ref. node 0

☒ T1 ☒ T2
 Gap: 0.

Direction

X	Y	Z
0.	0.	1.

Flip Dir.

AutoPos Accept
 Reject Done

Figure 14

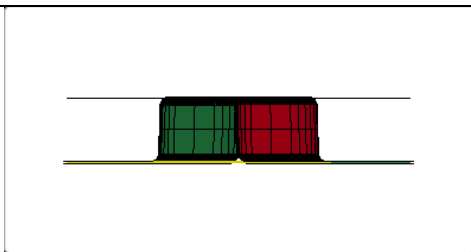


Figure 15

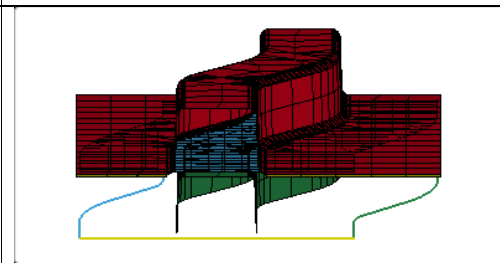


Figure 16

11. Define contact
go to page 3: *Contact

select FORMING_ONE_WAY_SURFACE_TO_SURFACE from the list
click *Edit*
click *NewID* in the KEYWORD INPUT popup form
enter TITLE: blank/punch
set SSTYP=3
click the SSID link button (dot)
select 2 blank in Link PART Dialog
click *Done* in Link PART Dialog
set MSTYP=3
click the MSID link button (dot)
select 3 punch in Link PART Dialog
click *Done* in Link PART Dialog
enter FS=0.1
click *Accept*

click *NewID*
enter TITLE: blank/die
click the MSID link button
select 1 die in Link PART Dialog
click *Done* in Link PART Dialog
click *Accept*

click *NewID*
enter TITLE: blank/binder
click the MSID link button
select 4 binder in Link PART Dialog
click *Done* in Link PART Dialog
click *Accept*
click *Done*

12. Define curves

go to page 3: *Define
select CURVE from the list
click *Edit*

a. define velocity curve
click *NewID* in the KEYWORD INPUT popup
form
enter TITLE: die velocity
click *Insert*
enter A1=2.0e-3, O1=-5000
click *Insert*
enter A1=8.02e-3
click *Insert*
enter A1=1.002e-2, O1=0
click *Insert*
click *Accept* (see Figure 17)

b. define binder force curve
click *NewID*
enter TITLE: binder force
click *Delete* 4 times
enter A1=0.0, O1=0.0
click *Insert*
enter A1=1.0e-5, O1=2.0e5
click *Insert*
enter A1=1.0
click *Insert*
click *Accept* (see Figure 18)
click *Done*

A1	O1
1.002e-2	-5000
1 0.0000e+000	0.0000e+000
2 2.0000e-003	-5.0000e+003
3 8.0200e-003	-5.0000e+003
4 1.0020e-002	-5.0000e+003

Data PL. 4

Replace Insert
Delete Help

Figure 17

A1	O1
1	2.0e-5
1 0.0000e+000	0.0000e+000
2 1.0000e-005	2.0000e-005
3 1.0000e+000	2.0000e-005

Data PL. 3

Replace Insert
Delete Help

Figure 18

13. Define tool movement
go to page 3: *Boundry

select PRESCRIBED_MOTION_RIGID from the list
click *Edit*
click *NewID* in the KEYWORD INPUT popup form
enter TITLE: die travel
click the PID link button (dot)
select 1 die in Link PART Dialog
click *Done* in Link DEFINE Dialog
set DOF=3
click the LCID link button (dot)
select 1 die velocity in Link DEFINE Dialog
click *Done* in Link DEFINE Dialog
click *Accept* (see Figure 19)
click *Done*

The screenshot shows the 'KEYWORD INPUT' dialog box. At the top, there are buttons: 'NewID', 'Draw', 'Pick', 'Add', 'Accept', 'Del/UnD', 'Default', and 'Done'. A 'Setting' button is also present. Below these buttons, there is a checkbox for 'Use *PARAMETER' and a text field for '(Subsys: 1)'. The main area contains a red text entry: '*BOUNDARY_PRESCRIBED_MOTION_RIGID_(ID) (1)'. Below this, there is a table with columns: ID, TITLE, PID, DOF, VAD, LCID, SF, VID, DEATH, and BIRTH. The table has one row with the following values: ID: 0, TITLE: die travel, PID: 1, DOF: 3, VAD: 0, LCID: 1, SF: 1.00000, VID: 0, DEATH: 1.000e+028, BIRTH: 0.0. Below the table, there is a 'COMMENT:' field. At the bottom, there is a status bar that reads: 'Total Card: 1 Smallest ID: 1 Largest ID: 1 Total deleted card: 0'.

ID	TITLE	PID	DOF	VAD	LCID	SF	VID	DEATH	BIRTH
0	die travel	1	3	0	1	1.00000	0	1.000e+028	0.0

COMMENT:

Total Card: 1 Smallest ID: 1 Largest ID: 1 Total deleted card: 0

Figure 19

14. Assign binder force

go to page 3: *Load

select RIGID_BODY from the list

click *Edit*

click *NewID* in the KEYWORD INPUT popup form

click the PID link button (dot)

select 4 binder in Link PART Dialog

click *Done* in Link DEFINE Dialog

set DOF=3

click the LCID link button (dot)

select 2 binder force in Link DEFINE Dialog

click *Done* in Link DEFINE Dialog

click *Accept* (see Figure 20)

click *Done*

The screenshot shows the 'KEYWORD INPUT' dialog box. At the top, there are buttons: 'NewID', 'Draw', 'Pick', 'Add', 'Accept', 'Del/UnD', 'Default', and 'Done'. Below these is a checkbox 'Use *PARAMETER' and a label '(Subsys: 1)' with a 'Setting' button. The main area displays the keyword '*LOAD_RIGID_BODY (1)' in red. Below this is a table with columns: PID, DOF, LCID, SE, CID, M1, M2, and M3. The values are: PID=4, DOF=3, LCID=2, SE=1.00000, CID=0, M1=0, M2=0, M3=0. Below the table is a 'COMMENT:' text area. At the bottom, it says 'Total Card: 1 Smallest ID: 1 Largest ID: 1 Total deleted card: 0'.

PID	DOF	LCID	SE	CID	M1	M2	M3
4	3	2	1.00000	0	0	0	0

COMMENT:

Total Card: 1 Smallest ID: 1 Largest ID: 1 Total deleted card: 0

Figure 20

15. Define solution control

go to page 3: *Control

a. termination time

select TERMINATION from the list

click *Edit*

enter ENDTIM=1.002e-2

click *Accept*

click *Done*

b. time step (mass scaling)

select TIMESTEP from the list

click *Edit*

enter DT2MS=-2e-6

click *Accept*

click *Done*

c. adaptive parameters

select ADAPTIVE from the list

click *Edit*

enter ADPFREQ=5.0e-4

enter ADPTOL=10

enter ADPENE=2.0

click *Accept*

click *Done*

d. shell parameters

select SHELL from the list

click *Edit*

set ISTUPD=1

click *Accept*

click *Done*

16. Define output requests (for more details see [Tutorial 1](#), [Tutorial 2](#), and [Tutorial 3](#))

go to page 3: *Dbase

a. plot files for animation

select BINARY_D3PLOT from the list

click *Edit*

enter NPLTC=10

click *Accept*

click *Done*

b. ASCII time history

select ASCII_option from the list

click *Edit*

enter Default interval=1.0e-4

activate ☒ GLSTAT

activate ☒ MATSUM

activate ☒ RCFORC

activate ☒ RBDOUT

activate ☒ SLEOUT

click *Accept*

click *Done*

17. Save the model

File → Save Keyword (see Figure 21)

enter Filename: srail.k

click *Save*

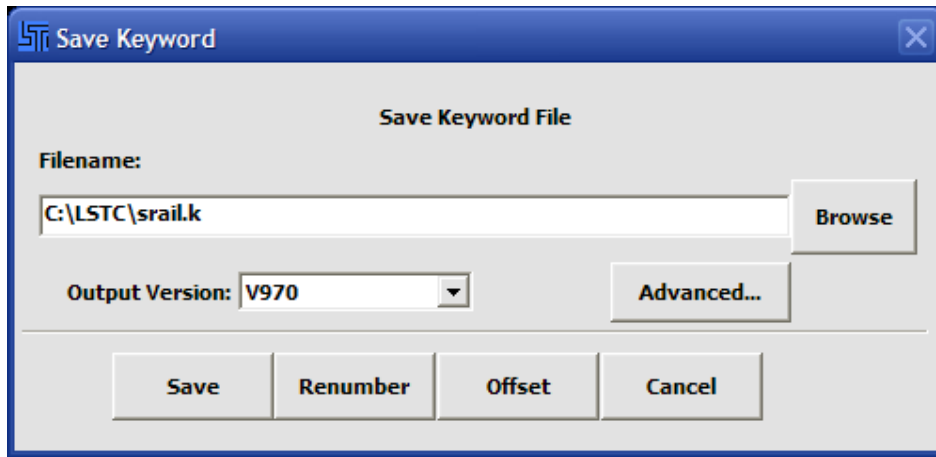


Figure 21