

**\*ALE\_STRUCTURED\_MESH\_REFINE**

Purpose: This keyword is to provide a convenient utility to refine existing meshes generated by \*ALE\_STRUCTURED\_MESH card. All the NODESET, ELEMENTSET and SEGMENTSET defined using SALECPT and SALEFAC options in \*SET?\_GENERAL\_ cards will be automatically updated. This way, this card is the only modification in the input deck for users to define a refined S-ALE mesh.

Card 1	1	2	3	4	5	6	7	8
Variable	MSHID	IFX	IFY	IFZ				
Type	I	I	I	I				
Default	none	1	1	1				

**VARIABLE****DESCRIPTION**

MSHID

S-ALE Mesh ID. The ID of the Structured ALE mesh to be refined.

IFX, IFY, IFZ

Refinement factor at each local direction. Please see remark 1.

**Remarks:**

1. IFX, IFY, IFZ prescribe how many times to refine the grid along each direction. They have to be integers.
2. This keyword provides a new modeling technique to handle the multi-material ALE problems. Compared to pure Lagrange problems, models contain multi-material ALE fluids are often time consuming and memory demanding. So it is better to construct a concept model with much coarse mesh to get an estimate of the computational resources needed and refine the concept model mesh gradually until convergence is achieved. This keyword minimized the user effort following such procedure.

**Example:**

This example below generates two regular evenly distributed box mesh. Each has 22 nodes along each direction and the overall size is 0.2 by 0.2 by 0.2. S-ALE mesh 1 is generated in a local coordinate system defined by three nodes 2,3,4 and originated from node 1.

# \*ALE

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If at later times, we decided to make the mesh finer, we can simply add the following card. Now the solid element set 100 would contain elements ranging between nodes (1,1,23) and (45,45,45) instead of the original (1,1,11) and (22,22,22).

```
*ALE_STRUCTURED_MESH_REFINE
$  mshid      ifx      ify      ifz
   1          2          2          2
*ALE_STRUCTURED_MESH
$  mshid      dpid      nbid      ebid
   1          1      20001      20001
$  cpidx      cpidy      cpidz      nid0      lcsid
   1001      1001      1001          1      234
*DEFINE_COORDINATE_NODES
$  cid      nid1      nid2      nid3
   234          2          3          4
*SET_SOLID_GENERAL
$  SID
   100
$  OPTION      MSHID      XMN      XMX      YMN      YMX      ZMN      ZMX
   SALECPT      1          1      22          1      22          11      22
*ALE_STRUCTURED_MESH_CONTROL_POINTS
   1001
$
      x1          x2
      1          .0
      22         .2
*NODE
   1  0.0000000e+00  0.0000000e+00  0.0000000e+00
   2  0.0000000e+00  0.0000000e+00  0.0000000e+00
   3  0.1000000e+00  0.0000000e+00  0.0000000e+00
   4  0.0000000e+00  0.1000000e+00  0.0000000e+00
   5  0.0000000e+00  0.0000000e+00  0.0000000e+00
*END
```