

# Model Flow and Model Organization

A Seminar for FEMAP and NX Nastran Users  
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FINITE ELEMENT ANALYSIS  
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## 1. MODEL FLOW AND MODEL ORGANIZATION

Model organization is an incredibly important but often overlooked aspect of FE analysis. With the increasing size and complexity of models it is more important than ever to be able to create, navigate and post process models in a fast-efficient manner. Groups and Layers are effective ways to organize and manipulate models during construction, analysis and post processing.

This seminar will cover a variety of uses for both layers and groups in constructing geometry, meshing, solving, and post processing along with the changes to the commands introduced in V12. It will cover the differences between groups and layers and when it may be beneficial to use one over the other.

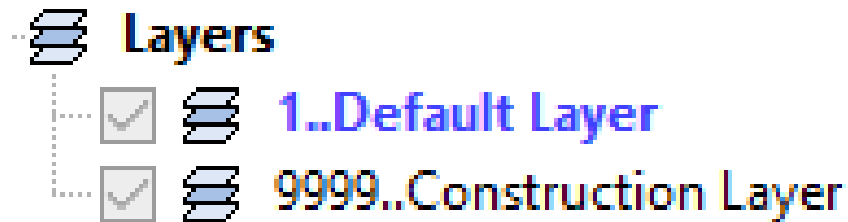
## 2. LAYERS AND GROUPS

### 1. Layers

- a. Commonly used in CAD to organize models
- b. Best uses are modeling geometry and mesh

### 2. Groups

- a. Can be used to model geometry and mesh
- b. Best uses are solving and postprocessing results



## 2.1 SIMILARITIES BETWEEN GROUPS AND LAYERS

1. Both groups and layers can control the following behavior from the model tree
  - a. Visibility Options
  - b. Create new groups and layers
  - c. Renumber, delete, rename groups or layers
2. Display Options
  - a. All, single, multiple
  - b. In addition, groups have the option of displaying only the active group
3. Graphical Selection
  - a. Graphical selection is limited to the entities displayed in the current window
  - b. Note that clicking the “select all” button in the entity selection dialog box is not graphical selection and will select every entity in the model

## 2.2 DIFFERENCES BETWEEN GROUPS AND LAYERS

### 1. Groups

- a. Entities are assigned by rules such as entity ID, or the entities relationship to one another
- b. Entities can be assigned to multiple groups
- c. Has the options to add new entities to the active group, no group, or a selected group
- d. Multiple groups can be combined to form a new group
- e. Groups have some automatic generation tools
- f. Allows for reference groups sometimes referred to as group of groups

### 2. Layers

- g. Can be automatically created when importing STEP or Parasolid geometry files
- h. Entities can be assigned to only one layer
- i. New entities are added to the active layer by default

### 3. LAYERS

Using layers to organize the model

1. Layers can be used to segregate portions of the model when creating geometry and mesh
  - a. Any new entities when using layers will be added to the active layer. The active layer is noted by the dark text in the modeling tree
  - b. Entities can be moved from layer to layer using the modify layer commands
  - c. When using layers it is important to ensure that the layer you want to add entities to is active to keep the model organized
2. Any number of layers can be visible by using the visibility checkboxes

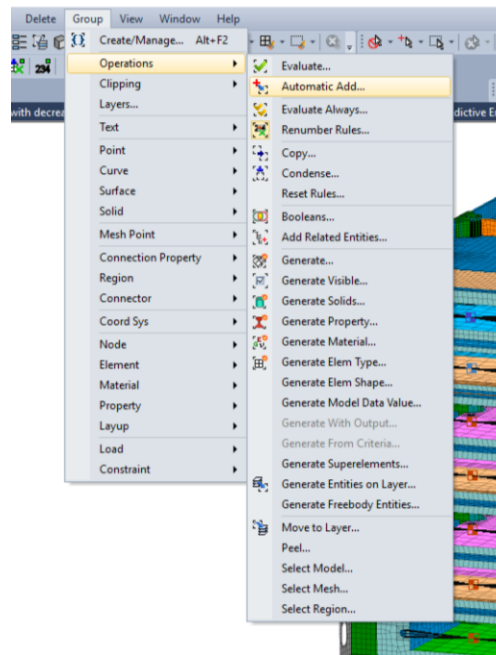
## 4. GROUPS

1. Groups can be created in the following ways:
  - a. by using the group-create/manage command
  - b. right clicking in the model tree
  - c. by using the draw erase toolbar
2. Groups can be populated by any of the available rule in the group menu and graphically selecting entities on the display
  - a. Entity id – eg group – solid – ID
  - b. Relationship to another entity:
    - i. Group – solid – using curve
    - ii. Group – element – using node (on surface, in solid, etc.)
3. Entities which can be grouped
  - a. Geometry: points, curves, surfaces, solids
  - b. Finite element entities: nodes, elements, layups, properties, materials, loads, constraints



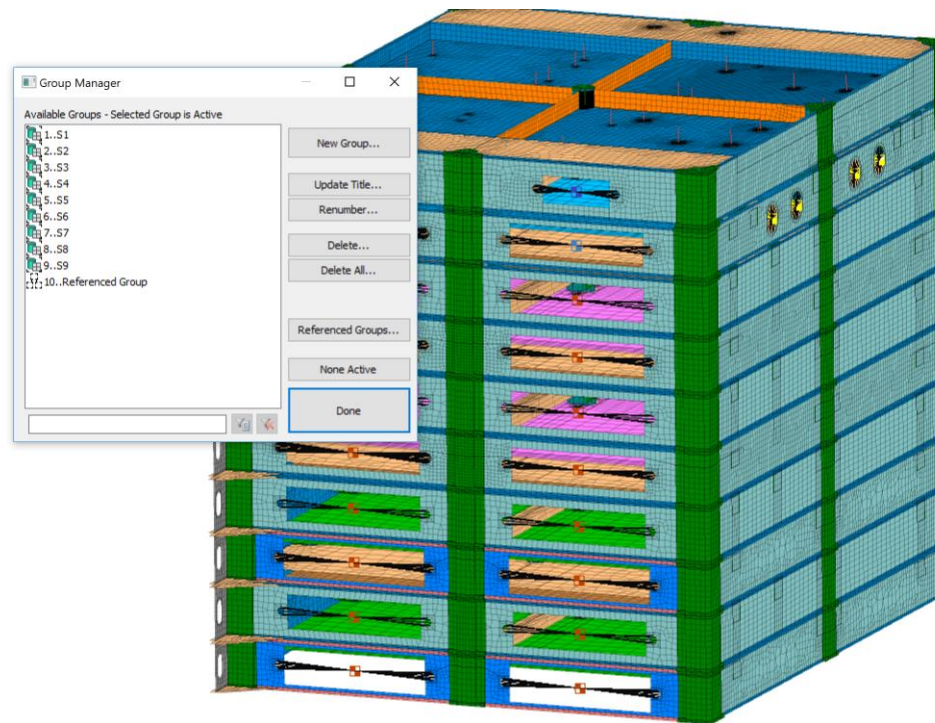
## 4.1 GROUP OPERATIONS

1. Group operations are used to manipulate groups they do not add new definitions to the current group
2. Examples of Group operations:
  - a. Evaluate: updates groups using the rules defined
  - b. Automatic Add: chooses to automatically add entites to groups options include active, none, and select
  - c. Copy/Condense/Reset Rules
  - d. Generate: create groups of entities using solids, elements, properties, materials, etc.



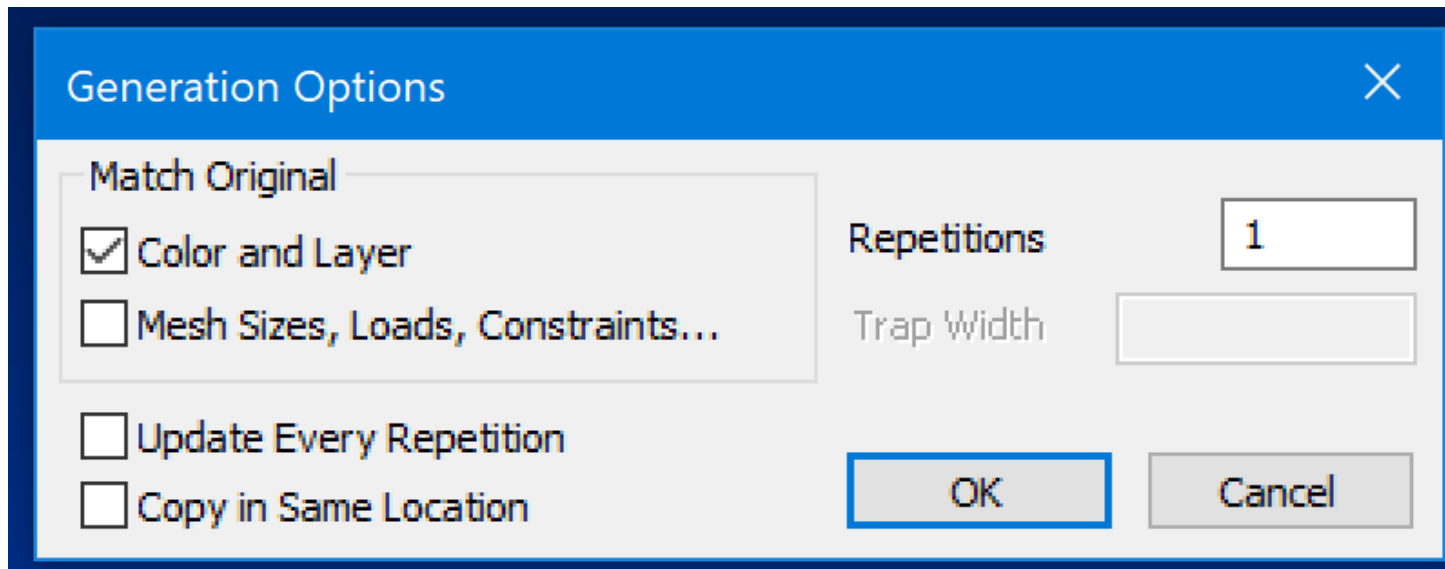
## 4.2 REFERENCE GROUPS

1. Reference groups – sometimes called group of groups
  - a. A reference group is a group that references or links one or more groups
  - b. Reference groups are updated when the groups referenced change
    - i. Note: updating reference groups does not update the referenced group
  - c. The symbol in the tree changes to indicate a reference group



## 5. COPYING ITEMS IN V12

One main change to copying is the removal of the check box match original color and layer. It is planned to be included in a future dot release or the next release of FEMAP.

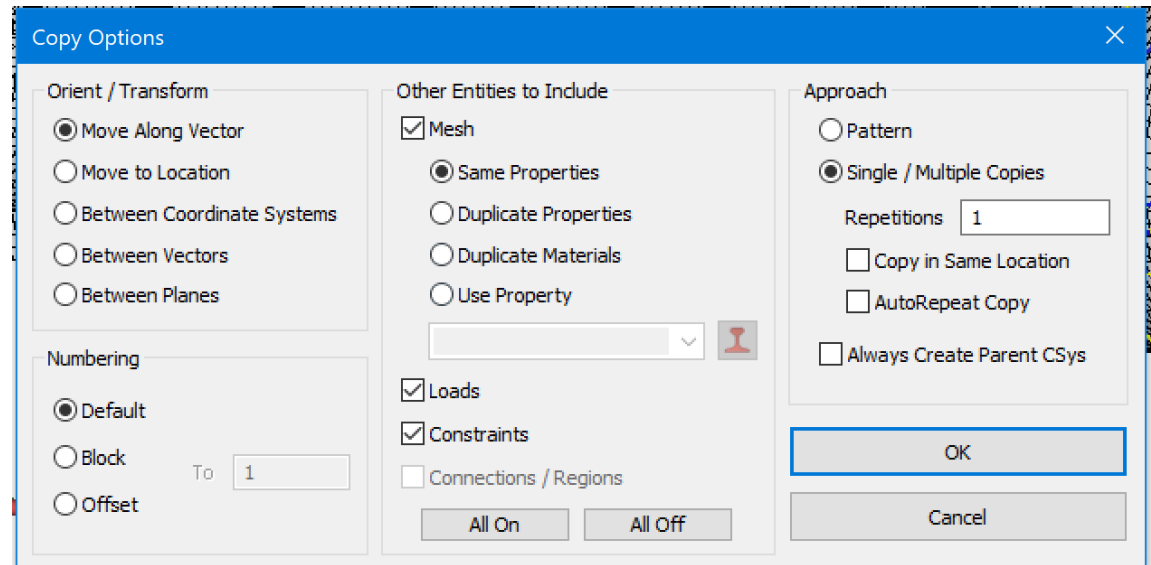


**1. Check box is missing from the following:**

- a. Geometry-Copy-All Entities
- b. Geometry-Rotate-All Entities
- c. Geometry-Reflect-All Entities
- d. Mesh-Copy-nodes/element
- e. Mesh-Rotate-All Entities
- f. Mesh-Reflect-All Entities

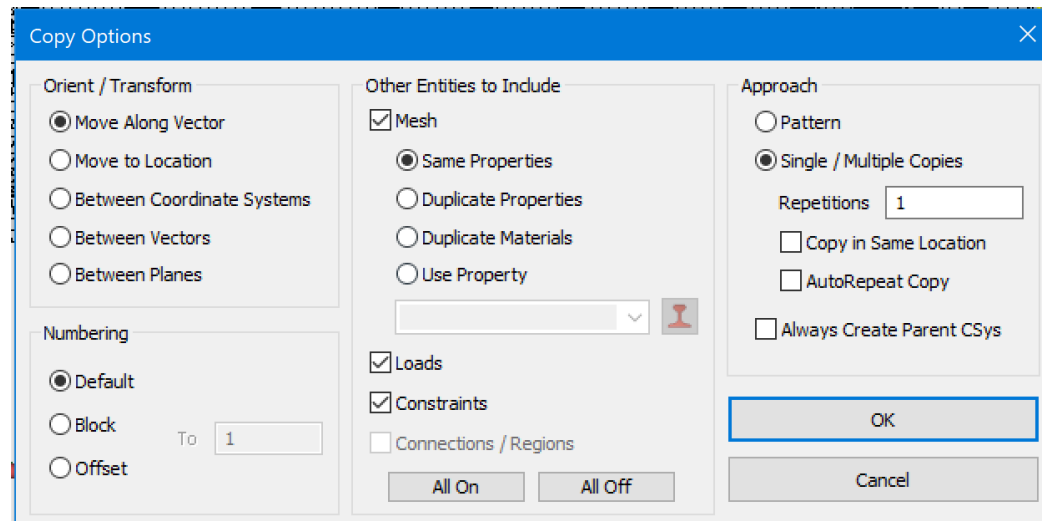
**2. Still exists for the following:**

- a. Geometry- scale-All Entities
- b. Geometry-radial copy-All Entities
- c. Mesh-Copy-offset element
- d. Mesh-Radial Copy-All Entities
- e. Mesh-Scale-All Entities
- f. Mesh-extrude-All Entities
- g. Mesh-Revolve-All Entities
- h. Mesh-Sweep-All Entities



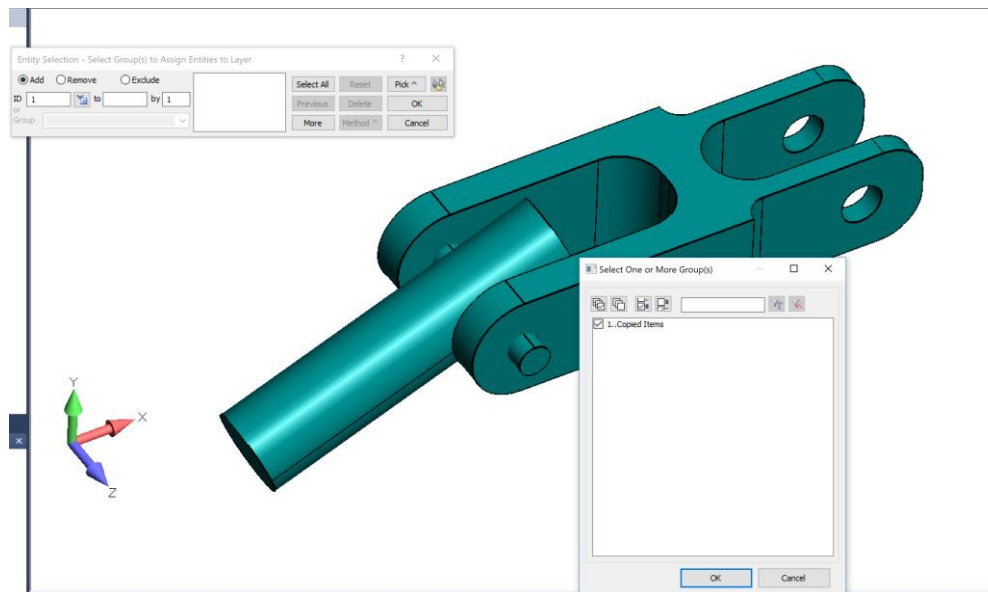
## 5.1 COPYING TO THE SAME LAYER

1. Copying to the same layer can be done using any of the standard copy/rotate/reflect commands with the new dialog boxes which will always copy entities to the same layer as the entity being copied



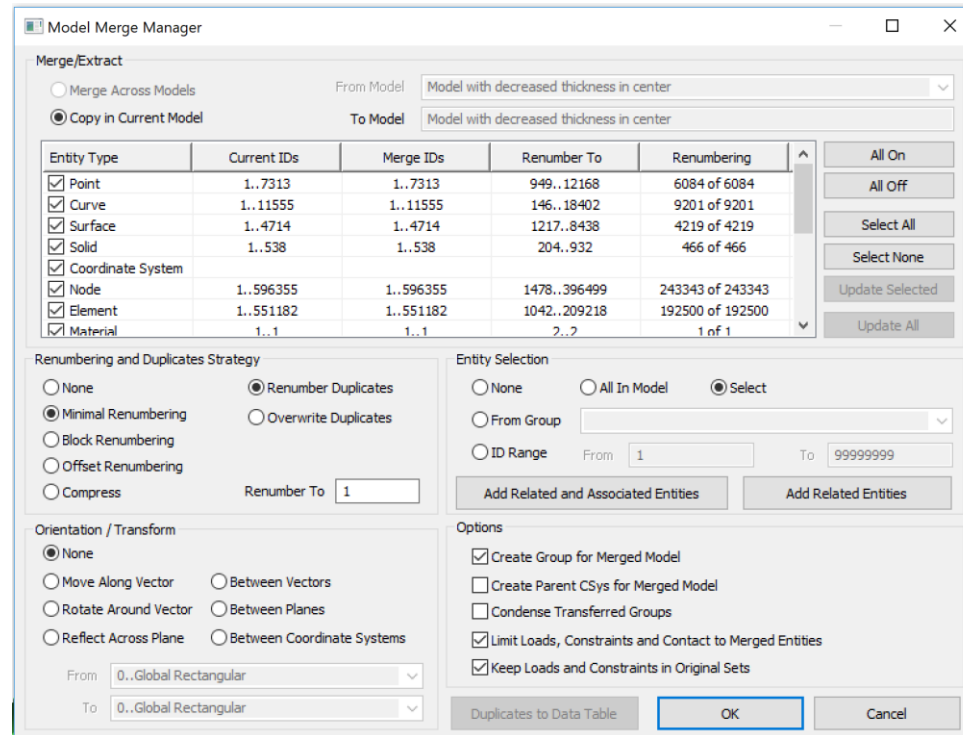
## 5.2 COPYING TO A NEW LAYER USING GROUPS

1. Use a group to transfer entities to new layer
  - a. Create Group to copy to
  - b. Activate automatic add on the newly created groups
  - c. Use any of the copy/rotate/reflect commands to copy the entities
    - i. Entities copied will automatically be added to the new group
  - d. Use group-operations-move to layer to move the entities to the desired layer



### 5.3 COPYING TO A NEW LAYER USING MERGE-COPY IN CURRENT MODEL

1. Use a group merge-copy in current model
  - a. Open the dialog box using file-merge-copy in current model
  - b. Use the copy in current model tool to copy entities
  - c. The model merge manager will always copy new items to a new layer
    - i. The new layer will have the same name as the layer the entities being copied are on



## 6. SOLVING AND POSTPROCESSING WITH GROUPS

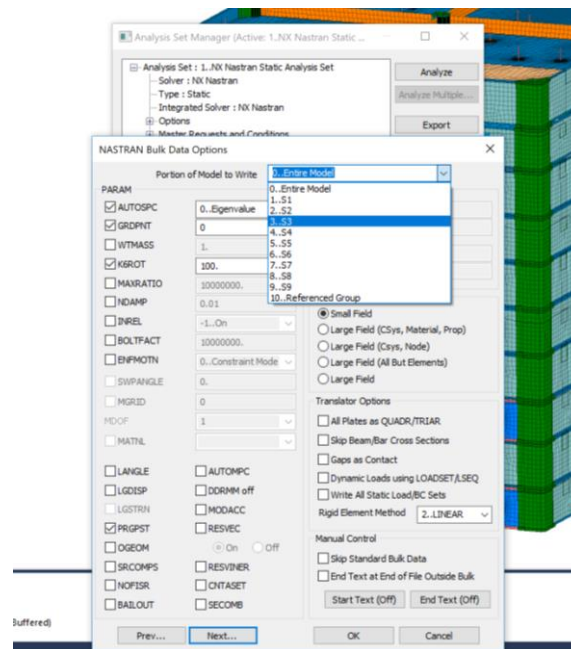
### 6.1 SOLVING WITH GROUPS

#### 6.1.1 ANALYZING SUBCOMPONENTS IN AN ASSEMBLY USING GROUPS

1. Groups can be used to analyze individual components in a larger assembly

a. In the analysis manager on the NASTRAN Bulk Data Options tab

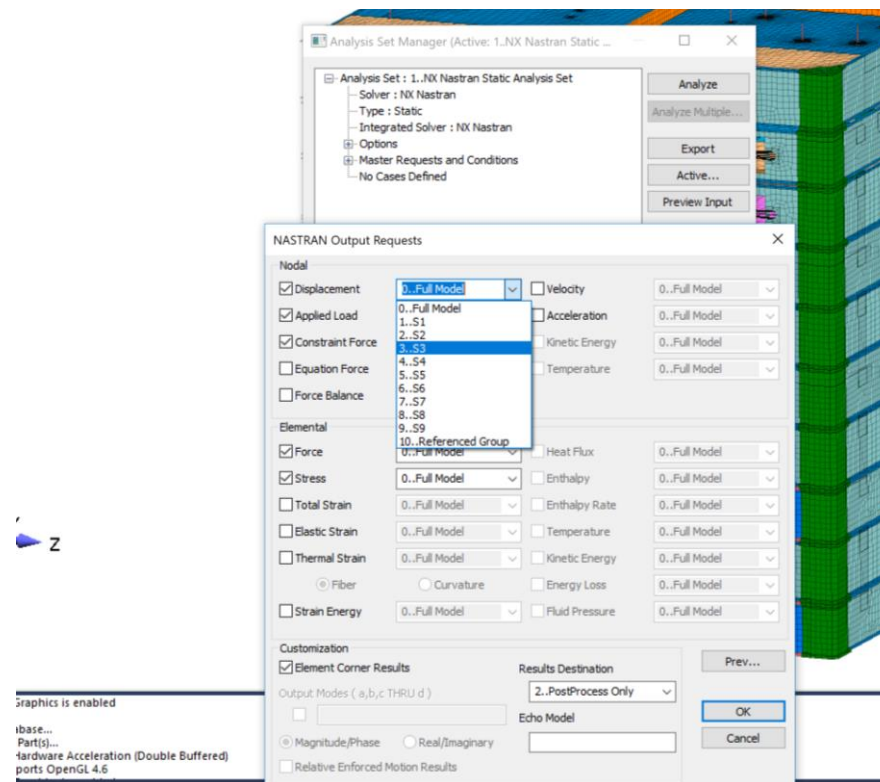
i. Choose the group of subcomponents to solve for in the portion of model to write dropdown menu





### 6.1.2 REQUESTING OUTPUT DATA FOR SUBCOMPONENTS IN AN ASSEMBLY

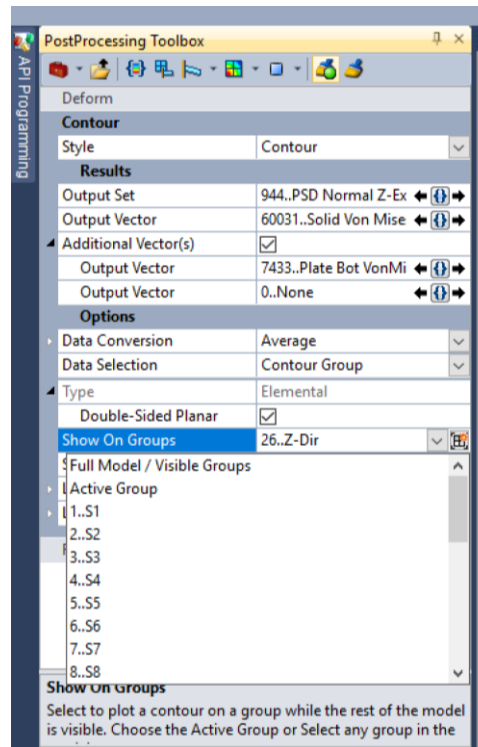
1. Groups can be used to request specific output data for individual components in a larger assembly
  - a. In the analysis manager on the NASTRAN Output Request tab
    - i. Choose the group of subcomponents for the desired output data requested



## 6.2 POSTPROCESSING WITH GROUPS

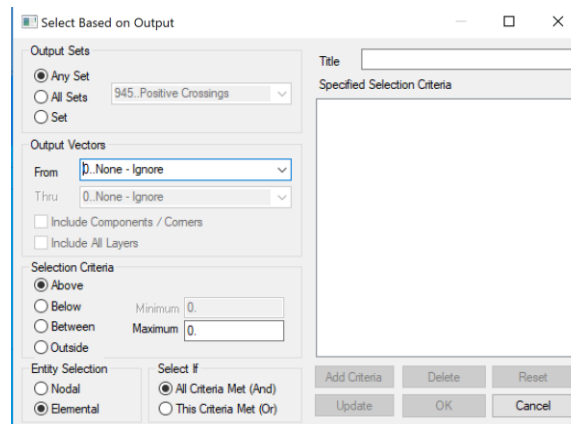
### 6.2.1 SHOW RESULTS USING GROUPS

1. results can be displayed on individual entities in an assembly using groups
  - a. In the postprocessing toolbox in the contour section there is the option to show on groups
    - i. Select the group you would like to display the results on



### 6.2.2 GENERATE GROUPS USING OUTPUT CRITERIA

1. Groups can be created using group-operation-generate with output
  - a. Choose the output set to display
  - b. In the selected based on output dialog box
    - i. Choose output vectors
    - ii. Criteria-above, below, between, or outside
    - iii. Choose the entity selection-nodal or elemental
    - iv. Select the criteria-all criteria met (and) or this criteria met (or)
2. The select based on output dialog box can also be accessed when populating a group using group-element-id
  - a. For the pick method choose by output

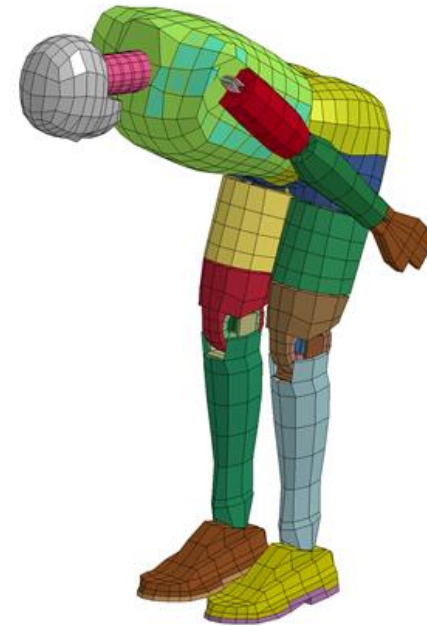


# Thank You

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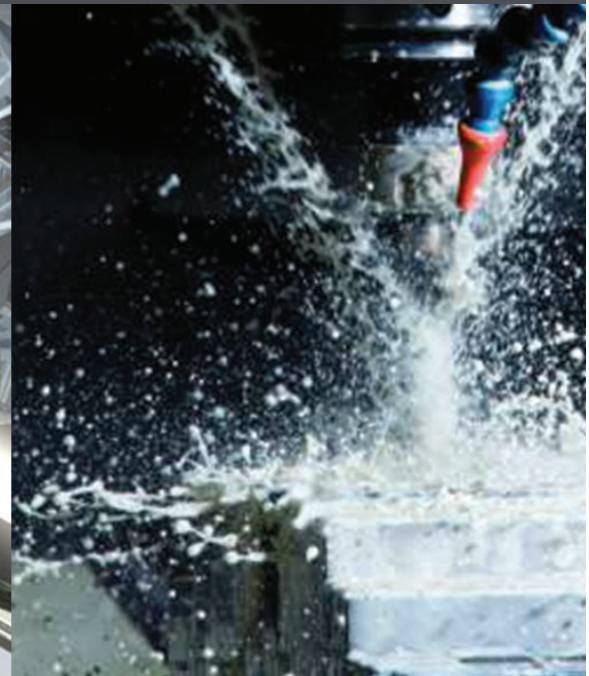
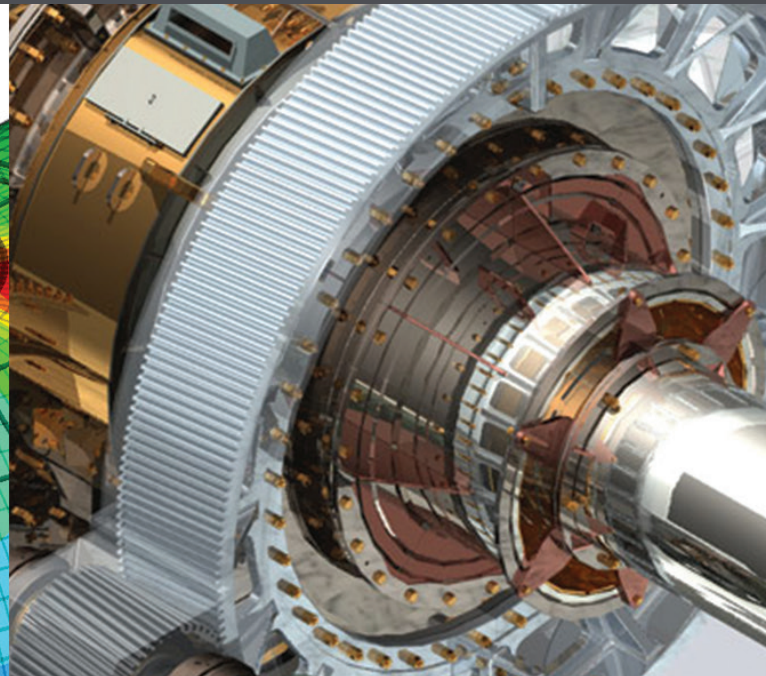
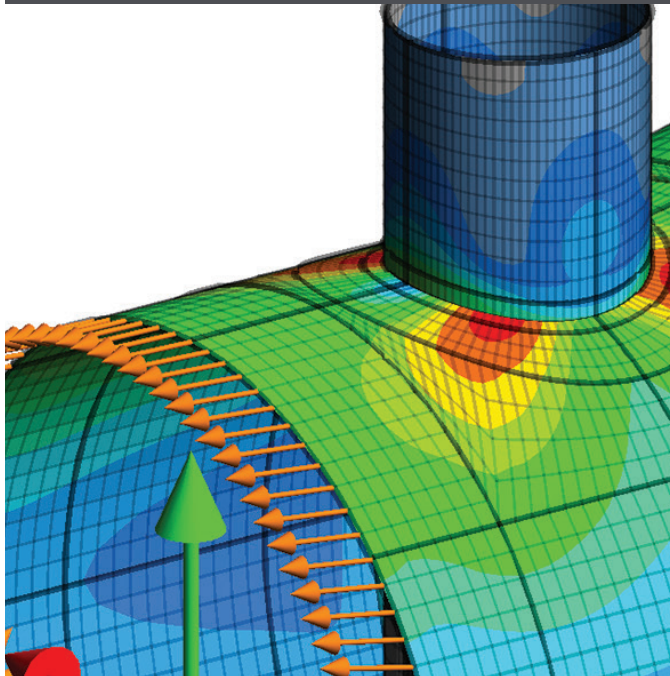
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