SAP2000 IGES EXPORT/IMPORT

SAP2000 Import from IGES Geometric Entities

IGES Entity	Import	SAP2000 Object
LINE (Type 110)	Yes	Line
ARC (Type 100)	Yes	Line
MATRIX (Type 124)	Yes	Transformation matrix
SPLINE (Type 126)	Yes	Line
SURFACE SPLINE (Type128)	Yes	Area

Note: SAP2000 IGES Export is for FEM entities only and based upon SAP2000 Element model.

SAP2000 Export to IGES FEM Entities

SAP2000 Element	Export	IGES Entity
Point	Yes	Node (Type 134)
Line	Yes	1-Beam (BEAM - Type 136)
Area (Triangle)	Yes	2-Linear Triangle(LTRIA - Type 136)
Area (Quad)	Yes	5-Linear Quad(LQUAD - Type 136)
Solid	Yes	17-Linear Solid(LSO - Type 136)
Spring	Yes	28-Grounded Spring (SPR - Type 136)
NLINK (Grounded Spring)	Yes	28-Grounded Spring (GSPR - Type136)
NLINK (Spring)	Yes	27-Spring (SPR - Type 136)
NLINK (Grounded Damper)	Yes	30-Grounded Damper (GDAMP - Type 136)
NLINK (Damper)	Yes	29-Damper (DAMP- Type 136)
Restraint	Yes	Nodal Load/ Constraint (Type 418)
Mass	Yes	Mass (MASS – Type 136))
Joint Load	Yes	Nodal Load/ Constraint (Type 418)

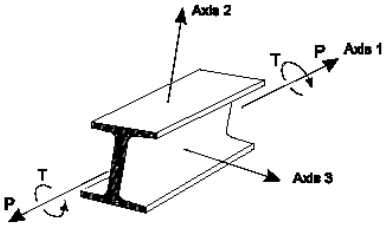
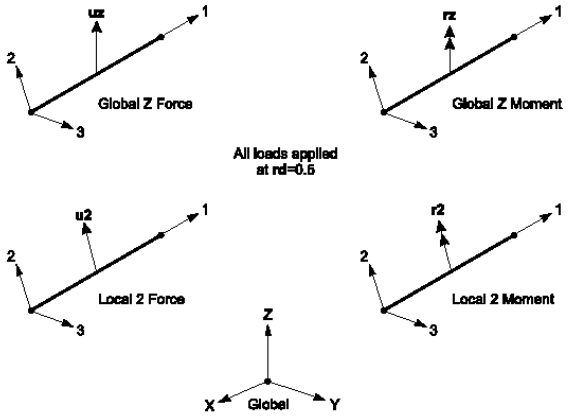
Note: Some new entities have been defined for Element Loads, Load cases and Weight Density. For more details see SAP2000 newly added FEM Entities for IGES.

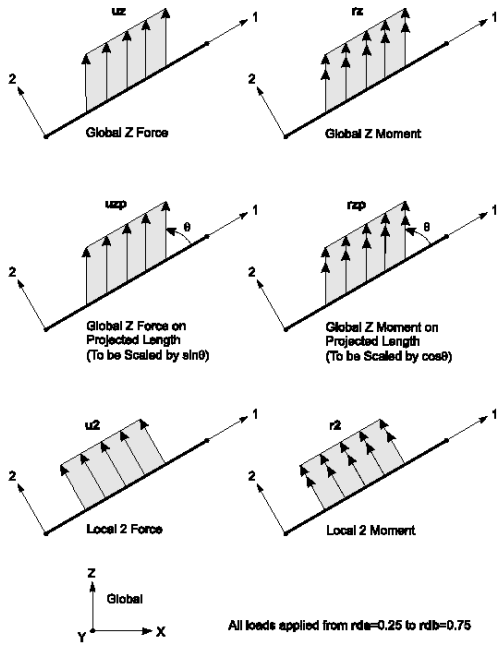
SAP2000 Import from IGES FEM Entities

IGES Entity	Import	SAP2000 Object
NODE (Type 134)	Yes	Point
1-Beam (BEAM – Type 136)	Yes	Line
2-Linear Triangle(LTRI – Type 136)	Yes	Area
5-Linear Quad (LQUAD – Type 136)	Yes	Area
12-Linear Solid Tetrahedron (LSOT – Type 136)	Yes	Solid
14-Linear Solid Wedge (LSOW – Type 136)	Yes	Solid
17-Linear Solid (LSO – Type 136)	Yes	Solid
28-Grounded Spring (SPR - Type 136)	Later	Spring
29-Spring (SPR - Type 136)	Later	NLINK
30-Grounded Damper (GDAMP - Type 136)	Later	NLINK
30-Damper (DAMP- Type 136)	Later	NLINK
Nodal Load/ Constraint (Type 418)	Later	JFLoad
Mass (MASS – Type 136))	Later	MASS
Nodal Load/ Constraint (Type 418)	Later	Restraint

Note: Some new entities have been defined for Element Loads, Load cases and Weight Density. For more details see SAP2000 newly added FEM Entities for IGES.

SAP2000 Newly Added FEM Entities for IGES

Ptype	Description	Variables
5001	**Frame (Beam/Line) Orientation:** Coordinates of third point which defines the 2-Axis (Local axis). 3-Axis can be obtained by cross product of 1-Axis and 2-Axis	Total Parameters NP = 6 PType = 5001 Total Dependent Variables = 3 Total Independent Variables = 0 X3 = X coordinate of third point Y3 = Y coordinate of third point Z3 = Z coordinate of third Point 
5002	**Frame (Beam/Line) Concentrated Load (Point Load):**	Total Parameters NP = 8 PType = 5002 Total Dependent Variables = 5 Total Independent Variables = 0 LC = Load Case Number KT = Type Force or Moment 1 or 2 KD = Direction Local Direction: 1 to 3 local Axes, Global Direction: 4 to 6 Global Axes X,Y and Z, Projected to Global Direction: 7 to 9 projected to X, Y and Z axes RD = Relative distance from Starting Point (First Point) 0 to 1 (0 = start point, 1= end point, 0.5 = middle) UK = Force or moment value  **Figure 25** *Examples of the Definition of Concentrated Span Loads*

5003	**Frame (Beam/Line) Distributed Load:**	Total Parameters NP = 10 PType = 5003 Total Dependent Variables = 7 Total Independent Variables = 0 LC = Load Case Number KT = Type Force or Moment 1 or 2 KD = Direction Local Direction: 1 to 3 local Axes, Global Direction: 4 to 6 Global Axes X,Y and Z, Projected to Global Direction: 7 to 9 projected to X, Y and Z axes RDA = Relative distance from Starting Point (First Point) 0 to 1 (0 = start point, 1= end point, 0.5 = middle) RDB = Relative distance from Starting Point (First Point) 0 to 1 (0 = start point, 1= end point, 0.5 = middle) UKA = Force or moment intensity at start, per unit length UKB = Force or moment intensity at end, per unit length 

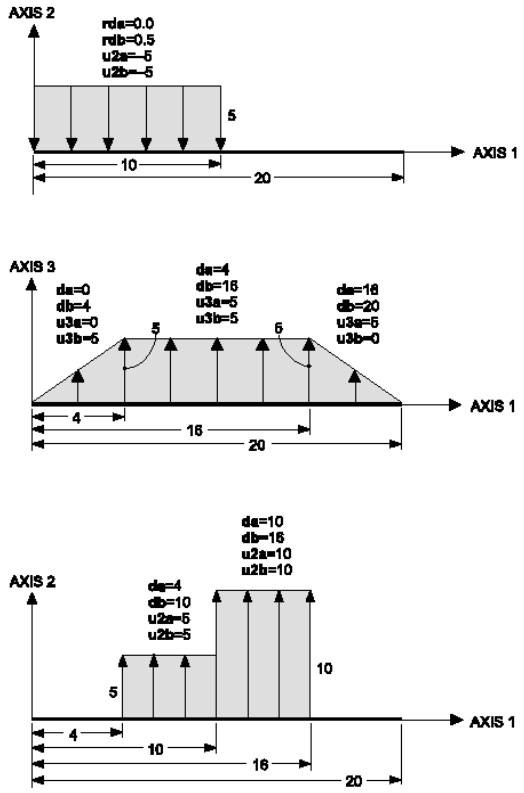
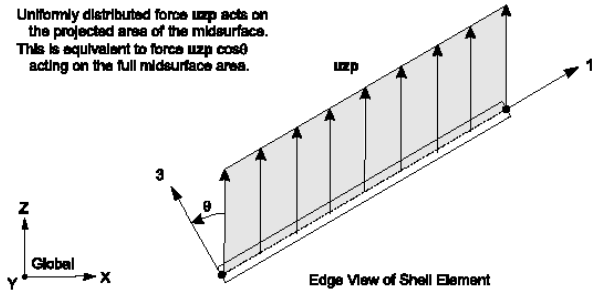
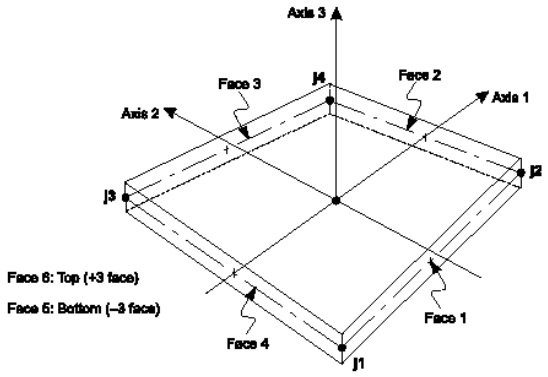
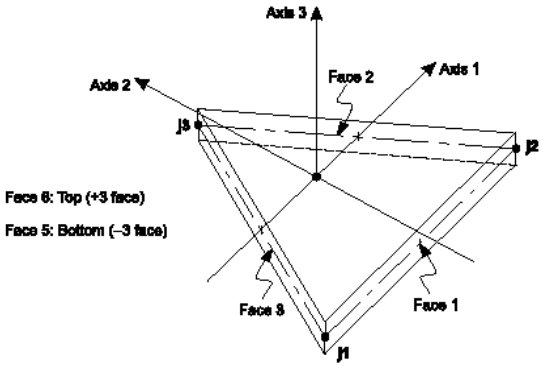


Figure 27
Examples of Distributed Span Loads

5005	**Shell (Area) Orientation:** Coordinates of 2 more points which define the 1 and 2 axes (Local axes). Axis 1 can be obtained by finding the vector passing through Centroid and first poin Similarly Axis 2 can be obtained by finding the vector passing through centroid and second point	Total Parameters NP = 9 PType = 5005 Total Dependent Variables = 6 Total Independent Variables = 0 X1 = X coordinate of point defines the 1 axis (local axis) Y1 = Y coordinate of point defines the 1 axis (local axis) Z1 = Z coordinate of point defines the 1 axis (local axis) X2 = X coordinate of point defines the 2 axis (local axis) Y2 = Y coordinate of point defines the 2 axis (local axis) Z2 = Z coordinate of point defines the 2 axis (local axis)
5006	**Shell (Area) Uniform Load:**	Total Parameters NP = 6 PType = 5006 Total Dependent Variables = 3 Total Independent Variables = 0 LC = Load Case Number KD = Direction Local Direction: 1 to 3 local Axes, Global Direction: 4 to 6 Global Axes X,Y and Z, Projected to Global Direction: 7 to 9 projected to X, Y and Z axes P= Load Value, per unit area  **Figure 36** *Example of Uniform Load Acting on the Projected Area of the Midsurface*

5007	**Shell (Area) Pressure Load:**	Total Parameters NP = 6 PType = 5007 Total Dependent Variables = 3 Total Independent Variables = 0 LC = Load Case Number Face = Face (1 to 6) P= Load Value, per unit area, inward  Four-node Quadrilateral Shell Element  Three-node Triangular Shell Element
5008	**Frame (Beam/Line) Section Name**	Total Parameters NP = 4 PType = 5008 Total Dependent Variables = 1 Total Independent Variables = 0 Name = Frame Section name

5020	**Load Case:** This is not linked to any element. It is used for defining the loading case name and the mass multiplier (Global negative Z Direction). A uniform distributed load will be applied to all frames (line/beams), which will be the product of the area and self-weight. Similarly, for Shells (Areas) a uniform pressure will be applied which will be product of self weight and the thickness.	Total Parameters NP = 8 PType = 5020 Total Dependent Variables = 5 Total Independent Variables = 0 LC = Load Case Number Name = Load Case name Type = Type of case "1-DEAD", "2-SUPER DEAD" "3-LIVE" "4-REDUCE LIVE" "5-QUAKE" "6-WIND" "7-SNOW" "8-OTHER" Mass Multiplier = Value for Mass Multiplier Self Weight Multiplier = Value for Self Weight Multiplier
5021	**Weight Density:**	Total Parameters NP = 4 PType = 5021 Total Dependent Variables = 1 Total Independent Variables = 0 W = Weight density

Note: The import of SAP2000 NEW FEM Entities from IGES will be added later. For more details about the SAP2000 loads please refer to SAP2000 user manual.