Andhra Pradesh State Skill Development Corporation

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Extended Three-Dimensional Analysis of Building System

ETABS

Edit Tools Part - V

EDIT TOOL-5

Objective

This chapter contains an explanation on Tools in EDIT Menu.
The EDIT menu contains various editing tools among those some of the edit tools are as listed below.

Merge Joints

Any joints in the model may be merged at any time using the **Edit menu > Merge Joints** command. To use this command, first select the joints to be merged. Then execute the command, specify a merge tolerance, and click the **Apply** button to modify the model as specified. The merge then takes place. ETABS uses the following logic to merge the joints:

1. ETABS orders the selected joints based first on the number of grid lines that pass through them and based second on the order in which they were drawn.
2. ETABS merges all selected joints that are within the specified merge tolerance of the first joint in the sorted list (if any) with the first joint in the selected list.
3. The sorted list is updated by deleting any joint that has been merged to the first joint on the sorted list and by deleting the first joint on the sorted list.
4. Steps 2 and 3 are repeated until all joints have been deleted from the sorted list.

A couple of special cases exist for merging joints, as follows:

- If one joint lies at a story level and another joint lies just above that story level, and thus is actually associated with the story level above, the joint above always merges into the joint located at the story level, assuming the joints are within the specified merge tolerance.
- If one joint is located just below a story level and another joint is located just above the same story level, and thus is actually associated with the story level above, those two joints will never merge. This is true regardless of the specified merge tolerance.

Note: Use the **Merge Tolerance** option (Options **menu > Tolerances** command) to set a basic tolerance check in the model. When joints are created (drawn, moved, copied, replicated, and so forth) such that they lie closer together than the Auto Merge Tolerance value, ETABS automatically merges the new joint into the existing joint.

Align Joints/Frames/Edges

The **Edit menu > Align Joints/Frames/Edges** command provides some powerful tools for aligning model objects.

- **Align Joints to X-Ordinate** option. Select the joint and this option and then enter the coordinate value where the selected joint should be aligned.
- **Align Joints to Y-Ordinate** option. Select the joint and this option and then enter the coordinate value where the selected joint should be aligned.
- **Align Joints to Z-Ordinate** option. Select the joint and this option and then enter the coordinate value where the selected joint should be aligned.

- **Align Joints to Nearest Frame or Edge** option. Select the joint and the line and this option. The selected joint is aligned with the nearest frame object. Specified items (frame objects or edges of area objects) are considered only if they are visible in the active window.
- **Trim Frame Objects** or **Extend Frame Objects** option. Select the frame to be trimmed/extended, the frame to which the to-be-trimmed/extended frame is to be trimmed/extended to, the end joint of the to-be-trimmed/extended frame and the *Trim Frame Objects* or *Extend Frame Objects* option to trim or extend frames to ensure proper connectivity for the elements in the model.
  With each option, click the **Apply** button to modify the model as specified using this form.

When the **Apply** button is used, the **Align Selected Joints/Frames/Edges** form will remain open until it is closed by clicking the **Close** button. This allows selection of another frame object(s), to which a different assignment can be made.

If only one assignment is being made to only one set of selected objects, the OK button can be used to both apply the assignment and close the form.

Move Joints/Frames/Shells

Move joints, frames, shells, tendons, and design strips in any direction as follows:

1. Select the object to be moved.
2. Select the **Edit menu > Move Joints/Frames/Shells** command to access the **Move Joints/Frames/Shells** form.
3. On the **Move Joints/Frames/Shells** form, specify the distances in the global X, Y and Z directions that the object is to be moved (i.e., Delta X, Delta Y, Delta Z).

   Pick Two Points on Model button.
   This button can be used to define the change in the X, Y, and Z of the selected joint/frame/shell. Use the button as follows:
   i. Follow steps 1 and 2 above to select the object(s) to be moved and activate the command.
   ii. With the object selected, click the **Pick Two Points on the Model** button.
   iii. Left click once on a point in the model; left click on a second point. Notice that values will display in the Delta X, Delta Y, or Delta Z edit boxes depending on where the two clicked points are located. The selected object(s) will move the specific distance. The two points picked do not need to be at the desired revised location. They need to specify the change in the X, Y, and Z only.
4. Click the **Apply** button to modify the model as specified using this form.
   - **Joints.** When a joint is moved, all frames and shells attached to the joint are reoriented or resized to account for the movement. For example, if a joint at the top of a column is moved, the column will become sloped. (Note that ETABS would then consider this column to be a brace.)

Note: In some cases, moving a joint in the Z direction would cause frame and shells that are attached to the joint to cross story levels. In such cases, ETABS does not allow the move to take place.

- **Frames.** When a frame is moved, the frame moves but the joints at the ends of the frame do not move. New joints are created at the ends of the frame in its new position if necessary. Any other objects connected to the joints at the ends of the frame in its original location remain where they are; they do not move in any way. Similarly any assignments to the joints at the ends of the frame in its original location remain where they are. If no other objects are connected to the joints at the ends of the frame in its original location and if there are no assignments made to those joints, ETABS deletes them after the frame has been moved.
- **Shells.** Similarly, when a shell is moved, the shell moves but the joints at the corners of the shell do not move. New joints are created at the corners of the shell in its new position if necessary. Any other objects connected to the joints at the corners of the shell in its original location remain where they are; they do not move in any way. Similarly any assignments to the joints at the corners of the shell in its original location remain where they are. If no other objects are connected to the joints at the corners of the shell in its original location and if there are no assignments made to those joints, ETABS deletes them after the shell has been moved.

Note: Objects can be moved in the Z-direction within their own story level or to the maximum Z coordinate (top) of the story level below or the minimum Z coordinate (bottom) of the story level above; ETABS will ignore a delta Z dimension that requires an object to move beyond these minimum and maximum Z coordinates.

Example

A four-story building has 10-foot-high stories at all levels. Thus, the first story level is at an elevation of 10 feet, the second story level is at 20 feet, the third story level is at 30 feet and the fourth story level is at 40 feet. The corner joint of an shell object that occurs at the mid-height of the third story level (i.e., elevation of 25 feet) is being moved. Note that the distance between the second and third floors is 10 feet. Thus,

- If a Delta Z between -5 feet (elevation 20 feet) and +5 feet (elevation 30 feet) is specified, say -3, ETABS moves the joint to the specified location (elevation 22 feet).
- If a delta Z dimension less than the -5 feet (e.g., -10 feet which would be elevation 15 feet) is specified, ETABS moves the joint to the second story level elevation (i.e., elevation 20 feet), but not beyond because objects cannot be moved in the Z direction across story levels.
- If a Z coordinate greater than +5 feet (e.g., 10 feet which would be elevation 35 feet is specified), ETABS moves the joint to the third story level elevation (i.e., elevation 30 feet), but not beyond because objects cannot be moved in the Z direction across story levels.

When the **Apply** button is used, the **Move Joints/Frames/Shells** form will remain open until it is closed by clicking the **Close** button. This allows selection of other object(s) that may need to be moved.

If only one move is being made to only one set of selected objects, the **OK** button can be used to both apply the movement and close the form.

Divide Frames

Select one or more frames and then use the **Edit menu > Edit Frames > Divide Frames** command to divide the frame into multiple frames. The following options are available for dividing frames:

- **Divide into ___ Frame Objects** option. Divides the selected frame(s) into the specified number of frames. The divided frames are all the same length.
- **Break at Intersections with Selected Frames and Joints** option. Breaks each selected frame at any joint where it intersects another *selected* frame or joint. The figures below show some examples.

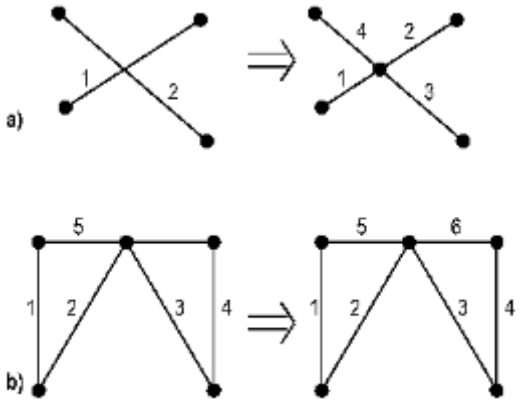


Figure "a" shows two crossing frames. Initially the frames are not connected at their intersection. When the two frames are selected and the *Break at Intersections with Selected Frames and Joints* option is used to divide the frame, each of the frames is broken into two objects at the intersection point.

Figure "b" shows a common situation in a chevron braced frame. Notice that the frames representing the top beam (labelled 5) spans from one column to the other and is not broken at the intersection with the braces. To break this beam at the intersection with the braces, select the beam and one of the braces (say you select the line objects labelled 2 and 5) and use the *Break at Intersections with Selected Frames and Joints* option. Alternatively, select the joint at the top of the braces and the top beam (frame labelled 5) to achieve the same result.

In both cases shown in the figures, ETABS would provide connectivity at the intersection points whether the frames are divided or not, unless the intersecting frames are indicated not to be meshed using the **Assign menu > Frame > Automatic Frame Subdivide**...No Auto Meshing command. In most cases, breaking up intersecting frames manually as described here and shown in the figures is not necessary, unless different properties are to be assigned or a different label is required. The example in the figures is provided to

illustrate the *Break at Intersections with Selected Frames and Joints* option for dividing frames.

- **Break at Intersections with Visible Grid Lines** option. Breaks each selected frame at any location where it intersects a visible grid line regardless of the coordinate system associated with the grid line.
- Apply button. After making the appropriate selections, click this button to apply them.

Note the following about divided frames.

1. The property assignments to divided frames are the same as the property assignments to the original frame.
2. Load and mass assignments on the original frame are appropriately broken up onto the divided frames.
3. Assignments that occur at the ends of the original frame, such as releases and rigid end zones, occur at the appropriate ends of the frames after the original frame has been divided.

Join Frames

Select two or more collinear frames with common end points and the same type of property (frame section, link or none) and use the Edit menu > Join Frames command to combine the frames into a single frame. The command completes the combination immediately; no form is used.

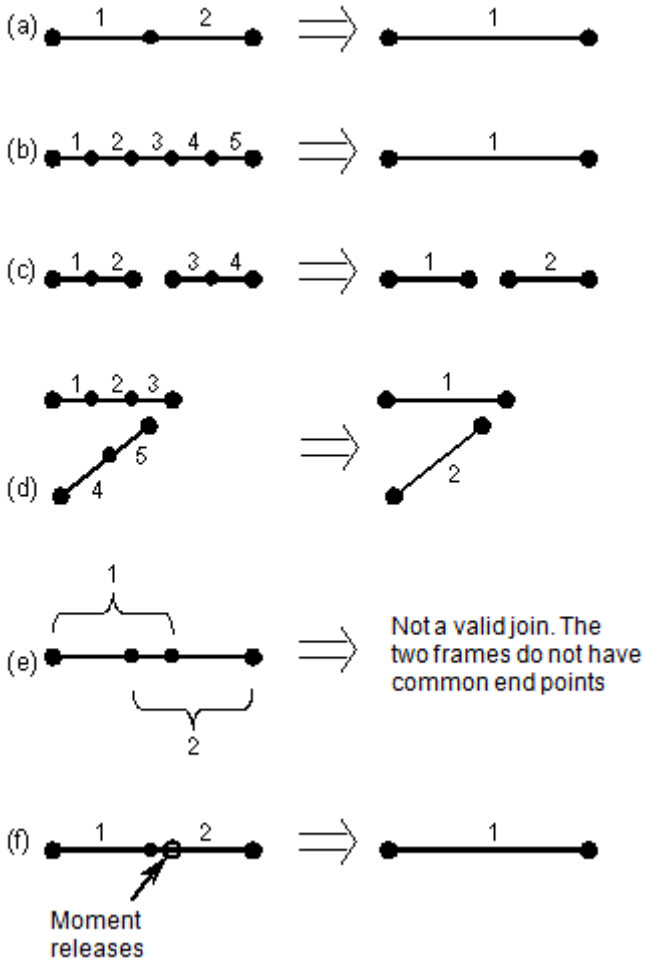
Note the following about combined frames:

- Combined frames must be collinear.
- Combined frames must have a common end point.
- Combined frames must all have the same type of property. In other words they must all have frame section properties, or they must all have link properties or they must all have no properties.
- When frames with frame section properties are joined, the section property assigned to the combined frame is the one that had the largest area. If two of the combined frame sections have the same area, the property of the first drawn object is used.
- Load and mass assignments from the unjoined frames are combined on the joined object.
- Assignments to the unjoined frames that would be illegal in the middle of the joined frame are ignored. For example, frame member end releases, rigid end zones and joint offsets that would occur in the center of joined frame members are ignored.

The figure below shows some examples. Item "a" in the figure shows that two collinear frames with a common endpoint (and the same property type assignment) are joined into one frame. Item "b" shows that five collinear frames can be joined at the same time. Items "c" and "d" show that two sets of collinear frames can be joined simultaneously. The two sets of frames can have different property type assignments, but all of the property type assignments within either set of frames must be the same.

Item "e" in the figure illustrates that the collinear frames must have a common end point; otherwise they are not joined. If it is necessary to join frames as shown in example item "e," move one of the center joints so that it is coincident with the other center joint and then perform the join.

Item"f" illustrates that assignments to the unjoined frames that would be illegal in the middle of the joined frame are ignored. In that case, a moment release that is in the center of the combined beam is ignored. If this moment release must remain, do not join the frames.



Modify/Show Frame Type

Use the **Edit menu > Edit Frames > Modify/Show Frame Type** command to review or modify the shape of selected frames.

Note: This command works only with beam type frames that lie in the model datum plane and if only one beam is selected.

Select a frame and use the **Edit menu > Edit Frames > Modify/Show Frame Type** command to access the **Frame Object Type Options** form.

- **Frame Object Information:**
  - **Story; Label**: The name of the frame selected is listed.
  - **Frame Type**: Select Straight, Circular Curve, Multilinear Curve, Bezier Curve, or Spline Curve from the drop-down list for the frame type as viewed in plan. The selection here will affect what items are displayed in the Curve Definition area.
- **Start Joint Object**: The name and coordinates of the starting joint for the frame are listed.

- **End Joint Object**: The name and coordinates of the ending joint for the frame are listed.
- **Straight/Circular/Multi-linear/Spline Curve Definition**: Enter additional geometric parameters to define the line curve selected in the Frame Type drop-down list.
    - If the frame type is Straight, no additional information is required. The Line Midpoint Coordinates display area is added, identifying the Global X and Global Y coordinates of the midpoint of the straight line.
    - If the frame type is Circular Curve, specify either the Radius or the coordinates of the Third Point on Curve. When using the radius option, ”Line” refers to the imaginary straight line defined by the start and end joints of the frame.
    - If the frame type is Multilinear Curve, enter in the edit box the number of internal points (IP), excluding the start and end joints, needed to define the frame and then the coordinates of each IP in the spreadsheet cells.
    - If the frame type is Bezier Curve, enter in the edit box the number of internal control points (ICP) needed to define the frame and then the coordinates of each ICP in the spreadsheet cells
    - If the frame type is Spline Curve, enter into the edit box the number of internal control points (ICP) and the spline curve tension needed to define the frame, and then the coordinates of each ICP in the spreadsheet cells. The higher the spline curve tension, the tauter the curve will be through the control points; this value should not exceed 1.
- **Refresh Window:** The **Refresh Window** button updates the display in the active window with any changes made to the frame geometry without leaving the **Frame Object Type Options** form.

Divide Shells

The **Edit menu > Edit Shells > Divide Shells** command divides slab type shell objects that lie in the model datum plane into smaller objects. Select the shell objects to be divided, and use the **Edit menu > Edit Shells > Divide Shells** command to access the **Divide Selected Shells** form.

- **Cookie Cut Floor Objects at Selected Frame Objects** and **Extend Frames to Shell Edges** check box: Divides the selected floor object along the selected straight-frame object. In some cases, the selected frame object may not intersect with the edges of the selected floor object. In such cases, the area of the floor object enclosed by the selected frame objects is divided/cut and the floor area outside the selected frames is removed from the model. Check the **Extend Frames to Shell Edges** check box to ensure that the entire shell object is divided/cut and remains in the model.
- **Cookie Cut Floor Objects at Selected Joints at ____ Degrees**: Divides the selected floor object along the orthogonal dividing lines that pass through the selected joint. Specify the rotation in degrees of the ”dividing lines” from the global X-Y axes; positive rotations appear counterclockwise when the Z axis is pointing toward you.
- **Divide Quadrilaterals/Triangles into ___ by ____ Areas**: Divides the selected Quadrilateral or Triangular shell object into the number of objects specified for each edge. ETABS adds joints to the adjacent edges, at equally spaced intervals, and then

automatically adds the same number of joints along the opposite edges so that dividing lines can be drawn between the opposing joints.

- **Divide Quadrilaterals/Triangles at**: Divides the selected Quadrilateral/Triangle shell object using the following options (these options may be used in combination):
    - **Intersection with Visible Grids**: Divides the selected shell object using the visible grid lines as the dividing lines. Use the **View menu > Show Grids** command to display the grid lines.
    - **Selected Joint Objects on Edges**: Divides the selected shell object using the selected joint objects along the shell's edges. If joints are selected on two opposing edges, ETABS will draw dividing lines connecting each pair of joints. If joints are selected on only one opposing edge, ETABS will place joints on the other opposing edge at the same ratio of spacing and draw dividing lines connecting each pair of joints.
    - **Intersections with Selected Frame Objects**: Divides the selected shell object using the selected frame objects that intersect the shell's edges. Dividing lines are drawn from the intersection joint to the opposing edge.

Click the **Apply** button to complete the edit. When the **Apply** button is used, the Divide Selected Shells form will remain open until it is closed by clicking the **Close** button. This allows selection of an additional object(s), to which another edit can be made.

If only one edit is being made to only one set of selected objects, the **OK** button can be used to both apply the edit and close the form.

Merge Shells

Use the **Merge Shells by Removing Common Edges** form to merge two or more floor-type (horizontal) shell objects that have a common edge or overlap. This command is intended primarily for floor objects that share common edges, although it will also work to merge two (and only two) floor objects that overlap. Floor objects that share only a point and not an edge cannot be merged.

Note: If floor objects to be merged contain curved edges, no more than two floor objects may be merged.

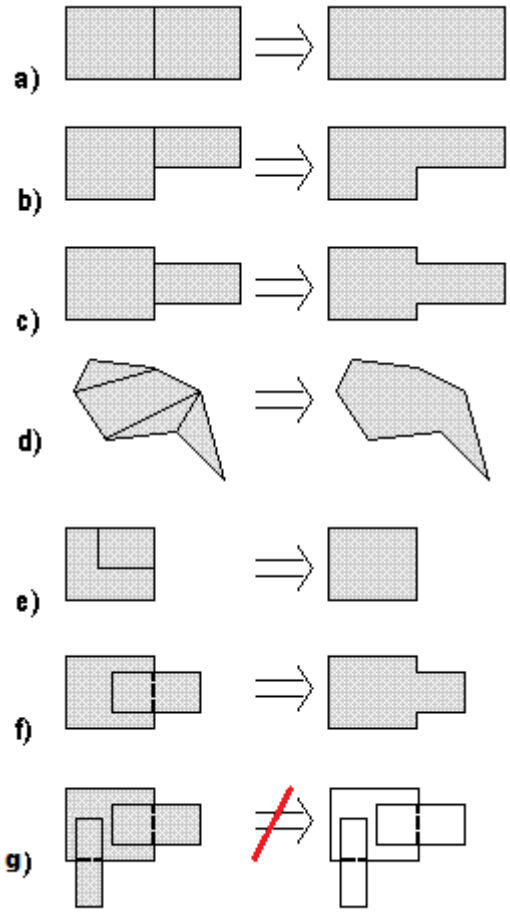
Floor shell objects to be merged must lie in the same plane (same floor/elevation) and be horizontal to ensure an appropriate merge. In addition, only floor objects with the same shell section property may be merged. When merging floor objects, the program will attempt to maintain all joints located along edges.

Access the **Merge Shells by Removing Common Edges** (Floor Areas Only) form as follows:

1. Select two or more floor shell objects to be merged. This may be done by clicking on them or using one of the many other selection techniques.
2. Click the **Edit menu> Edit Shells > Merge Shells** command to bring up the **Merge Shells by Removing Common Edges** form.
3. Review the floor objects selected and the settings on the form.
4. Click the **OK** or **Cancel** buttons.

Note: Right-click on the resulting merged floor object to access the Slab or Deck

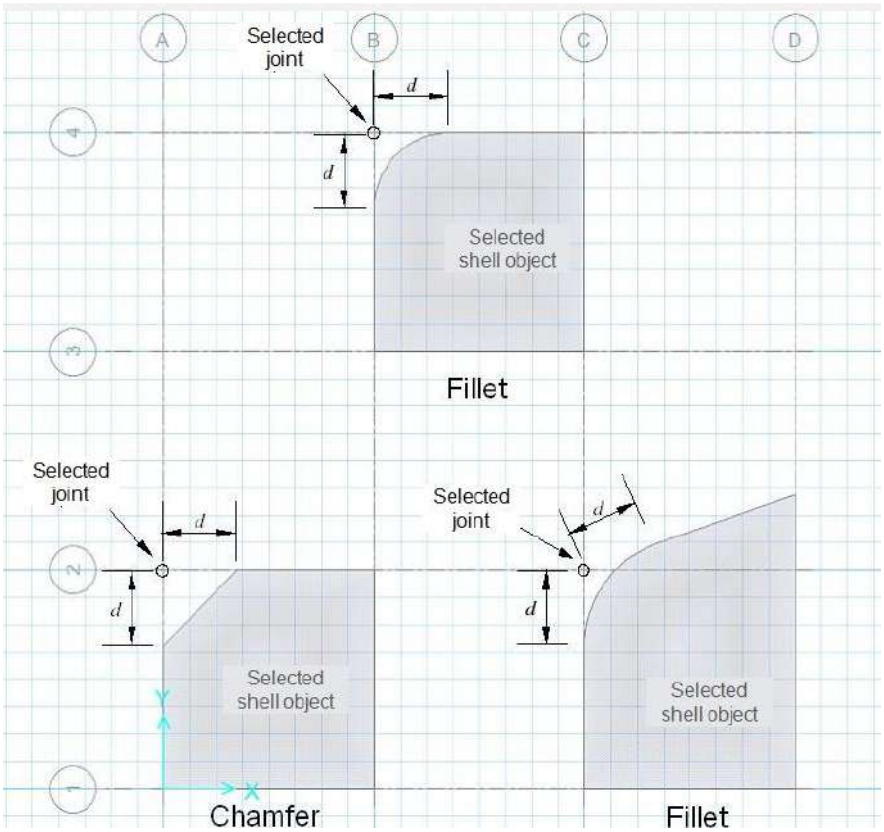
Information form, which can be used to check the object's properties and assignments. These figures show some examples of merged floor



Chamfer Slab Corners

Click the **Edit menu > Edit Shells > Chamfer Slab Corners** command to access the Chamfer Slab Corners form and bevel (chamfer) or round (fillet) slab edges. Note that the model must be unlocked for this command to work.

1. Select at least one shell object and at least one corner joint of the object. Note that multiple shells and corner joints can be selected at the same time.
2. Click the **Edit menu > Edit Shells > Chamfer Slab Corners** command to access the Chamfer Slab Corners form.
    - **Chamfer/Fillet Dimension** edit box. Specify the dimension for the bevel (chamfer) or round (fillet). The figure below shows how the dimension is applied.
    - Choose the **Beveled Edge (Chamfer)** option or the **Rounded Edge (Fillet)** option by clicking on it.


A
B
C
D
Selected joint
d
d
Selected shell object
Fillet
Selected joint
d
d
Selected shell object
Chamfer
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Selected shell object
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