

Modeling simply supported shells

Tutorial

Name:	Modeling simply supported shells
Description:	Procedure for modeling simply supported shells and coordinating their support systems.
Program:	SAP2000
Version:	na
Model ID:	na

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Approach 1 - assigning releases to shell elements

The latest versions of CSI programs allow to assign edge releases to the edge of shell elements via the Assign menu command for shell elements. This is the most convenient approach to assign simply supported shells. However, if more refined control is needed, then the additional approach described below can be used.

Approach 2 - connectivity via links

Shells may be **modeled** as **simply supported shells** by inserting short [links](#) between the slab and its supporting members. These links would be fixed for translational degrees of freedom (DOF), and free for rotational. This procedure results in a model which may be checked easily, since all links are readily visible.

Approach 3 - disconnect joints and apply constraints

An alternative procedure is to disconnect the [joints](#) and then use [constraints](#) to constrain only the translational DOF as follows:

- At each support location, disconnect all joints which connect the slab to adjoining members by selecting Edit > Edit Points > Disconnect. This will replace each single joint with two or more independent joints, one for each coincident member.
- If necessary, consolidate these disconnected joints such that adjacent slab objects share a common joint, and adjacent supporting members share a common joint.
- For each of these consolidated joints, define a [body constraint](#), [equal constraint](#), or [weld constraint](#) among UX, UY and UZ DOF.
- Ensure that the [mesh](#) for the simply supported shell matches that for the supporting system.

Approach 4 - offset shell element and apply weld constraint

Approaches 2 and 3 can be time consuming, especially for large models. A more efficient approach might be a combination of approaches 2 and 3 as follows:

- Select shell elements to modeled as simply supported.
- Move the selected shell elements by a small distance, say A, in a direction perpendicular to their plane (or approximately in this direction for more complex geometries).
- Select joints along the edges to be modeled as simply supported and include joints on both the moved shell elements and their adjacent shell elements. Apply weld constraint to the selected joints, using a tolerance slightly greater than A and constrain only translational Degrees of Freedom.
- Select joints along the edges to be modeled as fixed and include joints on both the moved shell elements and their adjacent shell elements. Apply weld constraint to the selected joints, using a tolerance slightly greater than A and constrain all Degrees of Freedom.

See Also

- [Modeling a pin connection between crossing members](#) tutorial