

Modeling slabs with variable thickness, loading and soil subgrade modulus

To **model slabs with variable thickness and loading** in [SAFE/ETABS](#), it is best to create a base slab which spans the entire floor, then draw slabs of variable thickness over the base slab to adjust local geometry and loading. Contained-area slabs drawn over the base slab will take precedent. This applies to every [area](#) object except drop-panels. To apply variable loading, assign NONE properties to contained-area slabs (aka null areas), then select Assign > Load Data to specify load magnitude and direction. When assigning loads to null areas in both programs, loads will be added to the existing base slab. See notes and table below for additional information:

Item	ETABS	SAFE
Shell Stiffness (including any stiffness modifiers)	<p>The slab object with the smaller area takes precedence.</p> <p>If the slab objects have a stiffness A and the drop panels (assumed to have a smaller area) have a stiffness B, then at the drop panels, the stiffness is B.</p>	<p>“Drop” type slabs take the highest precedence. If two slabs are the same type, the slab object with the smaller area takes precedence.</p> <p>If the slab objects have a stiffness A and the drop panels (regardless of size) have a stiffness B, then at the drop panels, the stiffness is B.</p>
Area/Temperature Loading	<p>The slab object with the smaller area takes precedence.</p> <p>If the slab objects have a loading A and the drop panels (assumed to have a smaller area) have a loading B, then at the drop panels, the loading is B.</p>	<p>Loading values add together.</p> <p>If the slab objects have a loading A and the drop panels have a loading B, then at the drop panels, the loading is A+B.</p>
Soil/Area Springs	<p>The slab object with the smaller area takes precedence.</p> <p>If the slab objects have soil spring stiffness A and the drop panels (assumed to have a smaller area) have soil spring stiffness B, then at the drop panels, the soil spring stiffness is B.</p>	<p>The soil subgrade modulus with the higher value will take precedence.</p> <p>If the slab objects have soil subgrade with stiffness A and the drop panels (regardless of size) have soil spring stiffness B, then at the drop panels, the soil subgrade stiffness will be the highest of <u>A</u> and B.</p>

Notes:

- 1- Shell rigid diaphragm must be explicitly assigned to null areas in ETABS for their loads/additional mass to be included in modal analysis (seismic mass).
- 2- For semi-rigid diaphragms, the contained areas are recommended to be assigned with the same structural properties of the base slab in lieu of null areas. The latter may cause local modes when their load/additional mass are part of the lateral mass source.
- 3- Refer to the release note below for the enhancement that was recently implemented in ETABS v19.1.0. This new behavior affects ETABS v19.1.0 and later versions, this is in line with the current behavior of SAFE:

"An enhancement was made to make uniform area loads assigned to floor objects with properties to be additive if the objects overlap at any location. This was already true for floor objects with null properties that overlapped objects with properties. Older models where drop panels overlap slab areas and have identical uniform load specifications will have their duplicated loads deleted to maintain the same total loads"