## Capacity Design

Capacity design is a design process in which it is decided which objects within the structural system will be permitted to yield (Ductile components) and which components will remain elastic (Brittle components).

Once Brittle and Ductile systems are decided upon, design proceed according to the following guidelines:

**Ductile Components:** Are design with sufficient deformation capacity.

**Brittle Components:** Are design to achieve sufficient strength levels.

The objective of capacity design is to confirm a building undergoes controlled ductile behavior in order to avoid collapse in a design-level earthquake. This involves designing the structure to allow ductile failure at key predictable locations within the structure and to prevent other failure types occurring near these locations or elsewhere in the structure.

In other words, in a structure that contains both brittle and ductile elements, capacity design is a method to provide the structure with an overall ductile characteristic.

### Brittleness and ductility

Brittle elements have very limited capacity for **inelastic deformation** (When an object changes its shape due to some forces and retain new shape after the removal f forces) without losing strength – put simply, they break when you bend them. Brittle materials include glass, unreinforced concrete, cast iron and unreinforced masonry . In contrast to this, ductile elements can withstand repeated displacements without significant loss of strength. They may bend and deform, but they do not easily break. Ductile materials include properly detailed reinforced concrete and structural steel.

When a structure acts in a ductile manner, it generally dissipates earthquake energy. This energy dissipation is sometimes referred to as **controlled damage**, as the ductile elements within the structure may well destroy themselves in order to protect the rest of the structure.

In traditional reinforced concrete and steel buildings, yielding of the steel or steel reinforced elements is used to provide the ductility and energy dissipation necessary to protect the building from collapse.

https://www.youtube.com/watch?v=QVCzjRJWdNw