STRUCTURAL FAILURE

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Why some structures fail and others do not. How the failure could have been prevented. These are the questions many builders and owners would be interested. Structural failure is an important subject that needs more deliberations.

How Structural Failure Occurs

Structural failure is concerning reduction in the load bearing capability of a structural component or element, or the main structure. Structural failure is commenced when the material is stressed to its upper strength limit, thus causing rupture or extreme deformations. The ultimate strength of the material or the system is the limit of the load bearing capacity. On reaching this limit, the construction materials could already been damaged, and their load carrying capacity is suddenly decreased permanently. If the system is properly designed, a local collapse should normally not be a cause of instant or gradual failure of the complete building. The ultimate failure strength of the construction elements should be carefully considered in the design of structures to prevent failure.

Design Parameters

A progressive collapse of a building or structure is initiated from local fracture that later spreads to include the main section of the facility. Current concerns with such collapses stem basically from modifications in building practices and improper structural designs. Strategies for mitigating the structural failures can be evaluated using a thoughtful risk assessment, supported by modern computational tools. It is important to arrange soil testing on the actual site before the detailed planning starts. Buildings, like all construction, are designed to sustain specific loads without excessive deformation to prevent failure. The live loads consist of the weights of humans, objects, rain, snow, and the wind pressure, while the dead load is that of the building itself. With buildings consisting of a few floors, strength usually involves adequate rigidity, and the vital design is essentially that of the roof that will endure the weather effects. However, the roof design is of a minor significance for tall buildings, and the major considerations are that of the building supports.

Prevention of Structural Failures

Structures may fail due to numerous reasons that need to be thoroughly deliberated during the initiation, design, planning, executing, and the monitoring processes of the project. It is essential to understand the load

conditions on the structure, and accordingly design the structural elements and the materials used on the construction. Faulty construction has been the most important cause of structural failure. This includes the use of salty sand to produce concrete, use of inferior steel, improver riveting, incorrect nut tightening torques, defective welding, and other wrong engineering practices. Design of structures should also consider the seismic effects to prevent damage due to the earthquakes. Earthquakes may cause problems concerning the foundations when the damp land liquefies.

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