

Auxiliary Concept: Structural Analysis

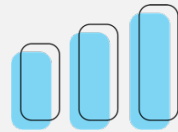
Engineering Literacy Dimension: Engineering Knowledge

Domain: Engineering Technical Applications

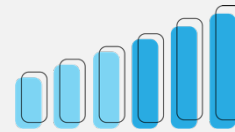
Overview: *Structural Analysis* concerns the process of determining the effects of loads, or forces, on physical structures, as well as their individual components, and examining what factors influence the deflection and deformation of these structural elements. This includes determining how and why structural elements may fail, break or deform, and preventing such failures. This concept is important to Engineering Literacy as all structures are constantly under some type of strain or stress due to a variety of forces applied to them. As such, structural analyses enable one to make informed decisions about how structures should be designed by performing the proper calculations to determine whether or not various structural members will be able to support the forces applied to them.

Performance Goal for High School Learners

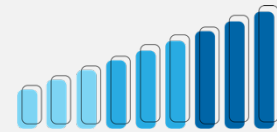
I can, when appropriate, draw upon the knowledge of Structural Analysis content and practices, such as (a) *the physical properties of construction materials*, (b) *material deflection*, (c) *material deformation*, (d) *column and beam analysis*, and (e) *the implementation of design codes*, to evaluate the structural elements of an structure design using the proper formulas and conventions necessary to calculate the effects of applied stresses or strains.



Basic



Proficient



Advanced

PHYSICAL PROPERTIES OF BUILDING MATERIALS

I can list a variety of materials used for construction purposes and classify them in terms of their physical properties.

I can explain a variety of categories of building materials in terms of their strengths (e.g. concrete, moisture protection, thermal protection, fire suppression, etc.)

I can determine and justify which building materials are most appropriate for my design.

MATERIAL DEFLECTION

I can define structural deflection in beams, differentiating it from deformations.

I can explain the factors influencing structural deflection (e.g. load, length, Young's modulus, area etc.), using mathematical models.

I can analyze the possibilities of structural deflection of a given architecture design, using mathematical equations.

MATERIAL DEFORMATIONS

I can define structural deformations, differentiating it from deflection.

I can explain the factors influencing structural deformations (e.g. load, length, Young's modulus, area etc.), using mathematical models.

I can analyze the possibilities of structural deformations of a given architecture design, using mathematical equations.

COLUMN & BEAM ANALYSIS

I can describe the functions of columns and beams in architecture structures.

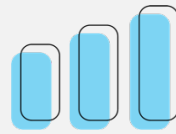
I can describe the basic factors influencing deflections or deformations of columns and beams (e.g. compressive, tensile, and shear stresses).

I can analyze the required forces of columns and beams for my design through column and beam analysis.

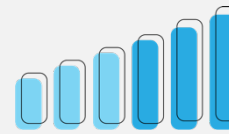
Auxiliary Concept: Structural Analysis Cont.

Performance Goal for High School Learners

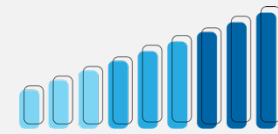
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Basic



Proficient



Advanced

IMPLEMENTATION OF DESIGN CODES

I can describe the importance of compliance of design codes in construction projects.

I can search for design codes built by professional associations (e.g. ASCE) and adopted by state or local jurisdiction.

I can evaluate the physical structure of my design with design codes.