

Lecture 1 – Units & Structural Analysis (review)

Units:

See [AECT 360 – Lecture 1](#)

Just a friendly reminder of units for the benefit of **passing this course**.

Basic Units:

- a. Length (inch, foot, meter, etc.)
- b. Force (lbs., kips, newtons, etc.)

Combinations of units - typical uses in structural engineering:

- a. Linear measurements (examples: dimensions, span, thickness, height, etc.)
- b. Area = Length x Length (examples: in², ft², m², etc.)
- c. Volume = Length x Length x Length (examples: in³, ft³, yd³, m³, etc.)
- d. Unit Weight = $\frac{Weight}{Volume}$ (examples: lbs/ft³, kips/in³, kN/mm³, etc.)
- e. Uniform Load = $\frac{Force}{Length}$ (examples: lbs/ft, kips/inch, N/m, etc.)
- f. Stress = $\frac{Force}{Area}$ (examples: lbs/in², kips/ft², kn/m², etc.)
- g. Strain = Deformation per unit deformation, $\frac{inch}{inch}$ (unit-less)
- h. Modulus of Elasticity = PSI, KSI (see Stress)
- i. Moment = Force X Length (examples: kip-feet, lb-inch, N-m, etc.)
- j. Moment of Inertia "I" = Length⁴ (examples: in⁴, mm⁴, etc.)
- k. Section Modulus = $\frac{I}{y}$ (examples: in³, mm³, etc.)
- l. Radius of Gyration = $\sqrt{\frac{I}{A}}$ (examples: inch, mm, etc.)
- m. Deformation = $\frac{PL}{AE}$ (examples: inch, mm, etc.)
- n. Deflection = $\frac{5wL^4}{384EI}$, $\frac{PL^3}{48EI}$, etc. (examples: inch, mm, etc.)

Structural Analysis:

1. Forces –
 - a) Vertical & horizontal force components
 - b) Point loads
 - c) Uniform loads
 - d) PressureSee [AECT 360 – Lecture 2](#)

2. Beam analysis -
 - a) Converting floor loads into uniform linear loads
 - b) Framing plan analysis
 - c) Determining support reactions
 - d) Calculating shear diagram
 - e) Calculating moment diagramSee [AECT 360 – Lecture 3](#) and [AECT 360 – Lecture 15](#)

3. Section properties –
 - a) Area
 - b) Centroid
 - c) Moment of inertia
 - d) Section modulus
 - e) Radius of gyrationSee [AECT 360 – Lecture 4](#)

4. Stress analysis –
 - a) Tensile stress
 - b) Compressive stress
 - c) Bending stress
 - d) Shear stress
 - e) Bearing stressSee [AECT 360 – Lecture 7](#) and [AECT 360 – Lecture 8](#)

5. Frame analysis – see [AECT 360 – Lecture 16](#)

6. Truss analysis – see [AECT 360 – Lecture 18](#) and [Lecture 19](#)