

TEST

CHAPTER 1: INTRODUCTION

STRUCTURAL DESIGN: An efficient & economical selection and arrangement of properly sized members & properly detailed connections to resist load

LOADS: (CVEN 345) - Applicable forces acting on a structure

DEAD LOADS: "constant" over life of structure ("gravity load")

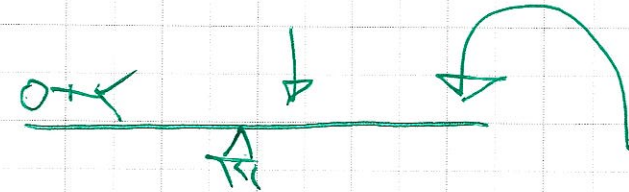
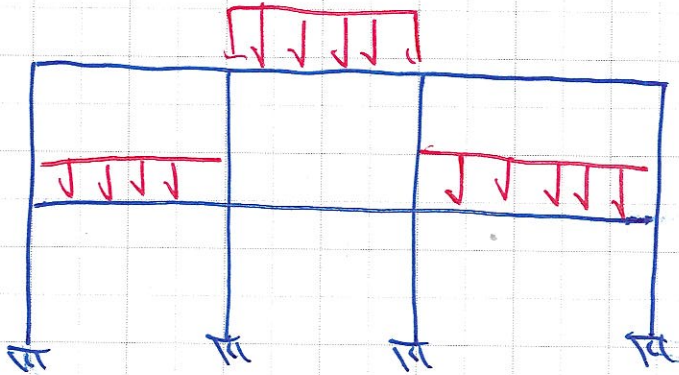
- self-weight
- perm. wt. of fixtures
- generally act vertically

LIVE LOADS: "vary" over the life of the structure, can. act in any direction

Result of nature

- wind
- rain, snow, etc.
- earthquakes
- soil pressure
- etc.

LOADS ARE PLACED ON STRUCTURE TO "MAXIMIZE LOAD EFFECT"^F₁



DESIGN SPECIFICATION: Design spec. provides more specific detailed guidelines for the design of structural members & connection

"MANUAL" - Design spec. plus design aides such as section properties, material properties, design tables, etc.

AISC Manual - American Inst. of Steel Construction

ACI Manual - American Conc. Inst.

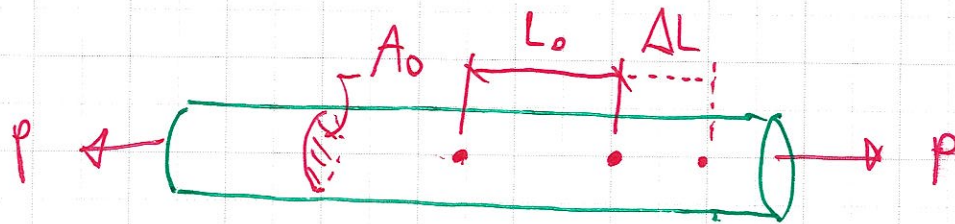
AASHTO - Highway & Bridges, related structure (Steel, wood, conc.)

STRUCTURAL STEEL

- Dates back to 4,000 BC
- Bessemer's process in 1885 greatly improved structural properties

- 1874 - 1st Steel Bridge (St. Louis Bridge, Railway) ductility
- 1884 - 1st Steel Building (Chicago, Home Ins. Bldg.) Strength

STRUCTURAL PROPERTIES - most come from uniaxial tension test



FOR DESIGN WE USE: f_y, f_u, E

Analysis (30,000 ksi) P_{fail}
 Design (29,000 ksi) *

Ductility: $\epsilon = \epsilon_f = \frac{L_f - L_0}{L_0} \times 100\%$

P	l_i
0	0
$\vdots$	$\vdots$
	l_{fail}

$\sigma = \frac{P}{A_0}$	$\epsilon = \frac{L_i - L_0}{L_0}$
0	0
$\vdots$	$\vdots$
σ_{fail}	$\epsilon_{snr fail}$

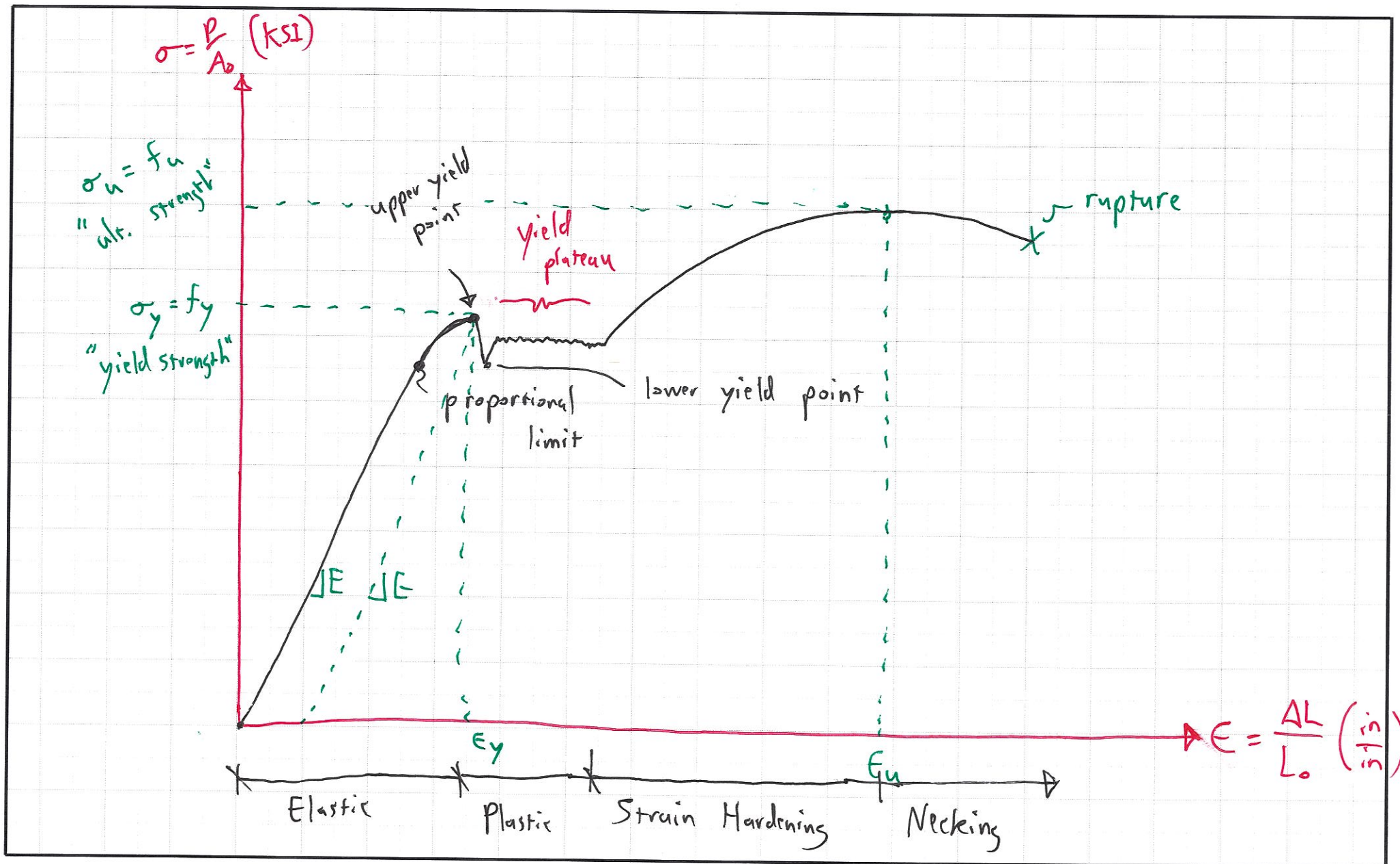
COMMON STEEL TYPES

ASTM DESIGNATION	F_y (ksi)	F_u (ksi)	e (%)
A36	36	58	20
A572 Gr 50	50	65	18
A992 **	50	65	18

Table 2-4

p 2-48 of AISI

** most commonly used for hot-rolled shapes



PARTS OF THE AISC MANUAL

1) DESIGN AIDS (PART 1-15)

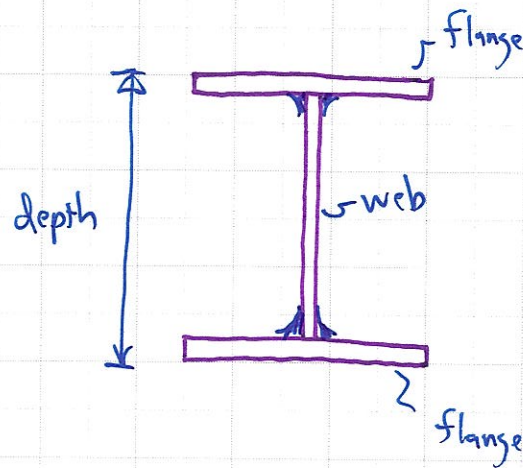
- Design Tables
- Sect. Properties
- Material Properties
- Etc.

2) SPECIFICATION (PART 16)

3) COMMENTARY TO SPEC.

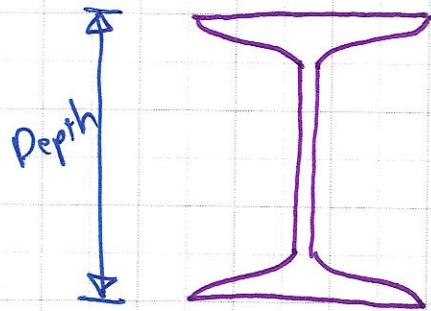
STANDARD HOT-ROLLED SHAPES (PART 1 AISC)

1) WIDE FLANGE → "W" SHAPE/SECTION



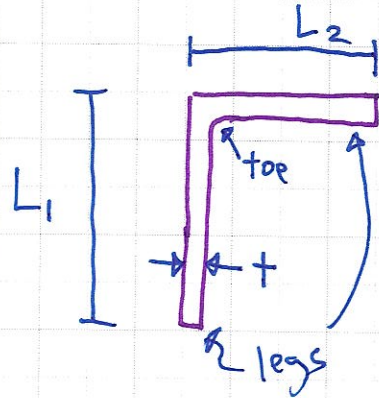
$$W \approx \frac{\text{depth}}{\text{lb/ft}}$$

ISC Table 1-1

2) AMERICAN STANDARD → "S" SHAPE

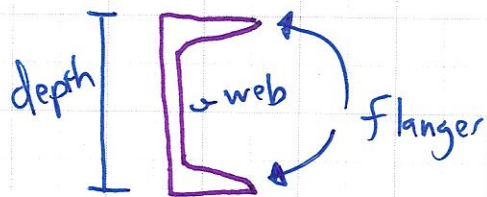
$$S \frac{\text{approx. depth}}{\text{depth}} \times \frac{lb}{ft}$$

Table 1-3

3) ANGLES → "L" SHAPE

$$L \frac{L1}{\text{longest leg}} \times \frac{L2}{\text{leg}} \times \text{thickness}$$

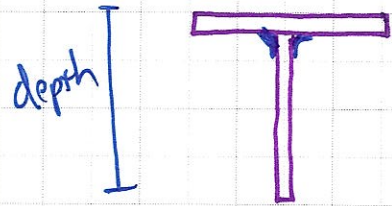
Table 1-7

4) AMERICAN STANDARD CHANNEL → "C" SHAPE

$$C \frac{\text{approx depth}}{\text{depth}} \times \frac{lb}{ft}$$

Table 1-5

5) TEE $\rightarrow$ "WT" SHAPE



$$\text{WT} \frac{\text{Approx. Depth}}{\text{Table 1-8}} \times \frac{\text{lb}}{\text{ft}}$$

* $\frac{1}{2}$ OF A W-SHAPE

* OTHER SHAPES INCLUDE HSS (HOLLOW STRUCTURAL SECTION), HP, MT, M, PIPE

6) BUILT-UP MEMBERS $\rightarrow$ Fabricated from other shapes

