LESSON 23

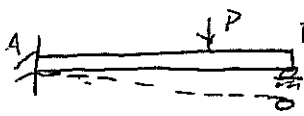
FINAL TOPICS ON FLEXIBILITY METHOD

- SUPPORT SETTLEMENTS
- TEMP. CHANGES
- FAB, ERROR
- ELASTIC SUPPORT

A.) SUPPORT SETTLEMENTS

CASE 1: SETTLEMENT CORRESPONDS TO A REDUNDANT:

→ VERY EASY:



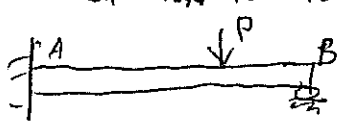
B IS REDUNDANT

$\Delta B = -1$ in

EQN. OF COMPATIBILITY: $\Delta B_{primary} + \Delta B_{Red.} = -1$ in (usually ϕ)

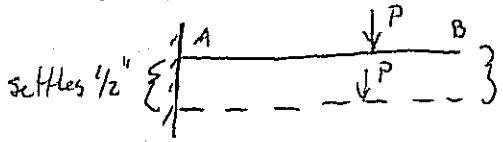
CASE 2: SETTLEMENT DOES NOT CORRESPOND TO A REDUNDANT:

→ SHOW SETTLEMENT RELEASED STRUCTURE



B IS REDUNDANT
SAY A SETTLES 0.5"

RELEASED STRUCTURE:



ΔB_{SA} → Def. Due to settlement at A
B ALSO SETTLES DUE TO SETTLEMENT AT A.

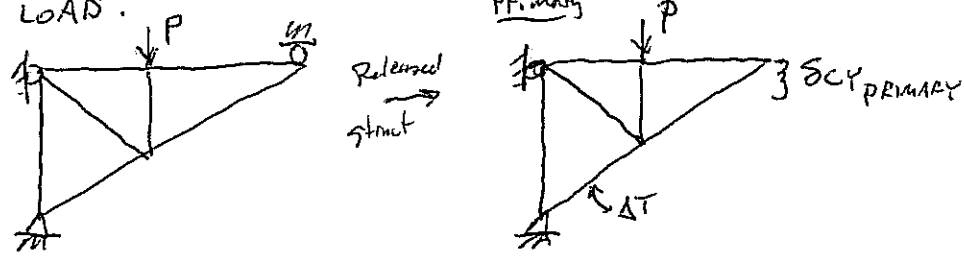
COMPATIBILITY EQN: $\Delta B_{PRIMARY} + \Delta B_{SA} + \Delta B_{Red.} = 0$

ΔB_{SA}: New term here

B.) TEMP. CHANGES

TREAT Change in Temp. Deformations As Deformations DUE TO LOAD.

EX:



→ VIRT. WORK WILL YIELD δ_{CY} DUE TO LOAD & Temp Change $\delta_{FQ} \propto [\Delta T]L$

→ SIMPLY ADD TO EQN. OF COMPATIBILITY

$\delta_{CY(PRIMARY)} + \delta_{CY(REDUNDANT)} = 0$

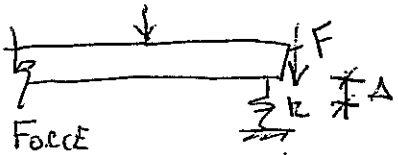
(ΔT term is in here)

C.) FABRICATION ERROR:

$+ \Sigma F_Q(\Delta L) \rightarrow \delta_{Primary}$ (Add disp. effect to Primary)

$\delta_{PRIMARY} + \delta_{REDUNDANT} = 0$

D.) ELASTIC SUPPORT:



F = Force

k = spring constant

Δ = displacement

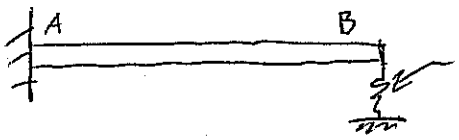
FORCE ON A SPRING: $F = k\Delta$

$\Delta = F/k$

FORCE ON A STRUCTURE BY A SPRING: $\Delta = -\frac{X}{k}$ where X is Redundant Force

↖ INCLUDE THIS IN COMPATIBILITY EQN.

EX.



Treat as a redundant

$$\Delta_{B\,PRIMARY} + \Delta_B(R_B) = \frac{-R_B}{k}$$