

STEP 2: FACTORED LOAD FOR STRUCTURAL DESIGN

CONSERVATIVE LOAD FACTOR (ACI 318-19, DEAD LOAD DOMINANT):

$$\text{FACTORED LOAD} = 1.4 \times 9492 = 13,288.8 \text{ LBS}$$

FACTORED SOIL PRESSURE:

$$Q_U = 13,288.8 / 12.25 \sim 1084.8 \text{ PSF}$$

STEP 3: FLEXURAL DESIGN

CRITICAL SECTION AT COLUMN FACE. CANTILEVER LENGTH:

$$(42 - 7) / 2 = 17.5 \text{ IN} = 1.458 \text{ FT}$$

MOMENT FOR 1-FT WIDE STRIP:

$$M_U = 1084.8 \text{ PSF} \times (1 \times 1.458) \times (1.458 / 2) \sim 1153.7 \text{ LB-FT/FT} = 1153.7 \times 12 = 13,844.4 \text{ LB-IN/FT}$$

EFFECTIVE DEPTH (D):

$$D = 12 - 3 (\text{COVER}) - 0.3125 (\text{HALF \#5 BAR}) \sim 8.69 \text{ IN}$$

REQUIRED STEEL AREA (STRENGTH REDUCTION FACTOR = 0.9, STEEL YIELD STRENGTH = 60,000 PSI):

$$A_S = 13,844.4 / (0.9 \times 60,000 \times 8.69) \sim 0.0295 \text{ SQ.IN/FT}$$

MINIMUM REINFORCEMENT (ACI 318-19):

$$A_{S,\text{MIN}} = 0.0018 \times 12 \times 12 = 0.2592 \text{ SQ.IN/FT}$$

MINIMUM GOVERNS. USE #5 BARS ($A_S = 0.31 \text{ SQ.IN}$):

$$\text{SPACING} = (0.31 / 0.2592) \times 12 \sim 14.35 \text{ IN}$$