

PROJECT : CLEAN FUEL PROJECT.LOCATION : SULPHUR PIT T-11401 WBS-C AREA.SUBJECT : FORMWORK WALL.BY : VIRUT PROMMA.

REQUIREMENT ; - WALL THICKNESS IS. 60 CM.

- WALL HIGH ABOUT 2.70 M.

- PLYWOOD THICKNESS 15 MM.

- BRACING  $\Delta$  - 50 X 50 X 2.3 MM.

ASSUMPTION ; - CONCRETE SLUMP 10 CM.

- POURING CONCRETE RATE ABOUT 2 M./HR.

- TEMPERATURE OF CONCRETE ABOUT 30 °C.

SOLUTION ;1) PRESSURE. (ACTION TO FORMWORK) FROM. CEB. (COMITE<sup>T</sup> EURO-INTERNATIONAL DE BETON<sup>T</sup>)

1.1) LIQUID PRESSURE CONCEPT.

$$\begin{aligned}
 P &= \gamma \cdot H. \\
 &= 2,400 \times 2.70 \\
 &= 6,480 \quad \text{kg./m}^2
 \end{aligned}$$

1.2) FORMATION CONCEPT. (VIBRATION FROM VIBRATOR MACHINE)

$$\begin{aligned}
 P_s &= 2,400 \cdot K \cdot R + 500 && \text{WHEN ; } K = 0.65 \\
 P_s &= [(2,400)(0.65)(2)] + 500 && R = 2 \text{ M./HR.} \\
 P_s &= 3,620 \quad \text{kg./m}^2.
 \end{aligned}$$

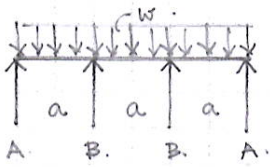
1.3) WIDTH EFFECT CONCEPT.

$$\begin{aligned}
 P_a &= 300 \cdot R + 10,000 \cdot d + 1,500 && \text{WHEN ; } d = 0.60 \text{ m.} \\
 P_a &= [(300)(2)] + [(10,000)(0.6)] + 1,500 && = 8,100 \quad \text{kg./m}^2.
 \end{aligned}$$

∴ THEN USED CONCRETE PRESSURE 3,620 kg./m<sup>2</sup> (FOR CALCULATION.)

## 2) CONSIDER PLYWOOD AND BRACING DISTANCE

## 2.1) BENDING CONTROL.



$$\text{FROM. } M = \frac{w \cdot a^2}{10}$$

$$\text{THEN. } F_b = \frac{6 \cdot M}{b \cdot d^2}$$

$$135 = \frac{6 \cdot (36 \cdot 20) \cdot \frac{a^2}{10}}{(100 \times 1.5)^2}$$

$$a = \sqrt{\left( \frac{135}{0.096533} \right)}$$

$$a = 37.4 \text{ cm.}$$

## 2.2) DEFLECTION CONTROL.

$$\text{WHEN. } \frac{a}{360} = \frac{1}{128} \cdot \frac{w \cdot a^4}{E \cdot I}$$

$$a = \sqrt[3]{\frac{128}{360} \cdot \frac{E \cdot I}{w}}$$

$$a = \sqrt[3]{\left( \frac{128}{360} \right) \left( \frac{115,500 \times 28}{36.2} \right)}$$

$$a = 31.0 \text{ cm.}$$

∴ THEN USED BRACING DISTANCE (a) 30 cm.

## 3) BEAM DISTANCE FOR SUPPORT BACK SIDE OF BRACING.

## 3.1) BENDING CONTROL.

$$\text{WHEN } F_b = \frac{6 \cdot M}{b \cdot d^2}$$

$$1,440 = \frac{6}{(5.0)(5.0)^2} \cdot \left( 3,620 \times \frac{0.30}{100} \times \frac{a^2}{10} \right)$$

$$a^2 = \frac{1,440 \cdot 0.052}{0.052}$$

$$a = \sqrt{27,692.3}$$

$$a = 166.4 \text{ cm.}$$

## 3.2) DEFLECTION CONTROL.

$$\text{WHEN } a = \sqrt[3]{\frac{128 \cdot E \cdot I}{360 \cdot W}}$$

$$a = \sqrt[3]{\left( \frac{128}{360} \right) \times \frac{(2.1 \times 10^6)(15.9)}{\left( \frac{3,620 \times 0.3}{100} \right)}}$$

$$a = \sqrt[3]{1,093,168.923}$$

$$a = 103.0 \text{ cm.}$$

∴ THEN USED BEAM DISTANCE FOR SUPPORT BACK SIDE OF BRACING FROM CALCULATE ABOUT 103 CM. MAXIMUM, BUT ACTUALLY RECOMMENCE THE MAXIMUM OF BEAM DISTANCE SHOULD NOT MORE THAN THE THICKNESS OF WALL ABOUT 60 CM. (USED)

4) WOODEN SUPPORT BOTTOM OF FORMWORK. (IN CASE OF USED)

3) FIXED WOODEN WITH CONCRETE BY NAIL  $\phi$  4 MM. (CASE OF SHEAR FORCED CONTROL)

$$\begin{aligned} \text{PRESSURE PER METER } P &= (3,620)(0.15)(1.0) \\ &= 543 \text{ kg.} \end{aligned}$$

$$\text{WHEN ALLOWABLE OF NAIL } 1,200 \text{ kg./cm.}$$

$$\begin{aligned} \text{NAIL. 1 NO. SUPPORT FORCED} &= \left[ \frac{70(0.4)^2}{4} \right] (1,200) \\ &= 150 \text{ kg.} \end{aligned}$$

THEN SPACING OF NAIL FOR FIXING WOODEN SUPPORT FORMWORK,

$$\begin{aligned} &= \frac{150}{543} \\ &= 0.276 \text{ m.} \end{aligned}$$

$\therefore$  USED NAIL SPACING IS 25 CM.

5) INNER UNIT

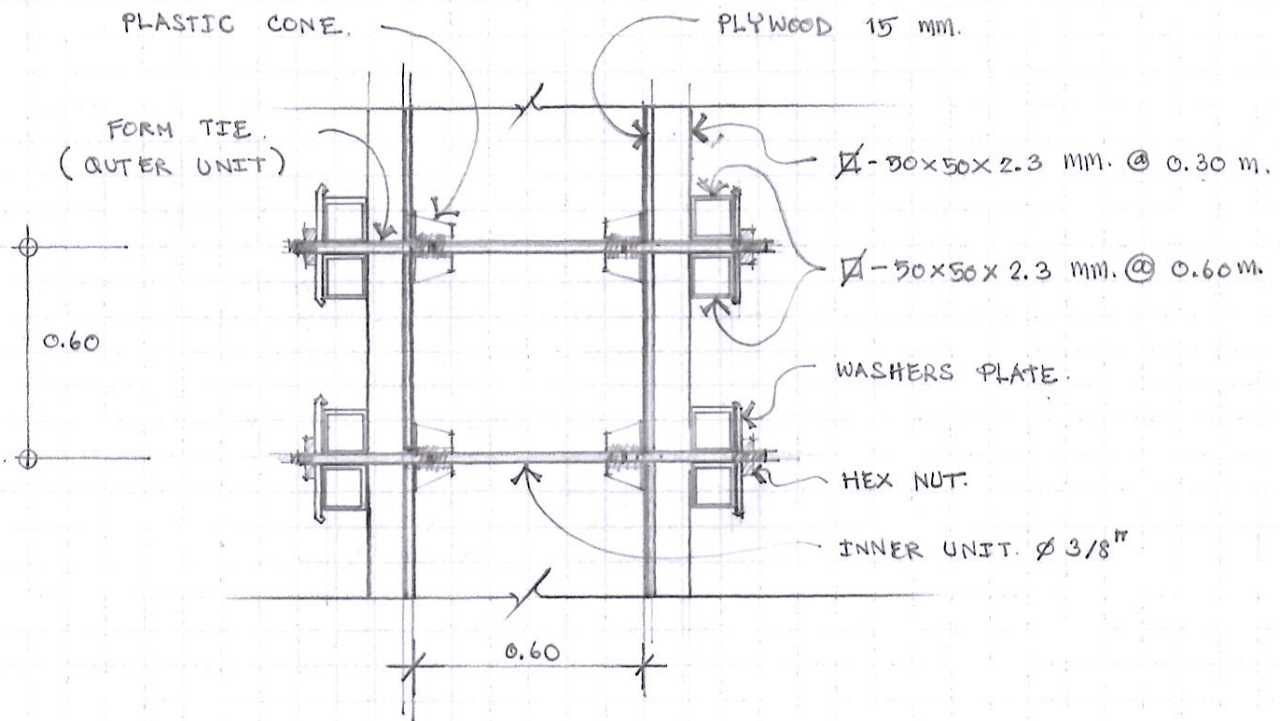
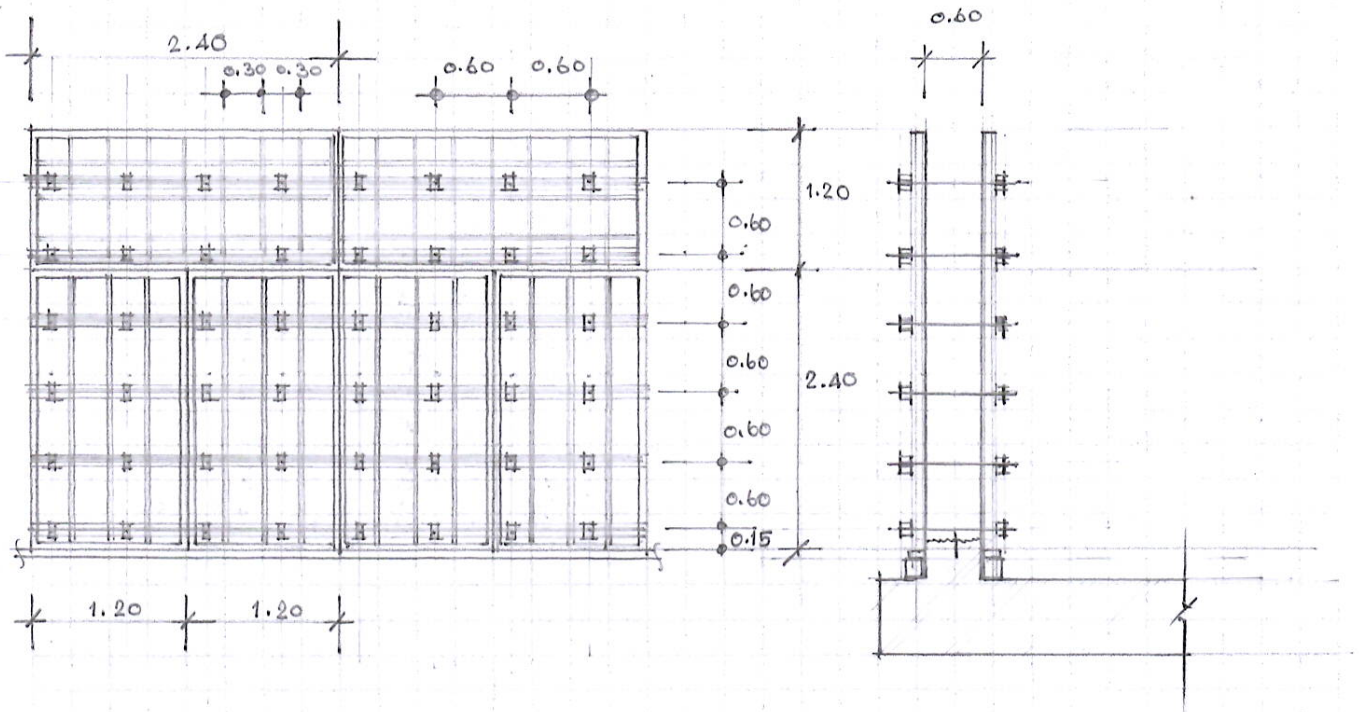
3) TIE ROD SIDE  $3/8''$  (ALLOWABLE WORKING STRENGTH 2,100 kg.)

$$\begin{aligned} \text{LOAD AREA} &= \frac{2,100}{3,620} \\ &= 0.58 \text{ m}^2 \end{aligned}$$

CONSIDER BEAM SUPPORT SPACING IS 0.60 M., THEN SPACING OF TIE ROD

$$\begin{aligned} &= \frac{0.58}{0.60} \\ &= 0.96 \text{ m. (MAXIMUM).} \end{aligned}$$

$\therefore$  USED SPACING OF INNER UNIT IS 0.60 M. (TO SUITABLE THE CONDITION OF FORMWORK)



DETAIL.

VIRUT PROMMA.