Online Instructor's Manual
to accompany

Construction Methods and Management

Eighth Edition

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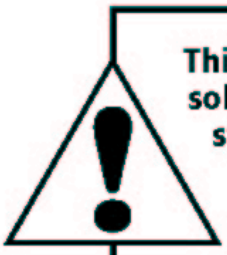

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CHAPTER 1

INTRODUCTION

1. The U.S. construction industry accounts for some 10% of the nation's gross national product. The approximate distribution of new construction contract value within the industry includes: private building 71%; public nonbuilding 12%; public building 10%; and private nonbuilding 7%.

2. Some major characteristics of the U.S, construction industry include:
   - Highly competitive
   - Fragmented
   - Work is seasonal and sporadic
   - High rate of bankruptcy
   - High accident rate

3. The purpose of a building code is to protect the public by providing minimum design and construction standards for structural and fire safety of buildings.

4. Construction may be accomplished by any of the following methods:
   - Owner construction force
   - Owner management of construction:
     - Employing hired labor
     - Utilizing subcontractors
   - Contract construction by a general contractor
   - Employing a design/build (or turnkey) construction contract
   - Utilizing a Professional Construction Manager

5. A decline in construction productivity in relation to the price of goods and services will limit the demand for construction services. The effect on the national economy would be significant because the industry accounts for a significant portion of the nation's gross national product and its employment.

6. Heavy or horizontal construction projects include highways, airports, railroads, canals, harbors, dams, utility lines, and similar works. Since most such projects fall into the category of public works, they are primarily constructed with public funds.

7. Quality control is the process of assuring that all elements of a constructed project meet the requirements established by the project designer in the project plans and specifications

8. A majority of serious construction injuries occur during the following operations:

Concrete construction
Erection of prefabricated trusses, precast concrete elements, and structural steel
Construction and operation of temporary facilities and construction plant
Working from elevated positions
Construction equipment operations

9. An Environmental Impact Statement (EIS) describes and quantifies the effect a proposed project will have on the environment. The preparation of an EIS is a complex, time-consuming, and expensive task which should be undertaken only with the assistance of a professional experienced in such matters.

CHAPTER 2

EARTHMOVING MATERIALS AND OPERATIONS

1. Corner points = 6.0+4.6+3.0+4.0 = 17.6 ft

[= 1.83+1.40+0.92+1.22 = 5.37 m]

Border points = 5.8+5.2+4.2+3.6+3.5+4.8+4.8+5.5 = 37.4 ft

[= 1.77+1.59+1.28+1.10+1.07+1.46+1.46+1.68 = 11.41 m]

Interior points = 5.0+4.6+4.0+4.9 = 18.5 ft

[= 1.52+1.40+1.22+1.49 = 5.63 m]

$$\text{Average depth} = \frac{17.6 + 2(37.4) + 4(18.5)}{36} = 4.62 \text{ ft}$$

$$[= \frac{5.37 + 2(11.41) + 4(5.63)}{36} = 1.41 \text{ m }]$$

2. $$\text{Moisture content} = \frac{15.0 - 14.2}{14.2} \times 100 = 5.6\ \%$$ (Eq 2-3)

$$[= \frac{6.80 - 6.44}{6.44} \times 100 = 5.6\ \%]$$

3. $$\text{Loose volume} = \text{bank volume} \times \left(1 + \frac{\text{swell}}{100}\right)$$

$$= 500 \times \left(1 + \frac{30}{100}\right) = 650 \text{ LCY}$$

$$= 650 \times 27 = 17{,}550 \text{ cu ft}$$

$$[= 382 \times \left(1 + \frac{30}{100}\right) = 496.6 \text{ LCM }]$$

$$\text{Base diameter} = \left(\frac{7.64 \times \text{volume}}{\tan R}\right)^{1/3}$$ (Eq 2-12)

$$= \left(\frac{7.64 \times 17{,}550}{\tan 35^\circ}\right)^{1/3} = 57.6 \text{ ft}$$

$$\{ = \left(\frac{7.64 \times 496.6}{\tan 35^\circ}\right)^{1/3} = 17.6 \text{ m }]$$

$$\text{Height} = \frac{D}{2} \times \tan R$$ (Eq 2-13)

$$= \frac{57.6}{2} \times \tan 35^\circ = 20.2 \text{ ft}$$

$$\{ = \frac{17.6}{2} \times \tan 35^\circ = 6.2 \text{ m }]$$

4.a. Cut = 150 + 100 = 250 x 10^3 BCY

[= 115 + 76 = 191 x 10^3 BCM]

Fill = 80 + 120 + 100 = 300 x 10^3 BCY

[= 61 + 92 + 76 = 229 x 10^3 BCM]

Waste = 0 BCY (BCM)

Borrow = 50 x 10^3 BCY

[= 38 x 10^3 BCM]

b. Average length of haul Section 2 = 1000 ft

[= 305 m]

5. Swell = $\left(\frac{\text{wt/bank volume}}{\text{wt/loose volume}} - 1\right) \times 100$ (Eq 2-4)

$= \left(\frac{3050}{2400} - 1\right) \times 100 = 27\%$

$[= \left(\frac{1383}{1089} - 1\right) \times 100 = 27\%$

6. Job efficiency = 0.69 (Table 2-1)

Estimated production:

$P = 3.0 \times \frac{60}{0.35} \times 0.69 = 355$ LCY/hr

$[= 2.3 \times \frac{60}{0.35} \times 0.69 = 272$ LCM/hr]

7. Loose volume per foot (m) of ditch = area x 1 x $\frac{1 + \text{swell}}{100}$

$V = 50 \times 1 \times 1.25 = 62.5$ cu ft/ft

[= 4.6 x 1 x 1.25 = 5.75 m^3/m]

Base width = $\left(\frac{4\ V}{L \times \tan R}\right)^{1/2}$ (Eq 2-10)

$= \left(\frac{4 \times 62.5}{1 - \tan 35^\circ}\right)^{1/2} = 18.9$ ft

$[= \left(\frac{4 \times 5.75}{1 \times \tan 35^\circ}\right)^{1/2} = 5.7$ m]

Height $= \frac{B \times \tan R}{2}$ (Eq 2-11)

$= \frac{18.9 \times \tan 35^{\circ}}{2} = 6.6$ ft

[$= \frac{5.73 \times \tan 35^{\circ}}{2} = 2.0$ m]

8 Cost per unit of production

$c = \frac{65 + (6)(35)}{300} = \$0.92/BCY$

[$= \frac{65 + (6)(35)}{229} = \$1.20/BCM$]

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