

CE431 Construction Contracting
Term Project: Detailed Cost Estimating
Ann Arbor Fire Station #6

CONCRETE ESTIMATE

Prepare a detailed estimate for the concrete work for the Ann Arbor Fire Station No. 6. This work includes all items in the specifications under Concrete, Division 3A, including **concrete**, **reinforcing steel**, **concrete finishing**, and **formwork**, except the following:

- Concrete work that was included in your flatwork estimate.
- Curb and gutters, signage, and footings for light posts. (You will be provided with subcontractor bids for these items when you put together the final lump-sum proposal.)

In your estimate you must:

- Include all concrete work within the building footprint such as columns, mezzanine, and aprons, other than flatwork.
- Design and cost out formwork for Fire Station footings, foundation walls, and columns.
- Develop a placement plan, showing the sequence, items, and volumes for each placement, including concrete flatwork estimated earlier.

You must turn in your entire estimate in the format given to you in the course. Your estimate will include a Summary. There is no such thing as scratch paper.

This assignment will be graded and returned. Subsequent corrections should be made directly on your takeoff sheets and the entire estimate must be handed in later as part of the complete project estimate.

Guidelines

The following should be taken into account:

- The columns are reinforced (there is a detail of this on the Structural Details page)
- Make sure you include all of the concrete on the site (driveway to the apparatus room, dumpster pad and footings, etc.)
- Make sure you take into account that concrete items different than slab-on-grade (such as the columns & mezzanine) may require different placement equipment and have different output.
- When lumber is used more than once, your placement plan should take this into account (e.g., if you use lumber twice for footings, you will need to have two placements for them).
- All of the workers are doing work for concrete NOC and the worker compensation must reflect this.
- Include a sheet that shows your labor calculations to make sure you receive partial credit in case you make any mistakes.
- Forms should be reasonable in design. Examples can be found in *Formwork for Concrete* (the ACI book), *The Building Estimator's Reference Book*, or the *Means Estimating Handbook* (a thick hardbound book). All are available in the Construction Lab.
- It is suggested that you use Sonotube ("fiber tube" in Means) for your concrete columns. They can only be used once, but are very easy to use in terms of setup and removal (see <http://www.sonoco.com/catalog/iii/sonotube.htm>).
- Concrete placement and finishing procedures, photographs, etc., are in *Fundamentals of Building Construction, Materials and Methods* by Edward Allen (CEE537 textbook).

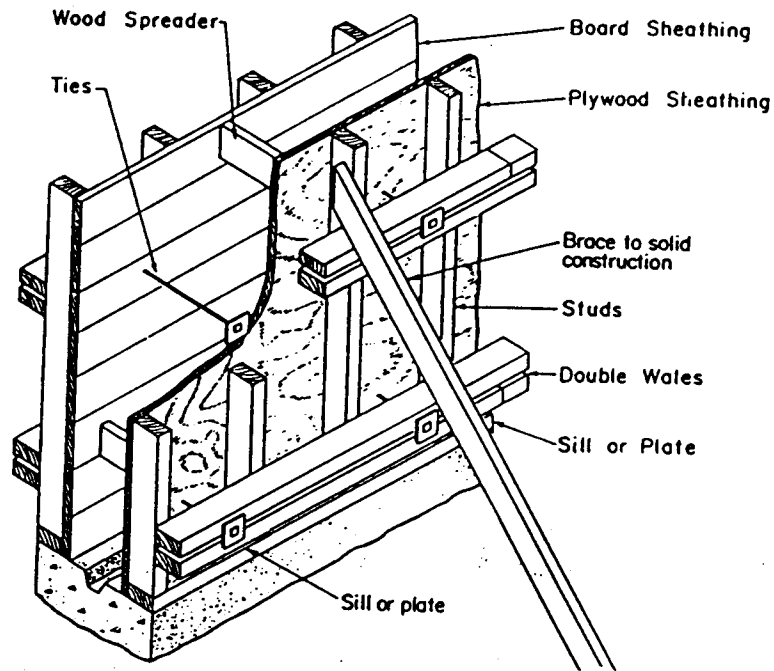
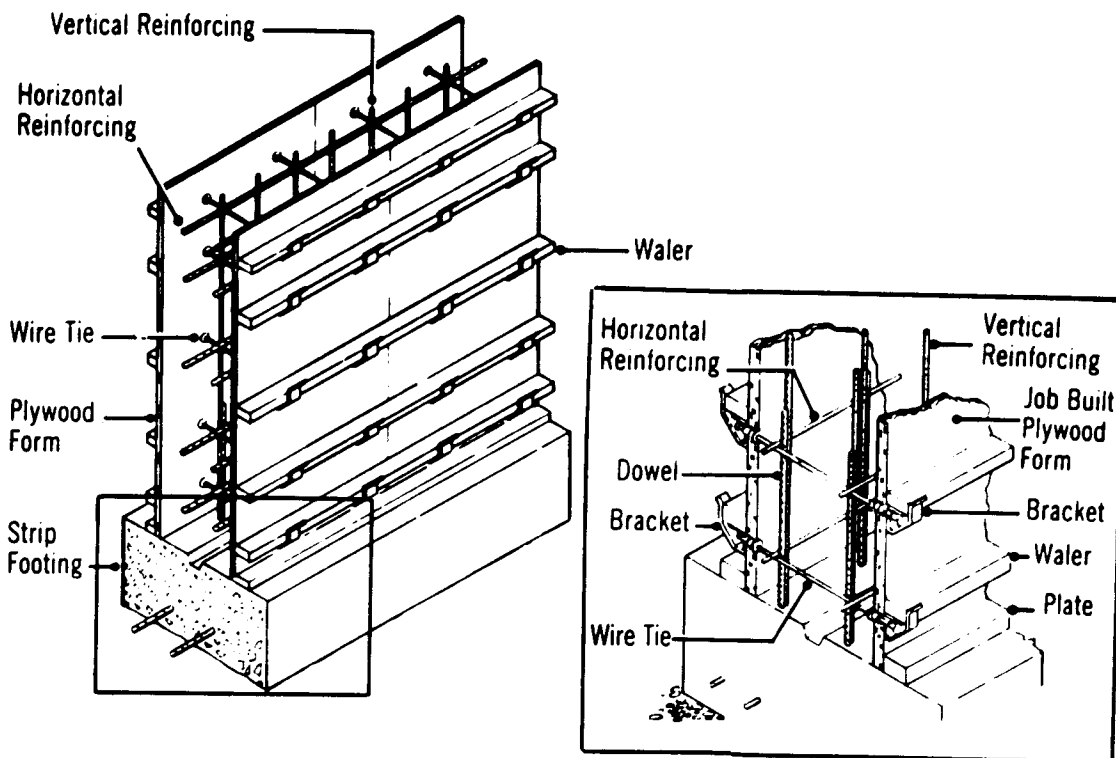
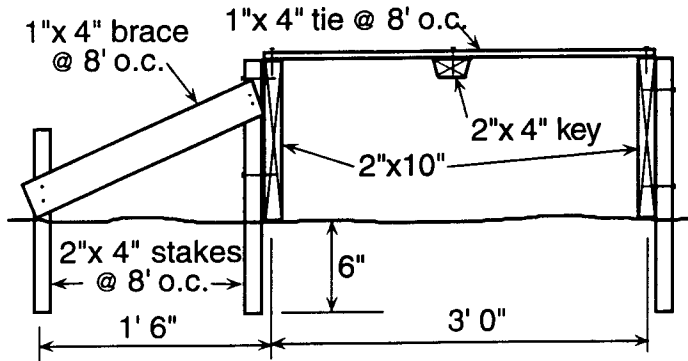


FIGURE 4.36 Typical wall form showing main components.
 (From *Formwork for Concrete*, Fourth Edition by M. K. Hurd.
 Copyright © 1979. Courtesy of American Concrete Institute.)



3. (35%) Estimate labor and material cost for footing formwork in the format required for the project. Total length of footings is 1,000 linear ft (LF). Of course, formwork is costed by the SFCA. The price of lumber = \$0.60/FBM. The 2x10 side forms and key will be used 10 times, on this site and others. The remainder of the lumber will be used 4 times.

Carpentry productivity per carpenter hour is the following: fabricate stakes, braces, and ties = 40 SFCA/hr; erect forms = 30 SFCA/hr; strip forms = 60 SFCA/hr. Show all work. Include labor and material extensions. Make up any information you believe is missing, as needed to make a good example.



Carpenter wages (\$/hr):

Base pay	23.00
Vacation & holiday	1.00
Pension	2.00
Insurance	2.50
Apprenticeship fund	0.10
Total	28.60

Fringes:

Unemployment	5%
Social security	8%
} 25% = 0.25	

Workers compensation:

Concrete NOC	12%
Carpentry NOC	10% not applicable

$$\$/hr = 28.60 + 0.25(23.00 + 1.00) = 28.60 + 0.25(24.00) = \$34.60$$

Materials - cost of 8' length

sides - $2 \times 10 = (2)(8') (20/12) = 26.67 \text{ BF}/8'$

Key $2 \times 4 = (8') (2 \text{ BF}/3 \text{ LF}) = 5.33$

$\frac{32.00 \text{ BF}}{10 \text{ uses}} @ \$0.60/\text{BF} = \$1.92$

stakes $2 \times 4 = [1 + 2(1.5) = 4'] (2/3) = 2.67 \text{ BF}$

tie & brace $1 \times 4 = (2 + 3 = 5') (1/3) = 1.67$

$\frac{4.33 \text{ BF}}{10 \text{ uses}} @ 0.60/4 \text{ uses} = \frac{0.65}{\$2.57/8'}$

unit cost = $\$2.57/8' (10''/12'' \frac{\text{SFCA}}{\text{ft}}) (2 \text{ sides}) = \$0.1928 \Rightarrow \$0.19/\text{SFCA}$

Labor - cost per SFCA [we could have used any length as a module.]

fabricate $1/40 \text{ SFCA/hr} (4 \text{ uses}) = 0.00625 \text{ hr}/\text{SFCA}$

erect $1/30 = 0.03333$

strip $1/60 = 0.01667$

$0.05625 \text{ hr}/\text{SFCA} @ \$34.60/\text{hr} = 1.946 = \$1.95/\text{SFCA}$

item	quan	labor		material	
	SFCA	\$/unit	\$	\$/unit	\$
footing formwork (1000 LF)(2 sides)(10''/12'') =	1667	1.95	3251	0.19	317