**Structural Concrete exercise**

Name and date submitted (5 pts):

Instructions: Using this form as a template, create space in the document below and write or type your answers. KEEP THE SAME NUMBERING.

(26 questions, 100 points possible).

1. Refer to “Cement and Concrete” in your textbook: (9 questions, 27 points)
	1. What four (4) ingredients is Portland cement comprised of?
		1.
		2.
		3.
		4.
	2. What four (4) components make up concrete?
		1.
		2.
		3.
		4.
	3. How long in days must concrete “cure” before it can be placed in service?
2. Utility Shed problem: (9 calculations, 36 points)

Calculate the cost of pouring the concrete floor slab for the utility shed which is depicted in “Sheet A1”. For help, refer to the PowerPoint “Estimating concrete pad – example problem”.

The slab contains concrete and reinforcing rods (rebar). You will also need a small amount of material to create the forms. USE THESE GUIDELINES:

* 1. Use Sheet A1 to calculate the number of cubic feet of concrete required to construct the pad. Convert cubic feet to cubic yards and record the amount in the quantity column of the table. If you forgot how, refer to the PowerPoint!
	2. Concrete: Use $115/yard3 for the price of concrete. Record the final cost of concrete to be poured for the utility shed.
	3. Rebar: Calculate the number and cost of the rebar needed to construct the pad. Rebar comes in 20-ft sections, and can be cut to any length you need, and smaller sections can be spliced together with tie wire. For this project, use $7 per 20-ft length for the #4 rebar. Assume the rebar should be spaced 18 in. apart to form a grid pattern in the pad. If any bar pieces need to be spliced together to save material cost, overlap the ends of the 2 bars by 24 inches. Plan to provide a 3 in. edge distance; that is, terminate the rebar 3 in. short of the edge of the concrete. If any of this is confusing, refer to the PowerPoint.
	4. Concrete forms: You can use 2x4’s to form up this slab. Record the number of 12 ft long 2x4s and the number of 16 ft long 2x4s needed to build the forms. Assume that you need no other material for the forms. For this project, use a cost of $.40 per linear foot of 2x4 material.

**COMPLETE THE HIGHLIGHTED COLUMNS:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Material** | **Size/Description** | **Quantity** | **Unit cost** | **Total cost** |
| Concrete | 12ft x 16ft x 4in. | Yds3:  | $115/C.Y. |  |
| Rebar | #4 (20-ft pieces) | Pcs:  | $7/20-ft piece |  |
| Forms | (12-ft) 2x4’s | Pcs:  | $.40/linear ft. |  |
| Forms | (16-ft) 2x4’s | Pcs:  | $.40/linear ft. |  |
|  |  |  | **Total Cost =** | **$** |

1. Building Code questions: (8 questions, 32 points)

Refer to the document “Information Bulletin 140”, pages 9-15.

* 1. What is the minimum thickness in inches for a slab-on-grade concrete floor? (Detail G)
	2. How many inches of sand (for drainage and capillary-break) must be placed under the floor? (Detail G)
	3. What is the minimum width and height in inches for a perimeter concrete footing?... in other words, the ‘thickened part’ of the foundation around the perimeter of the building which supports the exterior load-bearing walls… (Detail G)
	4. How many, and what size (#?) of steel reinforcing (“rebar”) must be incorporated in the perimeter footing? (Detail G)
	5. How far in inches must the 2x4 sill plate be above the ground (the “grade”)? (Detail G)
	6. How thick in inches must the “stem wall” be in the case of a raised foundation? (Detail H)
	7. What is the minimum width and thickness in inches for a footing in the case of a raised foundation? (The stem wall rests on the footing…) (Detail H)
	8. How far in inches must the floor joists be above the ground (“grade”) under the house, in the case of a raised foundation? (Detail H)