OALCF Tasks for the Apprenticeship Goal Path: Prepared for the Project, *Developing Best Practices for Increasing, Supporting and Retaining Apprentices in Northern Ontario (2014)*

OALCF Task Cover Sheet

Task Title: Working with Concrete

Learner Name:
Date Started: **Date Completed:**
Successful Completion: Yes___   No___
Goal Path: Employment ✓ Apprenticeship ✓ Secondary School___   Post Secondary ___ Independence___
Task Description: Carpenters read about concrete and related materials for understanding.

Competency:	Task Group(s):
A: Find and Use Information	A2: Interpret documents
C: Understand and Use Numbers	C3: Use measures
D: Digital Technology	

Level Indicators:

A2.1:	Interpret very simple documents to locate specific details
A2.2:	Interpret simple documents to locate and connect information
C3.2:	Use measures to make one-step calculations
C3.3:	Use measures to make multi-step calculations; use specific measuring instruments
D2:	Perform well-defined, multi-step digital tasks

Performance Descriptors: see chart on last page

Materials Required:

- Pencil
- NOTES ON CONCRETE document
- Mortar Mix Proportions chart
- Calculator

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Carpenters read about concrete and related materials for understanding. Sometimes, they make calculations using calculators with the information. They may interpret tables and locate information in lists about concrete.

Learner Information and Tasks:

Task 1:   Use the NOTES ON CONCRETE document to complete the following tasks.

a) Within reason, what ingredient should be reduced to strengthen concrete?

b) What can be added to concrete just before pouring to make it waterproof?

c) Carpenters sometimes pour cement when temperatures are freezing. What can be done to reduce the effects of the temperature during the mixing, pouring and setting of the concrete?

Task 2:   Use the NOTES ON CONCRETE document to complete the following tasks. Note that cement is one of the ingredients to make concrete.

a) 12 cubic yards of cement is required for a project. Calculate how many barrels of cement need to be ordered. Note: 3 ft = 1 yd; 1 yd³ = 27 ft³.

b) It is decided to use clean crushed stone and good sharp sand to build a wall requiring 60 cubic yards of concrete. How many cubic yards of sand are required?

Task 3:   Use the Mortar Mix Proportions chart to complete the following tasks.

a) How much sand (in litres) is required for a 50 kg bag of masonry cement to make Class I Mortar?

b) For Mortar class II, what is the difference in minimum compressive strength at 28 days between the laboratory and work tests?

c) 1 cubic meter of Class I mortar is required for a project. If common cement is being used, how many m³ of moisture is contained in the sand?

NOTES ON CONCRETE

1. All foundations must be carried well below the frost line.

2. Unless a foundation is built on a firm, uniform strata such as rocks, firm gravel or hard pan, a footing is required. (A footing is good at all times).

3. Footings are generally twice the thickness of the offset and not less than 8" or 10" deep.

4. A safe footing for posts 6 x 6 for most soils would be 10" deep by 18" square.

5. A good concrete should be mixed about 6 of ordinary bank run gravel to 1 cement or if clean crushed stone and good sharp sand are used, the mix could be 5 parts crushed stone, 3 parts sand and 1 part cement.

6. Concrete mix should be just wet enough to allow the cement to set as a glue covering each particle in the mix.

7. A good foundation should be well spaded and tamped to remove all air pockets.

8. Slacked lime can be added to concrete to make it waterproof. (Lime to be added just before pouring).

9. Concrete should be allowed to remain with the forms on until the concrete resists indentation with the thumb.

10. Forms should be sheathed with semi-seasoned stock. Dry stock will swell, warp and distort the form and wall faces.

11. The best forms should be matched lumber and free from openings which allow the liquid to escape.

12. If concrete is being mixed and poured in freezing temperature, have all ingredients warm and keep concrete well covered to prevent freezing. Straw, earth, saw dust or covers can be used.

13. Concrete is best when it dries slowly, that is, covered to keep out direct rays of the sun rapid evaporation of its moisture.

14. Initial setting of concrete takes place within one hour. Concrete should not be used if disturbed after its initial set.

15. The less water used the stronger the concrete, provided the mixture is plastic and workable.

16. Cement is sold by the barrel or bag; 4 bags make a barrel. Approximately 4 cubic feet to the barrel.

17. If field stones are placed in a concrete wall, they should be thoroughly washed and wet just before placing. Keep stones well apart and never place in a concrete which is not on the wet side when poured.

Mortar Mix Proportions

Mortar Class	Minimum compressive strength at 28 days, MPa		Quantity of sand per 50 kg bag of cement ℓ		Quantities of material required per m^3 of mortar (not including wastage)			
	Preliminary laboratory tests	Work tests	Common cement 32.5, 42.5	Masonry cement 22.5X	Common cement, bags 32.5, 42.5	Sand m^3	Masonry cement, bags, 22.5X	Sand m^3
I	14.5	10	130 ℓ	100 ℓ	9.0	1.15	10.5	1.1
II	7	5	200 ℓ	170 ℓ	6.5	1.25	7.25	1.22

Sand is estimated at 5% moisture content.

NOTE: For 90 – 110 mm thick single sheaf walls. 1 m^3 of mortar will be sufficient to lay about 3700 bricks (190 x 90 x 90 mm) without wastage.

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Answer Key

Task 1:   a) Scan the NOTES ON CONCRETE document to locate information about concrete strength. Realize using less **water** strengthens concrete.

b) Scan the NOTES ON CONCRETE document to locate information about waterproofing concrete. Realize **slacked lime** can be added to concrete to make it waterproof.

c) Scan the NOTES ON CONCRETE document to locate information about concrete and freezing temperatures. Realize one should **keep all ingredients warm and keep concrete well covered to prevent freezing**.

Task 2:   a) Scan the NOTES ON CONCRETE document to locate information about barrels of cement. Realize cement is sold in bags and barrels; that 4 ft^3 is about 1 barrel. Calculate how many barrels of cement need to be ordered for 12 cubic yards. 1 yd^3 = 27 ft^3.

12 cubic yards = 12 x 27 ft^3 = 324 ft^3

Calculate how many barrels are needed for 324 ft^3. Realize 4 ft^3 = 1 barrel.

324 / 4 = **81 barrels**

b) Scan the NOTES ON CONCRETE document to locate information about clean crushed stone and good sharp sand. Realize that these materials along with cement can be combined to make concrete. The ratio is 5 parts crushed stone, 3 parts sand and 1 part cement. For 60 cubic yards of concrete:

5 + 3 + 1 = 9 (Sum of the parts). Sand is 3 parts of 9 (or 1/3 of the mixture).

Amount of sand required is 1/3 of the amount of concrete. 60 yd^3 of concrete is required

60 yd^3 of concrete = 60 * 1/3 sand = **20 yd^3 of sand**.

Task 3:   a) Scan the Mortar Mix Proportions chart to locate the Mortar Class column; locate I. Scan to find the column about amount of sand for 50 kg bags of cement. Locate masonry cement. Note where row I (Mortar Class) intersects with Masonry cement (under the Quantity of sand heading). Record the answer.

100   litres

b) Scan the Mortar Mix Proportions chart to locate the Mortar Class column; locate II. Locate minimum compressive strength tests; locate laboratory tests and work tests. Note where row II

(Mortar Class) intersects with the laboratory and work tests information. Calculate the difference.

Laboratory test value = 7; work test value = 5

7 – 5 = 2

The difference in minimum compressive strength tests for Mortar Class II is 2.

c) Scan the Mortar Mix Proportions chart to locate the Mortar Class column; locate I. Locate quantities of material required per m^3 of mortar; locate common cement under this heading. Locate the amount of sand (m^3) for common cement. Note where row I (Mortar Class) intersects with the sand column for common cement. Record this amount in m^3.

1.15 m^3 of sand required for 1 m^3 of mortar (using common cement).

Note that "Sand is estimated at 5% moisture content".

Calculate the amount of moisture (in m^3) contained in 1.15 m^3 of sand is

1.15 x 5% = 1.15 x .05 = **.0575 m^3**

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	Performance Descriptors	Needs Work	Completes task with support from practitioner	Completes task independently
A2.1	• scans to locate specific details			
	• interprets brief text and common symbols			
	• locates specific details in simple documents, such as labels and signs			
	• identifies how lists are organized (e.g. sequential, chronological, alphabetical)			
A2.2	• performs limited searches using one or two search criteria			
	• extracts information from tables and forms			
	• uses layout to locate information			
	• makes connections between parts of documents			
	• makes low-level inferences			
C3.2	• calculates using numbers expressed as whole numbers, fractions, decimals, percentages and integers			
	• understands and uses ratio and proportion			
	• makes estimates			
	• interprets and represents area and volume using symbols and abbreviations (e.g. m3)			
	• converts units of measurement within the same system and between systems			
	• chooses and performs required operation(s); may make inferences to identify required operation(s)			
	• selects appropriate steps to solutions			
	• interprets, represents and converts measures using whole numbers, decimals, percentages, ratios and simple, common fractions (e.g. ½, ¼)			
C3.3	• calculates using numbers expressed as whole numbers,			

	fractions, decimals, percentages and integers			
	• manages unfamiliar elements (e.g. context, content) to complete tasks			
	• chooses and performs required operations; makes inferences to identify required operations			
	• selects appropriate steps to solutions from among options			
	• interprets, represents and converts measures using whole numbers, decimals, percentages, ratios and fractions			
D2	• selects and follows appropriate steps to complete tasks			
	• locates and recognizes functions and commands			
	• makes low-level inferences to interpret icons and text			

This task: was successfully completed___ needs to be tried again___

Learner Comments

_____   _____
Instructor (print)   **Learner Signature**