**OALCF Task Cover Sheet**

**Task Title:** Finding and Calculating Working Load Limits

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| **Learner Name:** |
| **Date Started: Date Completed:****Successful Completion: Yes\_\_\_ No\_\_\_** |
| **Goal Path: Employment\_\_\_ Apprenticeship ✓ Secondary School✓ Post Secondary\_\_\_ Independence\_\_\_** |
| **Task Description:**Understanding how to calculate Working Load Limits for rope, using formulas. Using the internet to locate information related to rope strength.  |
| **Competency:**A: Find and Use InformationB: Communicate Ideas and InformationC: Understand and Use NumbersD: Use Digital Technology | **Task Group(s):**A2: Interpret DocumentsB2: Write continuous textC3: Use MeasuresD2: Use Digital Technology |
| **Level Indicators:**A2.2: Interpret simple documents to locate and connect informationB2.1: Write brief texts to convey simple ideas and factual informationC3.3: Use measures to make multi-step calculations; use specialized measuring toolsD.2: Perform well-defined, multi-step digital tasks |
| **Performance Descriptors:** see chart on last page |
| **Materials Required:*** Computer and printer
* Pen and paper
* Calculator - optional
* Attached document - Working Load Limits Information and Formula for Fibre Rope
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**Learner Tasks**

Read the **Working Load Limit Information and Formula for Fibre Rope.**

**Task 1:** Use the formulas to calculate the Working Load Limit for the following fibre rope diameters.

1. ¼” diameter polypropylene rope
2. 1-5/8” diameter polypropylene rope
3. 3/8” diameter nylon rope
4. 1½” diameter nylon rope
5. 5/16” diameter polyethylene rope
6. ¾” diameter polyethylene rope
7. 7/8” diameter polyester rope
8. 1” diameter polyester rope

**Task 2:** Find the Break Strengths table in the Consumer Products section of the Cordages.com website. Print the table.

**Task 3:** What are the safe working loads for the following types of rope? Use the Break Strengths table on the Cordages.com website.

1. 5/16" Nylon Twisted
2. 1/2" Nylon Twisted
3. 3/16" Polypropylene Twisted
4. 3/4" Polypropylene Twisted
5. 1/4" Polyester Braided

**Task 4:** Use a search engine to locate definitions for the two terms listed below.

1. Design Factor
2. Factor of Safety

**Working Load Limit Information and Formula for Fibre Rope**

Working Load Limit (WLL) - is used to determine the maximum strength that a component such as the eyebolt, shackle and sling/rope can safely lift the weight of the load.

Formula for the Working Load Limit

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| --- | --- |
| WLL = Breaking strength  Design Factor = Breaking strength 5 | For example, a rope rated at 1500 lbs. breaking strength has a working load limit of 300 lbs.1500 lbs = 300 lbs 5  |

There are four popular types of rope and each rope has a certain calculation. Be sure to use the correct formula to ensure the safety of the lift. The four types of rope include:

 Nylon

 Polypropylene

 Polyester

 Polyethylene

There are different calculations for each type of fibre rope. The following formulas were used to determine the Working Load Limit (WLL).

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| **Nylon** **Rope**1. Change the rope diameter into eighths of an inch.
2. Square the numerator and multiply by 60

Example:1/2 inch rope = 4/8 inch diameterSquare the numerator of 4 (4x4) = 16Multiply 16 by 60 (16 x 60) = 960WLL = 960 lbs | **Polypropylene Rope**1. Change the rope diameter into eighths of an inch.
2. Square the numerator and multiply by 40

Example:1/2 inch Polypropylene rope = 4/8 inch diameterSquare the numerator of 4 (4x4) = 16Multiply 16 by 40 (16 x 40) = 640WLL = 640 lbs |
| **Polyester Rope**1. Change the rope diameter into eighths of an inch.
2. Square the numerator and multiply by 60

Example:1/2 inch Polyester rope = 4/8 inch diameterSquare the numerator of 4 (4x4) = 16Multiply 16 by 60 (16 x 60) = 960WLL = 960 lbs | **Polyethylene Rope**1. Change the rope diameter into eighths of an inch.
2. Square the numerator and multiply by 35

Example:1 inch polyethylene rope = 8/8 inch diameterSquare the numerator of 8 (8 x 8) = 64Multiply 64 by 35 (64 x 35) = 2240WLL = 2240 lbs |

**Answer Sheet**

Task1: Use the formulas to calculate the Working Load Limit for the following fibre rope diameters.

1. 1/4 inch diameter Polypropylene Rope
	* 1. Convert to eighths 1/4 = 2/8
		2. Square the numerator 2 x 2 =4
		3. Multiply 4 x 40 = 160
		4. WLL for 1/4 inch diameter is **160 lbs**
2. 1 5/8 inch diameter Polypropylene Rope
	* 1. Convert to eighths 1 5/8 = 13/8
		2. Square the numerator 13 x 13 = 169
		3. Multiply 169 x 40 = 6760 lbs
		4. WLL for 1 5/8 inch diameter is **6760 lbs**
3. 3/8 inch diameter Nylon Rope
	* 1. Convert to eighths 3/8 = 3/8
		2. Square the numerator 3 x 3 = 9
		3. Multiply 9 x 60 = 540
		4. WLL for 3/8 inch diameter is **540 lbs**
4. 1 1/2 inch diameter Nylon Rope
	* 1. Convert to eighths 1 1/2 = 12/8
		2. Square the numerator 12 x 12 =144
		3. Multiply 144 x 60 = 8640 lbs
		4. WLL for 1 1/2 inch diameter is 8640 lbs
5. 5/16 inch diameter Polyethylene Rope
	* 1. Convert to eighths 5/16 = 2.5/8
		2. Square the numerator 2.5 x 2.5 = 6.25
		3. Multiply 6.25 x 35 = 218.75
		4. WLL for 5/16 inch diameter is **218.75 lbs**
6. 3/4 inch diameter Polyethylene Rope
	* 1. Convert to eighths 3/4 = 6/8
		2. Square the numerator 6 x 6 = 36
		3. Multiply 36 x 35 = 1260
		4. WLL for 3/4 inch diameter is 1260 lbs
7. 7/8 inch diameter Polyester Rope
	* 1. Convert to eighths 7/8 = 7/8
		2. Square the numerator 7 x 7 = 49
		3. Multiply 49 x 60 = 2940
		4. WLL for 7/8 inch diameter is 2940 lbs
8. 1 inch diameter Polyester Rope
	* 1. Convert to eighths 1 = 8/8
		2. Square the numerator 8 x 8 = 64
		3. Multiply 64 x 60 = 3840
		4. WLL for 1 inch diameter is 3840 lbs

Task 2: Find the Break Strengths table in the Consumer Products section of the Cordages.com website. Print the table.

* + 1. Open the internet
		2. Use a search engine, such as Google to search Cordages.com
		3. On the home page of Cordages.com click on the Consumer Products page
		4. On the Consumer Products page click on the Break Strengths link
		5. A table of strengths for different types of rope will open
		6. Select print from the menu and print the table

Task 3: What are the safe working loads for the following types of rope. Use the Break Strengths table on the Cordages. com website.

1. 5/16" Nylon Twisted - safe working load is 184 lbs
2. 1/2" Nylon Twisted - safe working load is 454 lbs
3. 3/16" Polypropylene Twisted - 52 lbs
4. 3/4" Polypropylene Twisted - 612 lbs
5. 1/4" Polyester Braided - 51 lbs

Task 4: Use a search engine to locate definitions for the two terms listed below.

1. Design Factor

The design factor is what the item is required to be able to withstand (second "use").

The design factor is defined for an application (generally provided in advance and often set by regulatory code or policy) and is not an actual calculation. The safety factor is a ratio of maximum strength to intended load for the actual item that was designed.

1. Factor of Safety

The safety factor is how much the designed part actually will be able to withstand (first "use" from above).

Factor of safety (FoS), also known as (and used interchangeably with) safety factor (SF), is a term describing the structural capacity of a system beyond the expected loads or actual loads.

## Task Title: Finding and Calculating Working Load Limits for Fibre Rope

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| Performance Descriptors | Needs Work | Completes task with support from practitioner | Completes task independently |
| 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
 |  |  |  |
| B2.1  | * writes simple texts to request, remind or inform
 |  |  |  |
|  | * conveys simple ideas and factual information
 |  |  |  |
|  | * uses sentence structure, upper and lower case and basic punctuation
 |  |  |  |
| 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
 |  |  |  |
|  | * organizes and displays numerical information (e.g. graphs, tables)
 |  |  |  |
|  | * uses strategies to check accuracy (e.g. estimating, using a calculator, repeating a calculation, using the reverse operation)
 |  |  |  |
| D.2 | * selects and follows appropriate steps to complete tasks
 |  |  |  |
|  | * makes low-level inferences to interpret icons and text
 |  |  |  |
|  | * begins to identify sources and evaluate information
 |  |  |  |
|  | * performs simple searches using keywords (e.g. internet, software help menu)
 |  |  |  |

**This task:** was successfully completed\_\_\_ needs to be tried again\_\_\_

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| Learner Comments |
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#### Instructor (print) Learner Signature