

Unit 4 Assessment

Producing Engineering Solutions

Contents

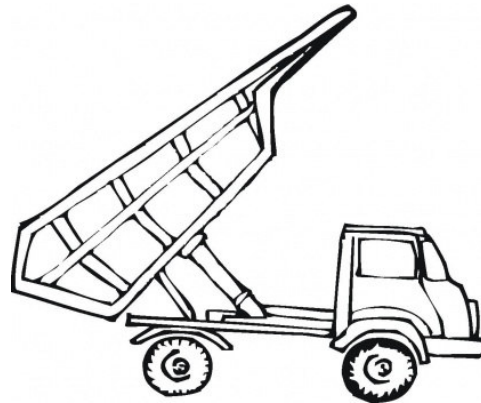
Brief - A hydraulic unloading system for a dump truck	1
Assessment Task 1	5
Assessment Task 2	6
Assessment Task 3	7
Assessment Marksheet	8

Brief - A hydraulic unloading system for a dump truck

A new dump truck is being designed to carry loads from one location to another. The dump truck will be loaded by crane and unloaded by tipping its body section.

The vehicle has been developed to carry loads of a sufficient size. As of yet there are no hydraulic controls or hydraulic cylinders for tipping the body section.

You must devise a hydraulic tipping system for lifting and lowering the body section.



The specification for the truck is shown on the page that follows, along with the design criteria for the tipping system. The design team has developed a solution and worked out the required cylinder size for two possible positions of the cylinders, as shown in the tables below. They have also provided you with a circuit diagram of the system that you need to build and test (see the Hydraulic System Design for Dump Truck).

You must first use the simulator to build and test the system to see that it meets the requirements:

- capable of lifting maximum load
- unload safely
- unload within the time

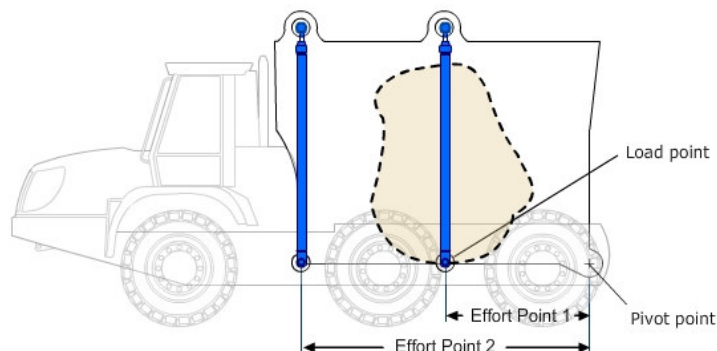
You must then build the hydraulic system on the Hydraulics Trainer. You will need to work out how to use 'T' connectors to connect two cylinders in parallel. In your report, comment on what can and cannot be proved using the Hydraulic Trainer and explain how any issues could be overcome.

Dump Truck Requirements (from specification)

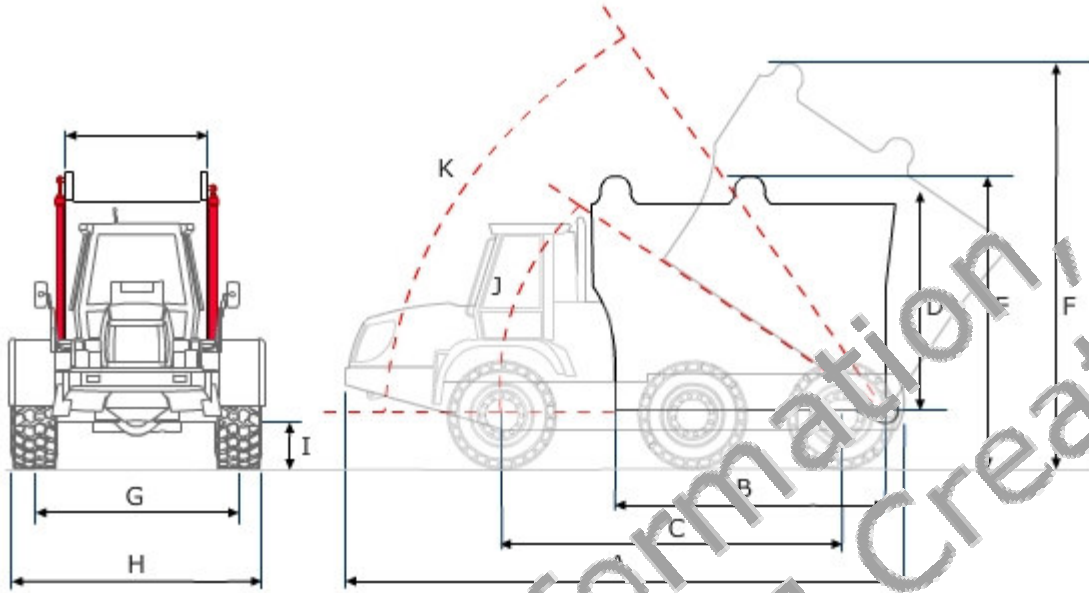
	Cylinders at Effort Point 1	Cylinders at Effort Point 2
Body length	3.05 m	3.05 m
Maximum load	12600 kg	12600 kg
Tipping angle	34-51°	34-51°
Time to tipping angle	8.5-10 seconds	8.5-10 seconds
Hydraulic system operating pressure	138 bar	138 bar

Calculated Cylinder Size (one cylinder each side of the truck)

	Cylinders at Effort Point 1	Cylinders at Effort Point 2
Force required per cylinder	62300 N	31150 N
Cylinder bore	76 mm	54 mm
Extended length of cylinder	3.3 m	4.11 m
Cylinder stroke	0.85 m	1.71 m
Cylinder volume (total for both):	7.67 litres	7.72 litres
Flow rate	0.767 to 0.903 l/sec	0.772 to 0.914 l/sec



Dump Truck Specification Sheet



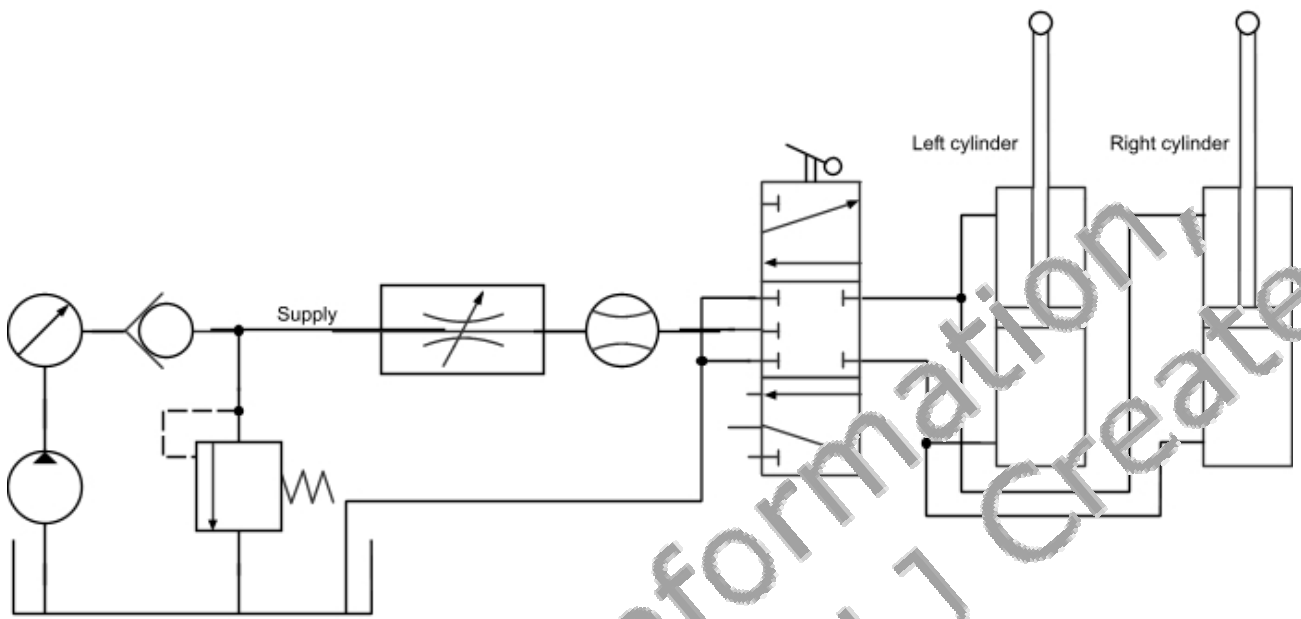
Static Dimensions		
A	Overall length	9.00 m
B	Body length	3.00 m
C	Wheelbase (front axle to rear axle)	4.80 m
D	Body Height	2.40 m
E	Height to top of body	3.00 m
F	Wheel height to body when tipped	4.60 m
G	Wheel track	2.10 m
H	Overall width	2.70 m
I	Ground clearance	0.60 m
J	Body tip angle (to unload point)	34°
	Body tip angle (maximum safe angle)	51°
L	Load capacity	12460 kg
M	Body - heaped	13 m ³

Static Dimensions	
Type	6 cylinder direct injection diesel
Capacity	5.9 litres
Bore	102 mm
Stroke	120 mm
Cylinders	6
Max. power	249 HP @2200 rpm
Max. torque	938 Nm @1450 rpm

Hydraulics	
Pump Type	Variable displacement
Pump: max flow @2200 rpm	95 l/min
Pump: max pressure	210 bar
Pump: standard operating pressure	138 bar

Operation	
Time to tip angle (acceptable*) <i>*Note: A time of less than 8.5 seconds would be unsafe.</i>	8.5-10.0 seconds
Max vehicle speed (forward)	31 mph
Max vehicle speed (backward)	12 mph

Hydraulic System Design for Dump Truck



For further information,
please contact LJ Create

Assessment Task 1

Health and safety standards and risk assessment

The purpose of task 1 is to allow you to demonstrate an understanding of health and safety procedures and standards and risk assessment.

Carry out a health and safety analysis and risk assessment for the engineering activity you are about to perform based on the brief given to you by your tutor. Write a short report.

Make sure you include the following points in your report:

	Marks
1. What are the health and safety procedures and standards that are appropriate?	(3)
2. Why could a risk assessment be necessary prior to the activity?	(1)
3. Describe the responsibilities of yourself and others in relation to the engineering activity.	(1)
4. What are the substances or processes where a risk assessment will be necessary for the engineering activity that you are about to carry out, state the reasons for this.	(2)
5. Compare the health and safety responsibilities of yourself and others when working on the engineering activity that you have been given.	(1)
6. Carry out a risk assessment identifying the hazards and risks, stating whether the risk is acceptable and how it can be controlled.	(2)

Assessment Task 2

Planning an engineering activity

The purpose of task 2 is to allow you to demonstrate an ability to plan an engineering product or service.

Marks

1. Produce a plan for the engineering activity that you are required to carry out which includes the following:
 - materials or components, tools and equipment
 - sequence of operations.You may use the Engineering plan template for your plan. (4)
2. Explain the reason for using the sequence of operations and the choice of tools and equipment for your engineering activity plan. (3)
3. Once you have used your plan, identify and suggest possible improvements. Record and explain your suggestions and their intended results. (1)
4. Decide how you will inspect and test the system to decide it is functioning correctly. (2)

Evidence for task 2 and 3 could be combined and presented in a short report.

Assessment Task 3

Carrying out an engineering activity

The purpose of task 3 is to allow you to:

- Demonstrate an ability to select suitable materials, parts or components for an engineered product or service.
- Demonstrate an ability to use processes, tools and equipment to make an engineered product or carry out a service.
- Demonstrate an ability to apply inspection techniques to the engineered product or service.

	Marks
1. Use the plan to identify parts and components for producing the system.	(4)
2. Prepare the parts by arranging them ready for building.	(3)
3. Explain and justify choices.	(3)
4. Follow the plan to build the system. Select and use processes, tools and equipment in a safe manner.	(20)
5. Inspect the system to check it complies with plan. Record key measurements and compare results with the plan to assess compliance.	(7)
6. Evaluate your use of inspection techniques and the results obtained. Explain what you have learnt during the process and what might be done differently.	(3)

Evidence for task 2 and 3 should be combined and presented in a short report.

Engineering Diploma L2 – Unit 4 Producing Engineering Solutions

LO: Learning Outcome MB: Mark Band T: Task

Name: _____ Candidate No. _____ Date: _____

Assessor: _____ Institution: _____

		Max Marks	Actual Marks	Comments
LO.1	Understand health and safety procedures, standards and risk assessment in engineering activities			
MB1 T1	Relevant health and safety procedures and standards are identified	3		
MB1 T1	Identifies why a risk assessment may be needed	1		
MB2 T1	Description or health and safety responsibility of self and others	1		
MB2 T1	Identifies substances or processes that require a risk assessment	1		
MB2 T1	States why a risk assessment is needed	1		
MB3 T1	Compares health and safety duties of self and others	1		
MB3 T1	Carries out a risk assessment and identifies risks and hazards	1		
MB3 T1	Recognises a risk is acceptable or suggests method of control	1		
<i>Mark Bands: 1 (0-4), 2 (5-7), 3 (8-10)</i>		Total	10	
LO.2	Be able to plan for an engineering product or service			
MB1 T2	Student creates a plan for the engineering activity	4		
MB2 T2	The sequence of operations in the plan is justified	3		
MB3 T2	The success of the plan is reviewed	1		
MB3 T2	Suggestions for improving the plan are considered.	2		
<i>Mark Bands: 1 (0-4), 2 (5-7), 3 (8-10)</i>		Total	10	
LO.3	Be able to select suitable materials parts or components for an engineered product or service			
MB1 T3.1	Suitable components, parts or materials are identified	2		
MB1 T3.1	Suitable components, parts or materials are selected	2		
MB2 T3.1	Selected components, parts or materials are prepared	3		
MB3 T3.1	Selection of components, parts or materials is justified	3		
<i>Mark Bands: 1 (0-4), 2 (5-7), 3 (8-10)</i>		Total	10	

LO.4	Be able to use processes, tools and equipment to make an engineered product or carry out a service		
MB1 T3.2	Student carries out an engineering service or produces a product	3	
MB1 T3.2	Student follows a plan	2	
MB1 T3.2	Health and safety considerations are adhered to	3	
MB1 T3.2	Student uses tools and equipment	2	
MB2 T3.2	Student completes task with limited or no support	2	
MB2 T3.2	Student selects own tools and equipment	1	
MB2 T3.2	Student considers health and safety	2	
MB3 T3.2	Student completes the engineering task independently	1	
MB3 T3.2	Student follows the plan independently	1	
MB3 T3.2	Students selects additional support documents independently	2	
	<i>Mark Bands: 1 (0-10), 2 (11-15), 3 (16-20)</i>	Total	20
LO.5	Be able to apply inspection techniques to the engineered product or service		
MB1 T3.3	Basic inspection techniques carried out		
MB1 T3.3	Inspection is relevant to drawing/ specification		
MB2 T3.3	Inspection results are recorded appropriately	1	
MB2 T3.3	Results of inspection are compared with the plan	2	
MB3 T3.3	Inspection technique reviewed	1	
MB3 T3.3	Improvements to the inspection technique are suggested	2	
	<i>Mark Bands: 1 (0-4), 2 (5-7), 3 (8-10)</i>	Total	10
		Unit Total	60