STEAMING STEM PROGRAM

BUILDING THE VISITOR CENTRE – HEAVY LIFTING

LEVEL

Level 5 – Level 6

ACTIVITY DESCRIPTION

Building the Puffing Billy's Visitor Centre at Emerald Lake has been an enormous and very exciting project. Opening in 2021 for the very first time, we hope you enjoyed it on your recent visit. Throughout the building process many cranes were used to transport materials into difficult places. Students are challenged with the task of designing and constructing a crane, to carry heavy loads. Students creatively design, build, test and evaluate a model crane.

THEME

- Design and construction
- Pulleys and levers

MATERIALS REQUIRED

- Balsa wood
- Pva glue
- Glue guns
- Small hand saws
- G clamps, pulleys
- Cardboard box (shoebox size or bigger)
- Corrugated cardboard
- Large paper cups
- Nuts and bolts
- Scissors, tape, paper clips
- Smooth string (E.g., Fishing line or kite string)
- Weights (rocks, marbles, or gravel)
- Other materials can also be brought from home.
- How do Cranes work? worksheet and answer sheet - attached
- Crane, design and planning worksheet – attached
- Crane evaluation worksheet - attached

INSTRUCTIONS

Discuss with students the use of cranes in everyday life. Where have they noticed cranes being used in their local area? Consideration for how and when cranes would be required at Puffing Billy Railway.

Distribute the "How do Cranes work?" worksheet to students. Using previous knowledge to discuss the parts, systems and materials that are used to guide and power cranes.

- Ask students to think about things that might affect how heavy a load your crane can lift?
- How do they keep the crane's arm from breaking off the box as it lifts a load?
- How would you stop a heavy load from pulling the arm to the left or right?
- How would you wind and unwind the cable so the hook can go up and down?

Ask students to complete the worksheet. Once completed, answer the worksheet as a whole group so students have the correct knowledge and language to complete the remaining activities.

Assign students to working groups. Hand out the "Crane, design and planning" worksheet to each group. Introduce a range of different materials to the class that can be used in the construction process. Demonstrate the safety procedures using the hot glue, hand saw and scissors. Encourage students to ask for adult assistance when required.

Allow enough time for students to discuss and complete a thorough design and planning stage.

EXTENSION CLIP: How do cranes work?
https://www.youtube.com/watch?v=PAvG2GeNQo8

To aid the construction process discuss the steps the students might take to complete a successful crane.

1. First, focus on making the arm. The arm holds the string up and away from the crane's body. Use one, two, or all three cardboard strips to design your arm. Then attach it to the box.
2. Make a take-up reel. Figure out how to make a take-up reel that lets you shorten and lengthen the cable. (Optional: add a crank to turn the take-up reel.)
3. Add the string, hook, and cup. Run the string through the arm. Attach it to the take-up reel and hook. Poke holes in each side of the cup near the rim. Make a handle for the cup and slip it onto the hook
4. Try adding different amounts of weight to the cup. What's your crane's breaking point? Engineers improve their designs by testing them. The steps they follow are called the design process.
5. Don't give up! Not all design and constructions work the first time.

Once students have completed the construction of their cranes, complete the evaluation sheet.

SUGGESTIONS FOR ASSESSMENT

Individual or group assessment of the "How does a Crane work?" and "Crane design and planning" worksheets. Group demonstration of completed construction. Ability to work in a team and equally contribute to the task. Successful completion of the "Crane Evaluation" worksheet.

CURRICULUM LINKS

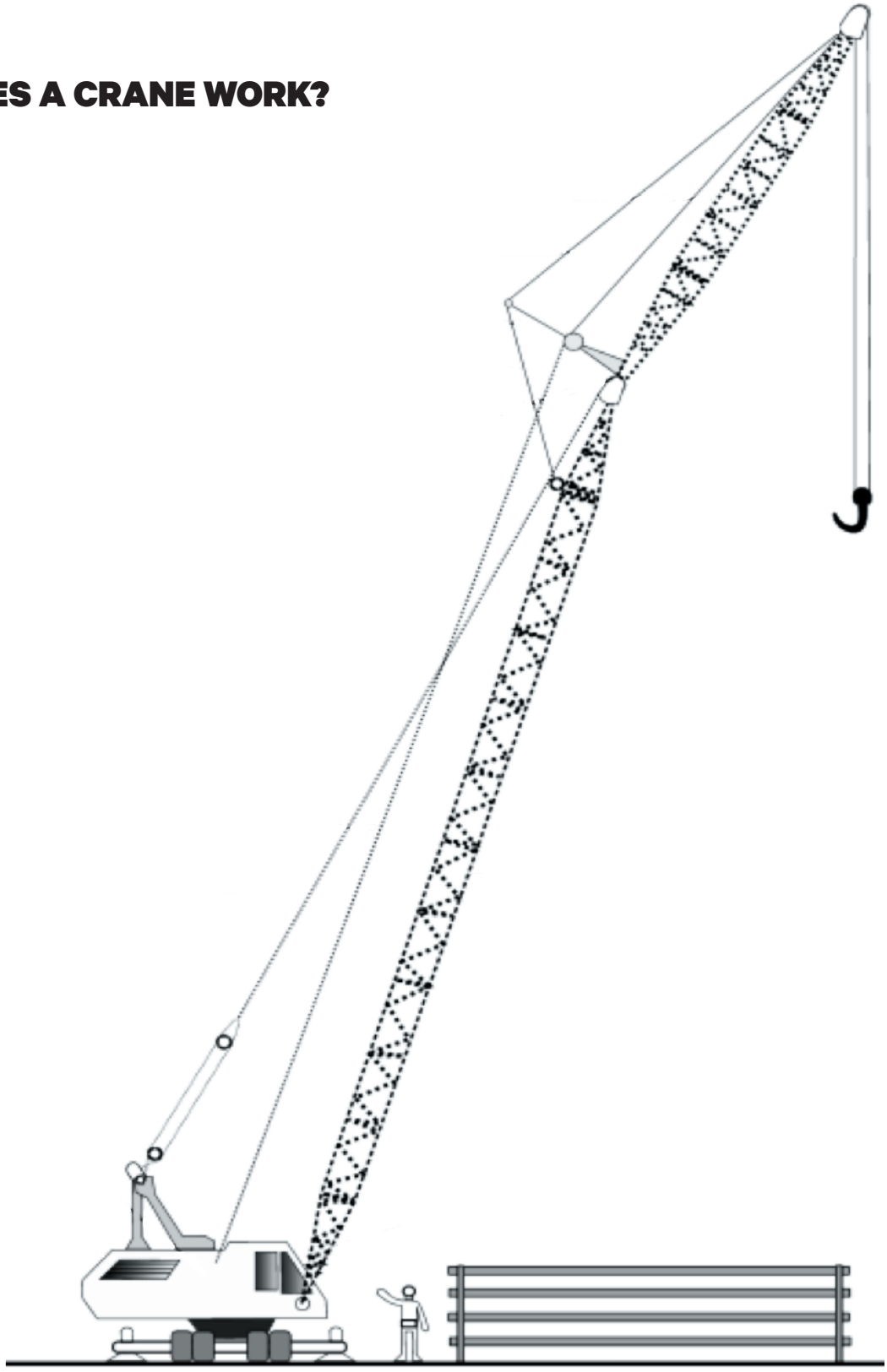
DESIGN AND TECHNOLOGIES

Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions (VCDSCD038)

Generate, develop, communicate and document design ideas and processes for audiences using appropriate technical terms and graphical representation techniques (VCDSCD039)

NAME:

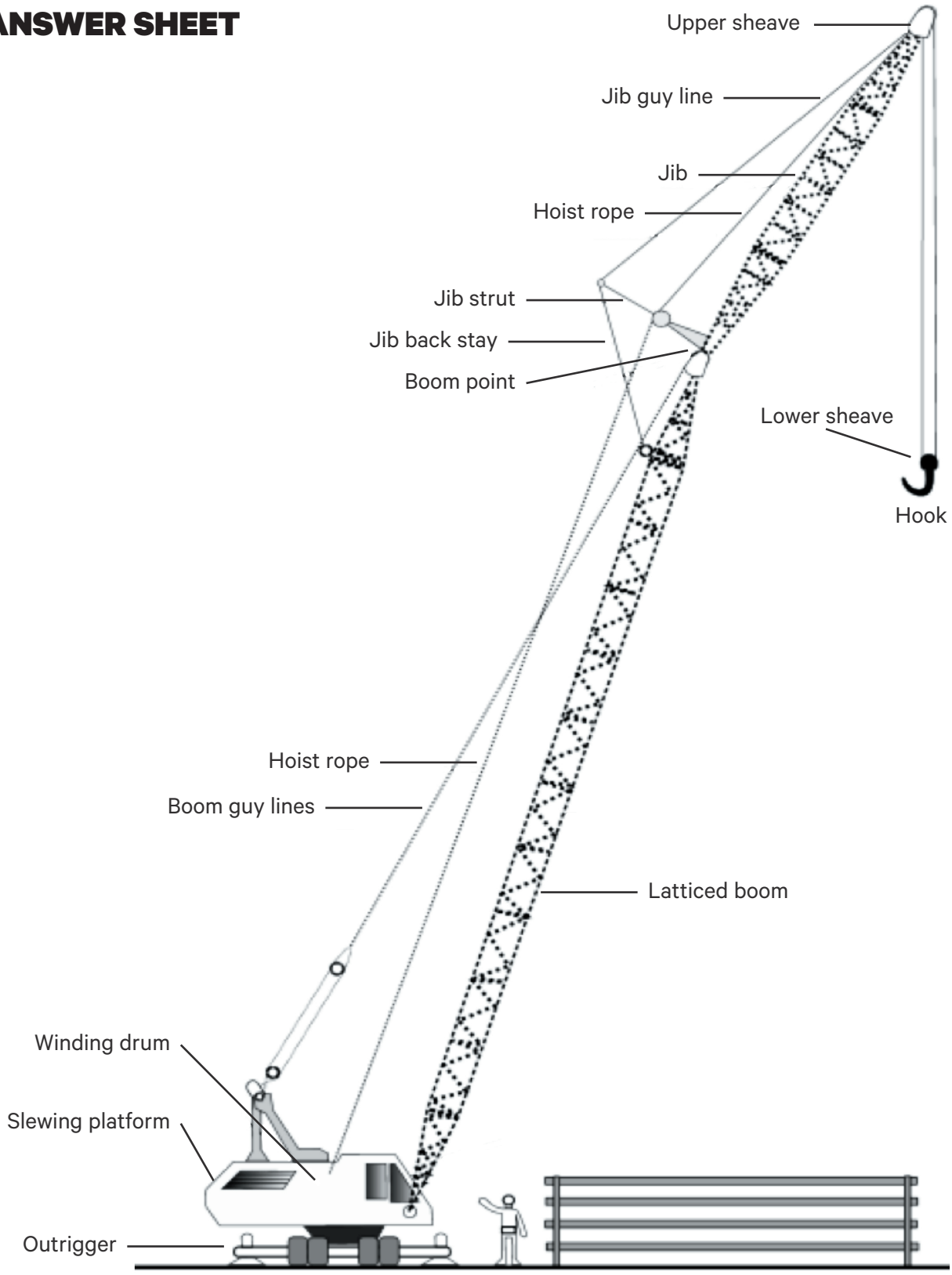
HOW DOES A CRANE WORK?



Label the Crane with the following to show where the levers are and how it is stabilised

Hook, Lattice Boom, Hoist Rope, Boom point, Outrigger, Winding Drum, Slewing platform, Upper Sheave, Jib guy line

ANSWER SHEET



CRANE PLANNING AND DESIGN WORKSHEET

Name:

Materials required:

Crane Design

What is providing the counterweight?

Number of levers?

Numbers of pulleys?

How have you prevented it from slipping or tipping?

CRANE EVALUATION SHEET

Name:

What was the most successful materials you used?

Did you change anything throughout the process?

Was it difficult to construct?

Are you pleased with your finished product?

What would you do differently next time?