

## 2022 PICK 'n PLACE CHALLENGE GRABBER SCENARIO

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### THE CHALLENGE:

An earthquake has badly damaged a warehouse that houses barrels of miscellaneous materials. One of the barrels, that may be leaking slightly, contains a very toxic chemical. The barrel is on a shelf, but the extensive damage to the warehouse structure and shelving means that there is only a narrow gap formed by the debris through which the barrel can be extracted. (*See drawings on page 3*).

Your team, of one or more, will design a grabber mechanism operated by fluid power that will pick up the barrel, represented by a wooden cylindrical object, and bring it to a designated *Drop Zone* where the barrel can be safely resealed. The grabber can be attached to the rectangular frame on the lifter that you built in class or to a modified frame that still fits onto the lifter base.

### SPECIFICATIONS:

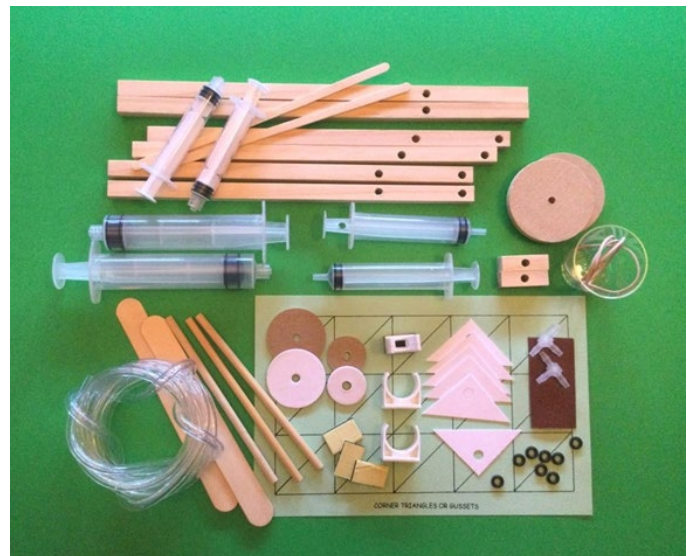
The wooden cylindrical object is 70mm high by 32mm in diameter. It is located on a shelf 150mm tall with its centreline 20mm from the near edge of the shelf.

The object must be moved to a *Drop Zone* 100mm wide and 50mm deep. This *Drop Zone* needs to be 100mm from the base of the shelving because of the debris on either side of the gap.

The base of the lifter on which you will mount your grabber mechanism can be located anywhere in the 100mm by 350mm *Base Zone* indicated on the drawings. *No part of the grabber can touch the floor or the debris on the sides of the gap.*

### MATERIALS AVAILABLE

Before taking part in this *Grabber Challenge*, you will have built a Lifter model. Many of the materials used in building the lifter are available for use for your team to design the grabber— materials such as the 10mm<sup>2</sup> wood, the 20cc piston-syringes, the large white clips, white card axle holder, green card gussets, and the dowel rod. The materials list (*see next page*) is very important as you are not permitted to use any other materials and the pieces have very specific dimensions that influence your design and the accuracy of the orthographic and isometric drawings.



DESCRIPTION OF COMPONENT	QUANTITY		Sample in Lifter?
1cm <sup>2</sup> wood, 265mm long, 1 hole - 65mm from 1 end	2	Dowel rod rotates freely	Y
1cm <sup>2</sup> wood, 235mm long, 2 holes - 65mm & 8mm from 1 end	4	Dowel rod rotates freely	Y
Dowel rod, 125mm long, 5mm diam	3		Y
Tongue Depressors or Spatulas,	2		
Coffee Stirrers, 178mm long, 5mm wide	2		Y
Wooden block, 3mm long, 5mm hole in centre	2		Y
Wooden wheel, 54mm diam, 5mm thick, 5mm hole in centre	2		
Card disk, 38mm diam, 2mm thick, 5mm hole in centre	2		
Card disk, 25mm diam, 2mm thick, 5mm hole in centre	2		
Green gussets on sheet, 30 gussets, each 53mm, 27mm high	1	Can be used as a 90° template	Y
Axle holders, white, 67mm, 30mm high, 5mm hole in centre	6	Dowel rod rotates freely	Y
Sticky pads, 21mm x 14mm, 3mm thick	3	Cut and use to secure pistons in clips	
“O”-rings, 25mm diam	8	Secures dowel rod	Y
20cc piston-syringe, barrel - 23mm diam, plunger end – 22mm diam	2	1 has hole in plunger; Length – closed 125mm, open 205mm	Y
10cc piston-syringe, barrel - 17mm diam, plunger end – 18mm diam	2	1 has hole in plunger; Length – closed 100mm, open 165mm (5mm for tubing)	
5cc piston-syringe, barrel - 14mm diam, plunger end – 15mm diam	2	Length – closed 90mm, open 142mm	
Syringe Clip, footprint 23 x 15mm, cup diam 21mm	2	Use with 20cc and 10cc	Y
Syringe Clip, footprint 20 x 12mm, cup diam 12mm	1	Use with 10cc and 5cc	
“T” connector, 30mm wide, 18mm high	2		
Tubing, 6mm internal diam	1m		Y
Elastic band, #16 (4mm diam quiet)	6		
Plastic cup, 40mm high, 37mm diam top rim, 30mm diam base	1		Y
Sandpaper, 60mm x 30mm, 60 grit	1		Y

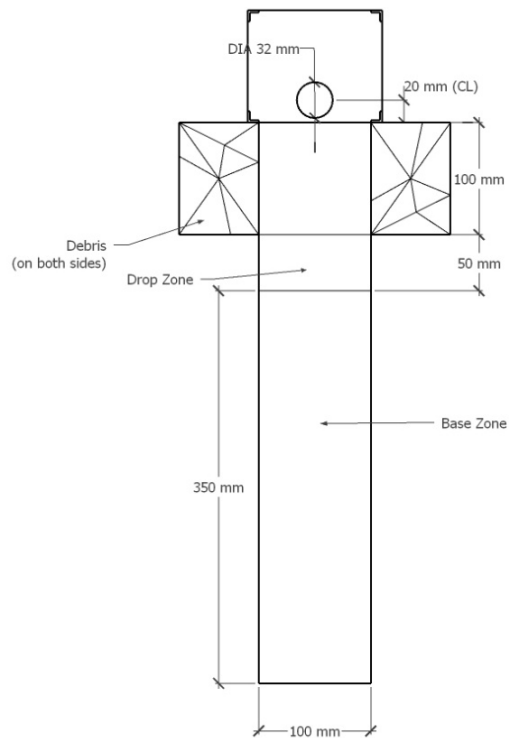
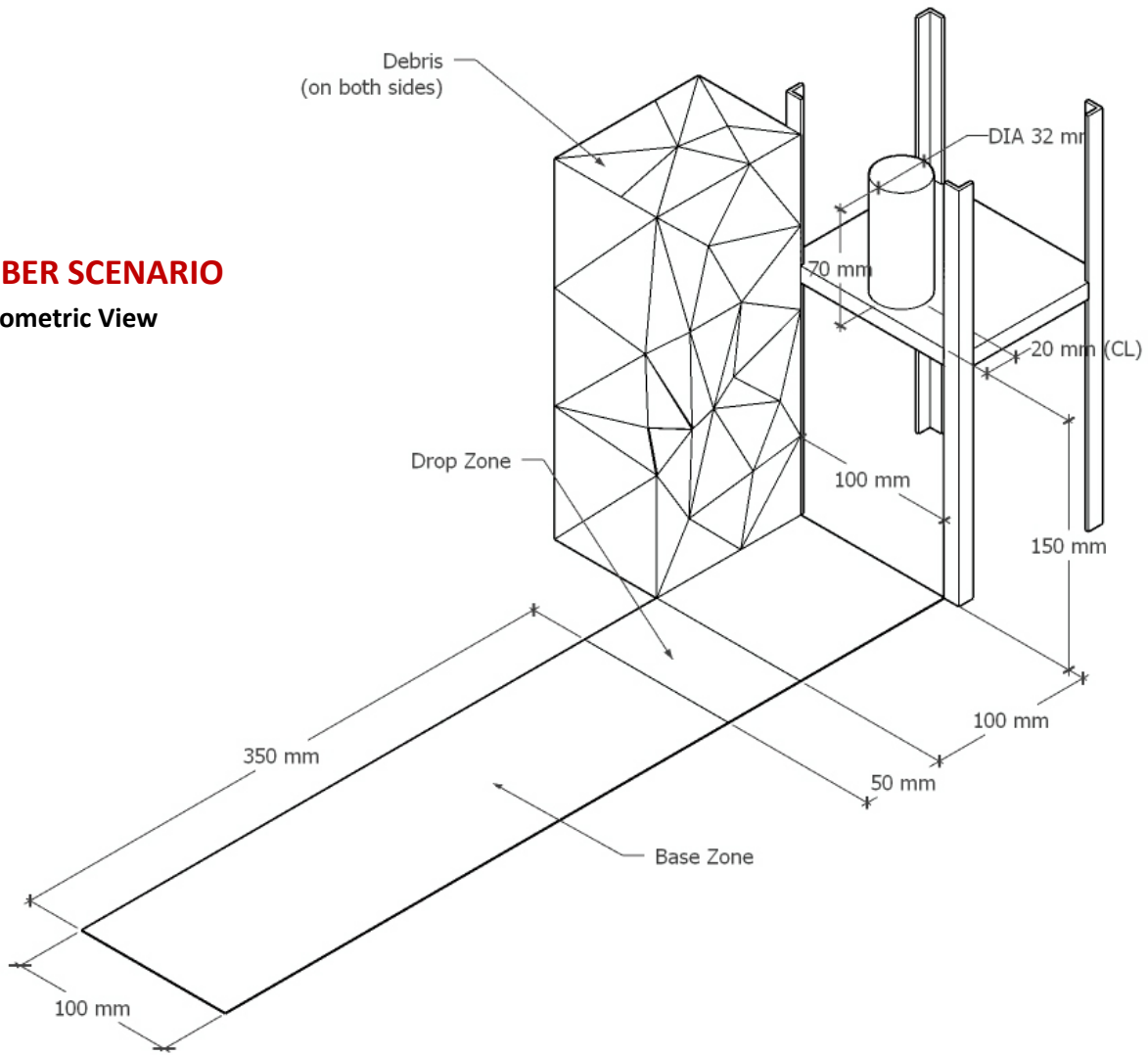
## The Design Portfolio:

Your team will document its design process and the details of its grabber design, including dimensioned drawings, in a *Design Portfolio*. You will be provided with checklists, templates and rubrics to help you produce the *Portfolio*.

When completed, you will submit your *Design Portfolio* electronically to the panel of judges. Design solutions that are unique, carefully and fully documented (so that they could be followed and the suggested prototype built and tested) will be given most credit. Only the contents of the *Design Portfolio* will be judged.

# GRABBER SCENARIO

## Isometric View



# GRABBER SCENARIO

## Plan View