

## SHEET ELEVEN – DESIGNING TO THE SPECIFICATIONS

How fast can you make a model car travel down a 20 metre track powered by a CO<sub>2</sub> cartridge? That is the design challenge you are facing.

Like every design challenge that scientist and engineers face, there are rules that must be followed. The rules are the specifications and tolerances that must be followed to insure that the design works properly. Specifications are written description of the size, shape, materials and other details of a design.

Tolerances tell us the allowable difference, minimum and maximum, in the size of each part. Your design must meet the following specifications and tolerances.

Just review these for now. You will get into the specifics during the design process.

### DRAGSTER DESIGN – SPECIFICATION AND TOLERANCES

#### STRUCTURE

CO<sub>2</sub> dragsters are fabricated from a balsa wood block. The blank must be one-piece all wood material. Two or more pieces cannot be glued together or laminated to create a blank. The use of additional material such as fibreglass or epoxy to increase the strength of the material cannot be used.



The size of the dragster you design must comply with the following specifications.

Body	Tolerance	
	Minimum	Maximum
Length	205mm	305mm
Height with wheels		73mm
Width at axles	37mm	42mm
Total width including wheels		85mm
Mass (without CO2 cartridge): Intermediate School	45g	
Mass (without CO2 cartridge): High School	45g	

#### SUSPENSION

Suspension includes the components that connect the vehicle to the road (or track). For the dragster design challenge, these components include wheels, wheelbase, bearing surface and assembly.

Axles and Wheelbase	Tolerance	
	Minimum	Maximum
Number of axles	2	2
Bottom of axle hole above car bottom	5mm	8mm
Rear axle hole for car rear	10mm	95mm
Wheelbase (measured at farthest point)	110mm	265mm
Space Washers		8
Axle Clips		4

Wheels	Tolerance	
	Minimum	Maximum
<b>Middle School</b>		
Diameter	32mm	40mm
Width	2mm	18mm
<b>High School</b>		
Front Diameter	32mm	36mm
Front Width	2mm	5mm
Rear Diameter	32mm	40mm
Rear Width	15mm	18mm

- Technical Notes:
1. Bearing, bushings and lubricants may be used
  2. Glue may not be used to hold wheels and axles in place
  3. Dragster must have 4 wheels

## POWER

The power plant provides the force needed to move your dragster down the track. Your dragster will be powered by a CO2 cartridge mounted in hole at the rear of the car.

Power	Tolerance	
	Minimum	Maximum
Hole Depth	50mm	52mm
Wall Thickness	4mm	
Chamber Diameter	19mm	20mm
Lowest Point of Hole to Race Surface	28mm	38mm

- Technical Notes:
1. The hole must be drilled so it is parallel to the track surface.
  2. The 4mm minimum wall thickness is required for safety.
  3. Only cartridges provided by your teacher may be used.

## CONTROL

Your car will not have a steering wheel but it will have a guidance system. The car will be guided down the track by a string tethered to the start and finish gate. Two eye screws attached to the bottom of the body will steer the car to the finish line.

Eye Screws	Tolerance	
	Minimum	Maximum
Inside Diameter	3mm	5mm
Distance Apart	155mm	265mm

- Technical Notes:
1. Screw eyes must not contact the race track.
  2. Glue may be used to reinforce the screw eyes.
  3. Screw eyes must be tightly closed to prevent string from slipping out.

Be creative when you begin designing your car BUT

be sure to check these specifications and tolerances when you finalize your design.