

JUNK DRAWER RACES

HYDRAULIC CRANE CHALLENGE

Grade 8

CHAMPIONSHIP GUIDELINE 2021-2022

Last Updated: December 2021

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If you require assistance or have any questions about the contest, please consult the **Junk Drawer Races Frequently Asked Questions** located on our website at www.skillsontario.com/junk-drawer-races or you may contact the Competition Coordinator at junkraces@skillsontario.com.

CHMAPIONSHIP OVERVIEW

The Hydraulic Crane Challenge Championship Round consists of the top 3 teams from each division from the regional competition. The Provincial Championship Round will follow the same rules and guidelines as the regional competition, except for the added Provincial Competition Challenge.

Teams competing within the Provincial Championship round will have until February 16th to review their existing blueprints, potentially modify their designs to meet the provincial challenge and construction requirements while explaining their modifications and submit their new submissions via Dropbox. Entries are to be assembled and submitted similar to how they were submitted within the regional competition.

Provincial Submissions will be judged and evaluated by industry volunteers, and the top three teams will be awarded prizes by Skills Ontario. Winning teams will be notified no later than March 10th.

PROGRAM REGISTRATION INFORMATION

Teams that are advancing to the Provincial Hydraulic Crane Challenge Championship Round will be announced via social media event on January 12th. Teams will also be notified via email that was used during the registration for the regional round. Teams that are advancing to the championship do not need to any fees, but teachers are required to register again with the name of the team members this time.

Every team must register for the championship round to participate. Teachers can register the teams on behalf of their students like they did for the regional round. A link to register for the championship round will be shared via email.

Registration Confirmation Email:

A confirmation email will be sent to the registering email. This confirmation email will be sent within 5 business days of registering. A team is not registered for the program until a confirmation email is sent. If the confirmation email is not received within 5 business days, please contact Skills Ontario at junkraces@skillsontario.com. Please be sure to check spam folders.

Registration closes Wednesday, February 16th at 3:00 PM. No exceptions.

If your school or school board is not listed, or if you notice an error, please contact the Competitions Coordinator at junkraces@skillsontario.com

CHAMPIONSHIP CHALLENGE

Teams that are competing within the Championship Round can choose to use their previous crane and its design, or they may create a new design and crane to meet the Championship Challenge.

This year's Hydraulic Crane Challenge Championship challenge is:

Create new Hydraulic Crane or modify the existing ones that can complete the load test with weight of up to 200 gm in coins.

Team will be awarded points for the time taken to complete the load test like the regional challenge and they will be awarded 1 point for every 10 gm of weight the crane is holding while completing the load test.

Once the cranes are built/modified, the teams are to then test their capabilities by lifting a load of up to 200 gm from **Pickup point 1** and drop it at **Drop Point 1/Pickup Point 2** and then lift it from the same point and drop it off at **Drop Point 2**. Teams are required to video record their load tests and submit their fastest attempt only.

CHALLENGE OVERVIEW AND JUDGING REQUIREMENTS

Below you will find the description and judging requirements for each section of the Hydraulic Crane Challenge.

PART 1: PLANNING & DESIGN

There are three components to the Students' Planning and Design. All three components must be handed in to receive full marks. Submissions will **not be accepted** if students do not include their Mandatory Safety Checklist. All students MUST complete the Mandatory Safety Checklist PRIOR to beginning their Hydraulic Crane project, however the checklist only needs to be submitted with the rest of the project files.

Mandatory Safety Checklist

Teams must complete the Mandatory Safety Checklist, which is a full project safety checklist that all entries must submit in order to be eligible to compete. Visit the Resources section of the Junk Drawer Races webpage to download the Mandatory Safety Checklist in .PDF format, located here: www.skillsontario.com/junk-drawer-races.

Design Plan

In teams, students are to create a Design Plan of their Crane and submit their designs within their submission package. Design Plan should be neat, easy-to-read, and should clearly show the design

of the Crane. Teams are welcome to create their designs by hand or by computer. Teams will be marked on their abilities to build according to their design plans.

Materials List

Teams must include, on a separate piece of paper, a full list of the materials used. This document can be created and formatted however the Team wishes. Teams will be marked on their ability to include all materials used to build their Crane. They must also provide quantity of materials used and will be marked on the legibility and professionalism of this document.

Your Planning & Design Package should include the following three (3) documents:

- Design Plan – Should include all necessary dimensions are labeled (Frame, width, weight, length). It should also include a legend if necessary
- Mandatory Safety Checklist (Can be found in Junk Drawer Races Resource webpage)
- Materials List - Full list of materials used

Teams will be marked on:

- Materials List– Is it legible? Are all materials used listed? Did they use all approved materials? (Up to 5 marks)
- Design Plan – Does the design plan look neat and organized? Was a straight-edge ruler used? Is it legible? Are all measurements to scale? Does the design reflect the build? (Up to 5 marks)
- Accuracy – Are all measurements to scale? (5 marks)

All components of the Planning & Design section must be included with final submission in Dropbox in order to receive marks.

PART 2: CONSTRUCTION CHALLENGE

Once the Students have completed their mandatory safety checklist, materials list and design plan, they are then to begin constructing their projects according to their design plans. Students will be marked on: their ability to follow their design plans, the quality of the construction and the images provided.

Dimensions –

- Total width of the base of the crane cannot exceed **30 cm**
- Total length of the 1st Boom cannot exceed **18 cm**

Approved Materials:

Approved Paper Products

- Printer paper
- Wrapping paper

- Newspaper
- Tissue Paper
- Toilet Paper or Paper Towel
- Cardboard and other Corrugated materials
- Stiff cardstock
- Any other paper product available – **MUST be a product primarily made of paper**

Other Approved Materials

- Bamboo/wood Skewer Sticks
- Toothpicks
- Popsicle sticks
- 10 ml Syringes *
- Water and colors for fluids
- Plastic/rubberized tubes for syringes*
- Old batteries or coins for counterweights
- Thin wire or craft thread for hook and hoist rope
- The use of other materials, hard plastic, motors or wire will **not be permitted**.

All items listed above can be found at most grocery stores, Dollar Stores, Stationary Stores, Walmart, Canadian Tire or Home Hardware stores across Ontario.

* Syringes can be found at Michaels and Canadian Tire; Tubes can be found at Canadian Tire, Home Depot and other home, hardware, and plumbing stores.

If you are having difficulty finding these items, please contact junkraces@skillsontario.com.

Approved Adhesives & Connectors

Students **may use ANY type of adhesive for their crane** but should take into account the type of materials they are using and if it will restrict movement of the crane.

Recommended adhesive/connector products:

- 3M scotch tape
- 3M masking tape
- Painters tape
- Duct tape
- Super Glue
- Glue stick
- Glue gun
- White glue or carpenter's glue
- Zip Ties

Construction Images for Final Project Submission

Team's construction will be marked upon images submitted and proper materials used. Three (3) pictures of the Crane from different angles is to be included with the project submission. Those picture angles are to be taken of the:

1. front
2. side (either side)
3. Top

Teams will be deducted marks if three images showing three separate views are not included with their submission package.

Teams will be marked on:

- Build Accuracy – Did the student competitors follow their design plans? Are all features in the designs present on the product? (Up to 5 marks)
- Picture Quality – Did the team include 3 images with the required views? Do the pictures clearly show the Crane? (Up to 5 marks)
- Quality of Construction – Does the Crane look like it will function? Is it well built? Is it a creative design? (Up to 5 marks)

SAFETY NOTE:

If using a device that requires an electrical source such as a Hot Glue Gun, please ensure a teacher, parent or guardian is supervising at all times.

PART 3: LOAD TEST – FASTEST ATTEMPT

Once the Student Competitors have completed constructing/modifying their Crane and have taken photographs for their submission entries, students are to **print the test drawings** for the contest and place it like it is in the image below. Students are required to place the crane behind the lines as seen in the picture.

Task

The teams are then to test their capabilities by lifting a load of up to 200 gm from **Pickup point 1** and drop it at **Drop Point 1/Pickup Point 2** and then lift it from the same point and drop it off at **Drop Point 2**. Teams are required to video record their lifting test attempts.

Students are to perform load tests, with the goal of fastest attempt. The students are to video record their load tests and submit **one attempt only**. Points will be awarded based on the time taken to complete the task and 1 point for every 10gm of weight the crane carries while completing the task. Tiebreakers will be determined to the nearest tenth of a second.

The video must capture the entire movement of the crane at all times. The Crane must not escape the video at any time. Teams must plan their load tests and video shot carefully in order to ensure the crane, load and the test drawing is in the video frame at all times.

Teams will be marked on:

- Video – has it met all criteria? (Submitted on time and titled in proper format, crane does not leave frame;)
- Time taken by the crane to complete the **task**
- 1 Point for every 10 gm of weight the crane is carrying during the load test

SAFETY NOTE:

Students should use a safe indoor area, such as a classroom, school gymnasium or an activity room to perform a ride test.

PART 4: WEIGHT CHALLENGE

Teams that are competing within the championship round are to complete an additional challenge to what they had completed during the Regional Round. At regional round, the cranes had to carry a weight of 25 gm. For the championship round, the cranes may carry a weight that they can support (max 200 gm) and teams will also be awarded points for the weight. 1 Point for every 10 gm of weight will be awarded.

For weight, students must use any mix of coins and they are required to specify the coins used in their material list. Students must include the weight and the mix of coins in their materials list.

For the purpose of the competition, the weight of each coin is determined in the table below.

| Coin | Weight (grams) |
|----------|----------------|
| Toonies | 7 |
| Loonies | 7 |
| Quarters | 5 |
| Dimes | 2 |
| Nickels | 4 |

Teams must include the total amount of coins, along with total weight, they secured to their Crane within their design plan package in a chart that looks like this. Example below:

| Coin (Example) | Number of Coins used (Example) | Weight (Grams - Example) |
|----------------|--------------------------------|--------------------------|
| Nickel | 3 | 12 grams |
| Dime | 0 | 0 grams |
| Quarter | 6 | 30 grams |

| | | |
|---------------------|---|-----------------|
| One dollar | 3 | 21 grams |
| Two dollar | 3 | 21 grams |
| Total Weight | | 84 grams |

BONUS: VISUAL APPEAL

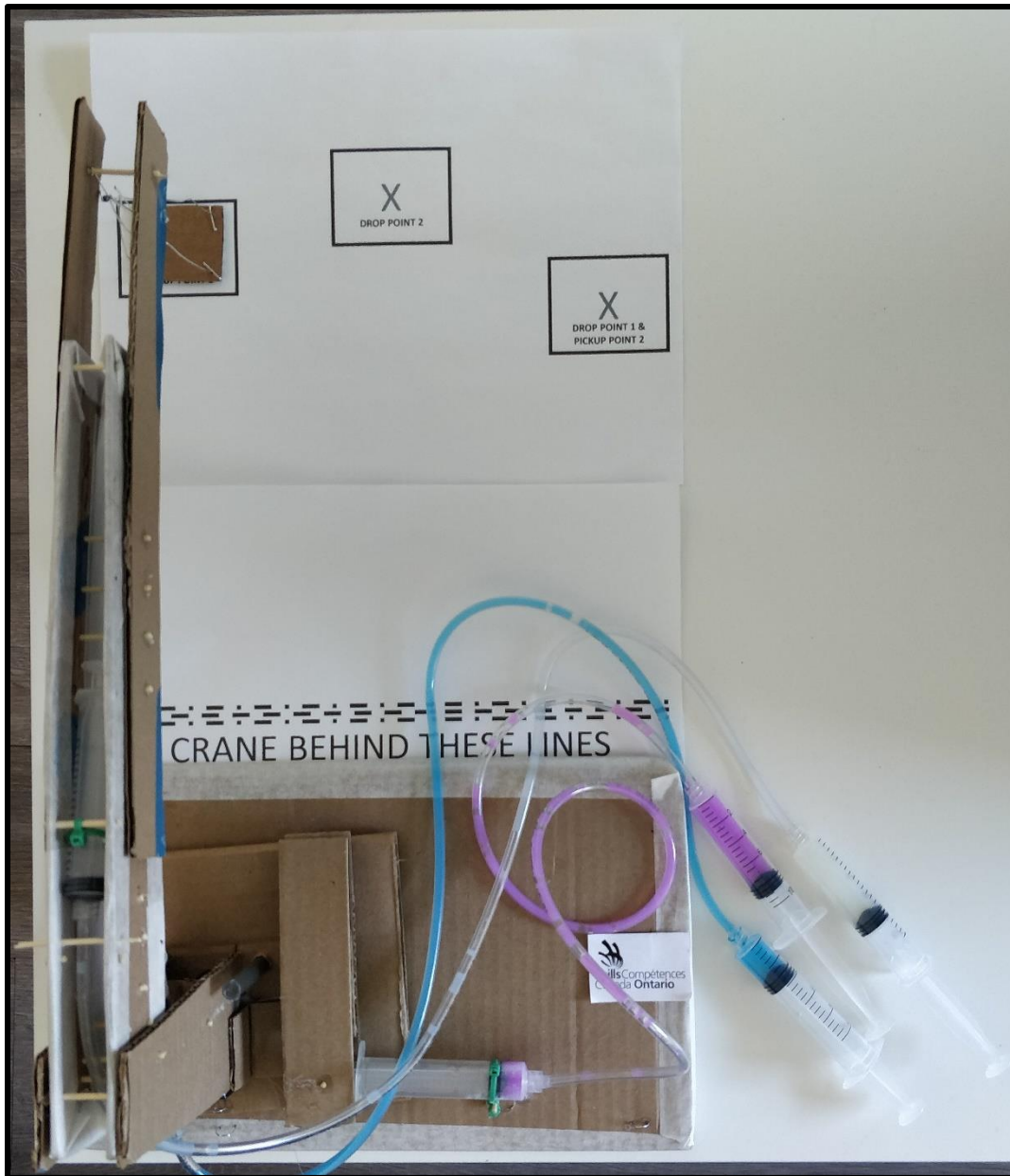
Teams have the option to decorate their Crane projects but must do so using specific materials that do not provide a structural advantage. Students may only use decorations such as colorful construction paper, markers, crayons, paint, glitter, etc.

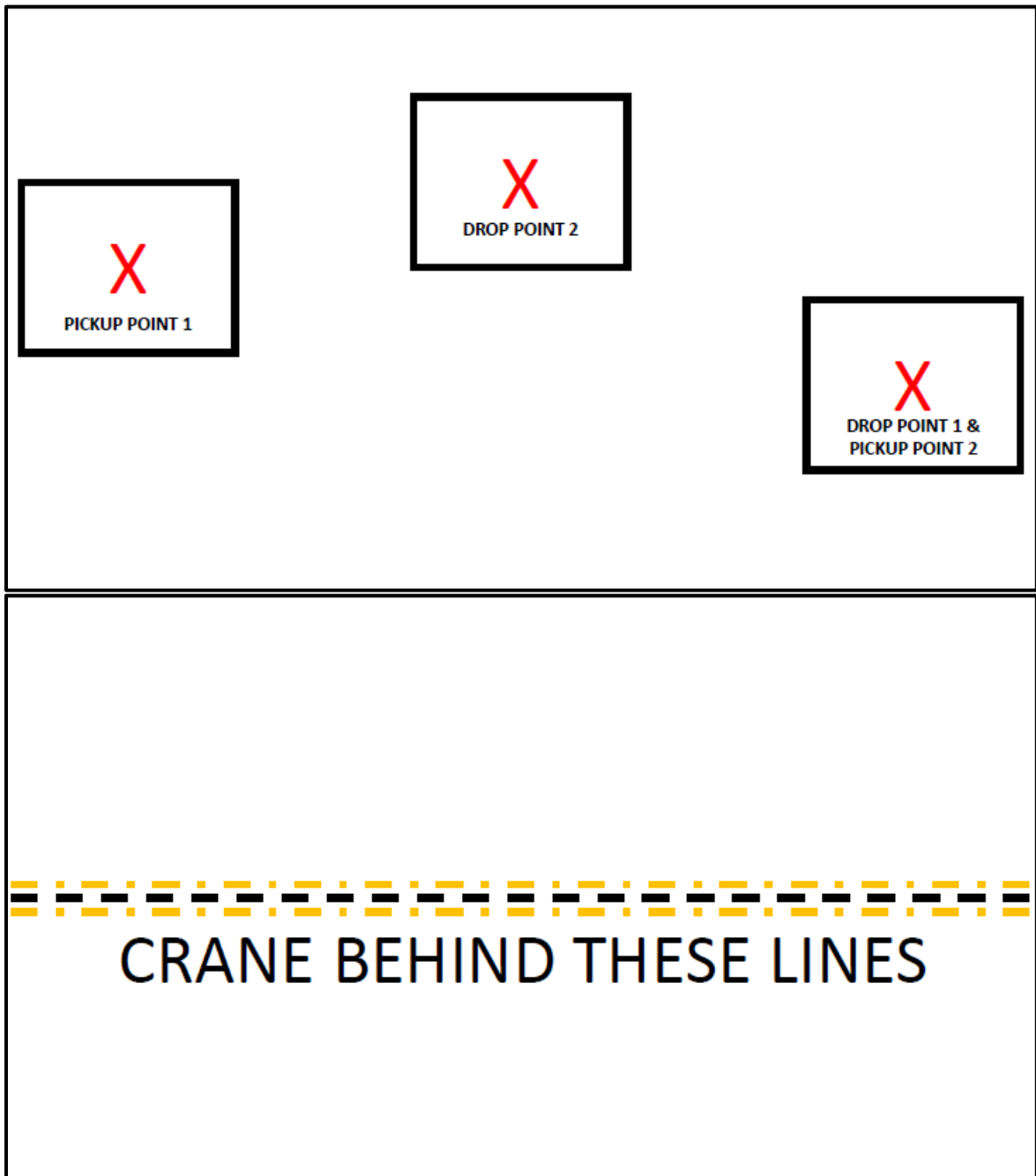
Some examples of decorations that could provide an unfair advantage are:

- Wire
- Pipe Cleaners
- Non-Paper materials, such as aluminum foil, saran wrap or plastic

Any decorations that appear to be aiding in the structural integrity of the Crane will result in a 5-point penalty. If a team is unsure if a certain decoration material is allowed to be used, they may email the Competitions Coordinator at junkraces@skillsontario.com.

Placement of Crane





Test Drawing

[https://www.skillsontario.com/files/www/Junk Drawer Races/Test Drawings for Hydraulic Crane Challenge EN.pdf](https://www.skillsontario.com/files/www/Junk%20Drawer%20Races/Test%20Drawings%20for%20Hydraulic%20Crane%20Challenge%20EN.pdf)

SCORING

| Category | Maximum Points | | | | | | | | | | | | |
|---|-------------------|-----------|--------|----------------------|-----------|--------------------|-----------|--------------------|-----------|--------------------|-----------|----------------------|----------|
| Part 1: Planning & Design package | | | | | | | | | | | | | |
| Materials List- Is it legible? Are all materials used listed? Did they use all approved materials? | 5 | | | | | | | | | | | | |
| Professionalism – Does the Design Plan look neat and organized? Was a straight-edge ruler used? Is it legible? | 5 | | | | | | | | | | | | |
| Accuracy – Are all measurements to scale? | 5 | | | | | | | | | | | | |
| Mandatory Safety Checklist - submitting this is an automatic 5 points. If an entry does not include a Safety Checklist, the entry will be disqualified | 5 | | | | | | | | | | | | |
| Total Planning and Design | 20 points | | | | | | | | | | | | |
| Part 2: Construction | | | | | | | | | | | | | |
| Build Accuracy – Did the Student Competitors follow their design plans? Are all features in the designs present on the product? | 5 | | | | | | | | | | | | |
| Picture Quality – Did the team include 3 images with the required views? Do the pictures clearly show the Crane? | 5 | | | | | | | | | | | | |
| Quality of Construction – Does the crane design look like it will work? Is it well built? Is it a creative design? | 5 | | | | | | | | | | | | |
| Total Construction | 15 | | | | | | | | | | | | |
| Part 3: Load Tests | | | | | | | | | | | | | |
| Points Breakdown | One attempt only | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Time</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>Less than 10 seconds</td> <td>20 points</td> </tr> <tr> <td>10 – 11.99 seconds</td> <td>18 points</td> </tr> <tr> <td>12 – 13.99 seconds</td> <td>15 points</td> </tr> <tr> <td>14 – 15.99 seconds</td> <td>10 points</td> </tr> <tr> <td>16 seconds and above</td> <td>5 points</td> </tr> </tbody> </table> | | Time | Points | Less than 10 seconds | 20 points | 10 – 11.99 seconds | 18 points | 12 – 13.99 seconds | 15 points | 14 – 15.99 seconds | 10 points | 16 seconds and above | 5 points |
| Time | | Points | | | | | | | | | | | |
| Less than 10 seconds | | 20 points | | | | | | | | | | | |
| 10 – 11.99 seconds | | 18 points | | | | | | | | | | | |
| 12 – 13.99 seconds | | 15 points | | | | | | | | | | | |
| 14 – 15.99 seconds | | 10 points | | | | | | | | | | | |
| 16 seconds and above | 5 points | | | | | | | | | | | | |
| Quality of Video | 10 | | | | | | | | | | | | |
| <ul style="list-style-type: none"> Was the Crane and load within the frame at all times? Was the test drawing and placement marks in the frames? Was it clear in the video, load was picked up and dropped at right spots? | | | | | | | | | | | | | |
| Total Load Test Challenge | | | | | | | | | | | | | |
| Part 4: Championship Challenge | | | | | | | | | | | | | |
| Weight the plane is holding | 1 point per 10 gm | | | | | | | | | | | | |
| Total Weight Challenge | 20 | | | | | | | | | | | | |
| VISUAL APPEAL BONUS MARKS | 5 | | | | | | | | | | | | |

| | |
|---|--|
| <ul style="list-style-type: none"> • Did the team use approved decoration materials? Is the decoration appropriate? | |
| TOTAL MARKS | |

Important Points:

1. All judging is final. Individual final scores will not be shared with teams.
2. Students are encouraged to work in a team and every student must have a different responsibility (keeping the time, placing the drawing, helping with the load and recording)

Tiebreaker

In the event of a tie between two or more teams, ties will be broken by using the score from the Load Test.

SUBMISSION PACKAGE

Team’s submissions for the Regional Hydraulic Crane Challenge round are to include the following media in the following formats:

Part 1 – Design Plan Package

- A copy of the Crane Design Plan is required to be submitted. These can be created and submitted in: .PDF, .JPEG, .DOCX (Word or Excel). Any other formats will not be accepted. Must be saved as “Design Plan”
- Material List is required to be created and submitted in: .docx, .xls or .pdf format (MS Word or Excel). Must be saved as “Materials List”
- Mandatory Safety Checklist to be downloaded, answered, and submitted in: .docx, .xls or .pdf format (MS Word or Excel). Must be saved as “Mandatory Safety Checklist – Completed”

Part 2 – Construction Photographs

- Three (3) pictures of the Crane are required to be submitted (Front, Side and Top). These can be received in: .PDF, .JPEG. Any other formats will not be accepted.
- The three (3) pictures must each be saved as: “crane_top”, “crane_side”, “crane_front”.

Part 3 – Load Test

- **One (1) attempts within 1 unedited video** is required to be submitted. Video submission formats accepted are: .MP4 and .AVI.
- This file must be titled “Load Test”.

The Hydraulic Crane Challenge Submission Package should contain the Team’s design plan, materials list, three (3) photographs of the constructed Crane, and the video recording of their Load

test online. **Registered Teams will have until February 23rd at 3:00 PM** to submit their Submission Package to the Dropbox folder.

Submitting to Dropbox

Teams are to collect all parts of their submission within a folder and submit their final submission package within the Skills Ontario Junk Drawer Races webpage at <https://www.skillsontario.com/junk-drawer-races#Submission>. Teachers may assist with the Safety Checklist, if required.

Project submissions must be submitted in a specific naming format in order to receive marks. If a team does not name their submission package in the following naming convention, their submission may be disqualified from competition.

STUDENTS: Be sure to have all 5 components of your project saved within a compressed .ZIP file folder. The .ZIP file MUST be titled using your school's name and school board initials if there was only one team. If the school had more than one team during the regional round, the title should include the team number (team 1 or team 2 or team 3). Please use the same team number from the regional round.

Teams may ask their teacher(s) for assistance in creating a zip file folder. You may also watch this video (<https://www.youtube.com/watch?v=lpn-T5Um3d4>) to learn how to create a zip file folder.

For example, if your school is St. Mary's Elementary School in Waterloo Catholic District School Board, your file must be titled: "stmarys.wcdsb.ZIP" if there was only one team from the school. In case the school had two or three teams, the .zip file should be titled as "stmarys.wcdsb.team1.zip" or "stmarys.wcdsb.team2.zip" or "stmarys.wcdsb.team3.zip".

NOTE: Your full submission package should include a total of 5 documents that is a part of the 4 sections noted in the guidelines of every contest.

IMPORTANT DATES

| Event | Date |
|---|---|
| Registration for Regional Competitions Opens | Oct. 12 th , 2021, at 9:00 AM |
| Registration for Regional Competitions Closes | Nov. 26 th , 2021, at 4:00 PM |
| Submissions for Regional Competitions Due | Dec. 9 th , 2021, at 2:00 PM |
| Regional Competitions Winners Announced | January 12 th , 2022, VIA Social Media |
| Championship Round Challenge Announced | January 12 th , 2022 |
| Championship Round Registration Opens | January 12 th , 2022 |
| Championship Round Registration Closes | February 16 th , 2022 at 3:00 PM |

| | |
|--------------------------------------|---|
| Championship Round Submissions Due | February 23 rd , 2022 at 3:00 PM |
| Championship Round Winners Announced | March 23 rd , 2022, VIA Social Media |

*All important dates are subject to change.

RESOURCES

To learn how to build this activity and see how it functions, you can refer to the links below:

- <https://www.youtube.com/watch?v=AklAmKKu1y0>
- <https://www.instructables.com/CARDBOARD-Robotic-Hydraulic-Arm/>
- <https://www.youtube.com/watch?v=dYhWg3038rl>

Note: The links are for reference only, you may learn from these, but your submission shouldn't be identical. If it is found to be identical by the judges, your submission may not be considered for marking.

QUESTIONS?

Should you have any questions regarding this competition, please don't hesitate in contacting the Competitions Coordinator at junkraces@skillsontario.com.

Thank you to our Sponsor. Merci à notre commanditaire.



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