



GNCTR 2024 Official Rules

The 50th Annual Great Northern Concrete Toboggan Race
St. John's, Newfoundland & Labrador

Version 9



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Version Control

| Rule Version | Section Revised | Description of Revision |
|--------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 001 | 5.7 | Addition of 5.7.1 regarding the inclusion of full-time graduate students (RFI 003) |
| 002 | 11.2.9.5 | Approval of Spirt Judge challenges/methods of communication by OC |
| 003 | 5.7 | Addition of 5.7.2 regarding students graduating prior to competition (RFI 009) Update to registration opening/closing dates |
| 004 | 6.1 | Competition deliverables due dates update |
| 005 | 6.2.2 & 6.2.3 | Deliverable submission email addresses |
| 006 | 3.5 12.1.2 (Table 3)/Appendix B 12.2 (Table 4) Appendix G | 3.5: Crate dimensions (RFI 015) & warehouse shipping address Appendix B: Updated spirit judging scoring rubric 12.2 – Table 4: Non-compliant crate point deductions Appendix G: Updated safety inspection checklist |
| 007 | 3.5 6.1 (Table 1) 12.2 (Table 4) | 3.5: Crate weight & 'No Surprise Crate Checklist' requirement/deadline 6.1 – Table 1: No Surprise Crate Checklist deliverable date 12.2 – Table 4: Non-compliant crate point deductions |
| 008 | 7.5.1 7.6.14 12.2 13 | 7.5.1: Re-use of previously used Toboggan components deductions 7.6.14: Lifting of Toboggan recommendation 12.2 – Table 4 13.5: Updated award description for 'Best New Team' 13.25: Removal of 'Most Spectacular Run'; Addition of 'Best Superstructure Frame Design' |
| 009 | 9.2.3 13.28 | 9.2.3: Technical Display presentation requirement 13.28: ThereMedia Best On-Screen Performance Award |



Hello From St. John's

Hello GNCTR competitors, we, the 2024 Great Concrete Toboggan Race (GNCTR) Organizing Committee (OC), are excited to bring you to St. John's, Newfoundland & Labrador for the next GNCTR competition!

The rules have been written to provide competitors with minimum design requirements, safety expectations, technical specifications, the competition itinerary, expected behavior guidelines, and general material pertaining to the competition.

In order to achieve a successful GNCTR 2024 event it is requested that all guidelines and rules given by the OC and volunteers are followed by all competitors, and attendees.

The Organizing Committee aims to be clear and concise with all communication with expectations and guidelines. If your team or team members have any issues related to the rules as outlined in the document a Request for Information (RFI) form may be filled out at www.gnctr2024.ca. See section 1.4 for more information regarding RFI submission.

1. Introduction

Welcome to the 50th annual Great Northern Concrete Toboggan Race! GNCTR is the oldest and largest concurrent engineering Competition in Canada. Teams are required to build a 350 lbs Toboggan with a concrete Sliding Surface with fully functional Steering and Braking Systems. This Toboggan must be able to safely carry five (5) Racers and compete in drag, slalom, and king of the hill races.

Outlined below are some high-level goals for Teams competing in the Competition from the Organizing Committee's perspective, please keep these in mind when planning and working with your Team:

- Designing a Toboggan that can safely complete the Competition tasks.
- Scheduling and managing a large engineering project.
- Developing practical, hands-on skills.
- Practice working in an industry environment.
- Encouraging creativity and outside-the-box thinking.
- Recruiting and networking with industry partners.
- Making new connections.
- Having fun.

The following are high level Rules for the competition:



- 1.1.** The rules contained in this document will govern GNCTR 2024, hosted in St. John's, Newfoundland & Labrador.
- 1.2.** This document shall be read in conjunction with a number of additional documents to be posted on the GNCTR 2024 website (www.gnctr2024.ca). Competing Teams are required to check the website regularly for updates on the registration, accommodations, Rules, and the Competition in general.
- 1.3.** The Organizing Committee reserves the right to add, remove, or modify the Competition Rules at any time for any reason.
- 1.4.** If Teams have any questions pertaining to the rules outlined within this document, a "Request for Information" (RFI) form should be filled out on www.gnctr2024.ca. In this form, questions should be clearly stated, and relevant sections of the rules should be referenced. The Organizing Committee will issue responses to all RFI's publicly on www.gnctr2024.ca/RFI such that all Teams have access to all rule clarifications.
- 1.5.** Teams are expected to check www.gnctr2024.ca/RFI on a regular basis. This website will outline minor amendments and clarifications to the rules contained within the document. In the event that major amendments to this document need to be made, registered Teams will be notified and provided with a revised copy of this document.
- 1.6.** The Organizing Committee, Judges, and Volunteers will act as compliance officers throughout the Competition and may request proof of compliance to any rule at any time.
- 1.7.** Teams found to be non-compliant with any requirements defined in this document may be subject to Deductions in the relevant scoring categories at the discretion of the Organizing Committee. This is to ensure that the Competition is fair for all Competitors.
- 1.8.** The decisions of the Organizing Committee with respect to enforcing the Rules outlined herein are final, apart from cases outlined in Section 12.3 - Petitions.



2. Definitions

The following section describes the commonly used terms that govern GNCTR 2023.

- 2.1.** Alumni: A Competitor or Volunteer that has competed in a past GNCTR event and is ineligible to compete amongst a Competing Team at GNCTR 2024.
- 2.2.** Brake Deployment Failure: Failure to deploy brakes will not result in a DNF or Crash but will result in a deduction per-occurrence as outlined in section 12.2 and teams must follow reinspection procedures as outlined in section 10.5.
- 2.3.** Braking System (Brake): The mechanical system designed to stop the Toboggan at the end of the Run.
- 2.4.** Braking Zone: The marked area beginning at the finish line of a Racecourse and ending at a fixed distance.
- 2.5.** Captain: A Competitor designated as the primary point of communication between the members of their Team and the Organizing Committee.
- 2.6.** Closing Ceremonies: The Closing Ceremonies are the final event of the Competition, which include a banquet and an awards ceremony.
- 2.7.** Complete Run: For a run to be considered a Complete Run, it must meet the following criteria:
 - 2.7.1.** The Toboggan must cross the Starting Line using the procedure outlined in Section 10.4.
 - 2.7.2.** The Toboggan must reach the Finish Line, having completed Event Objectives without meeting Crash Criteria.
 - 2.7.3.** Brakes MUST be deployed after the Finish Line to bring toboggan safely to a stop.
- 2.8.** Competition: The Competition refers to the series of events programmed by the Organizing Committee to be held in St. John's, Newfoundland & Labrador between February 7th – February 11th, 2024.



- 2.9.** Competitor Code of Conduct: A code of conduct document produced by the Organizing Committee that governs the conduct of Competitors during the Competition.
- 2.10.** Competitor Interaction Day: A day for participants to explore the host city and connect with other Competitors by engaging in activities planned by the Organizing Committee.
- 2.11.** Competitor: An Individual member of a Competing or Non-Competing Team participating in the Competition.
- 2.12.** Concrete Toboggan (Toboggan): A gravity-propelled vehicle with concrete Sliding Surface(s) that conforms to the requirements outlined in Section 7 - Toboggan Requirements.
- 2.13.** Crash: A Run which meets any of the criteria below. Crash will result in a DNF and/or score deduction:
- 2.13.1.** The Toboggan has impacted the side barrier, causing the Toboggan to come to a stop.
 - 2.13.2.** The Toboggan has rolled over.
 - 2.13.3.** A structural failure of any part of the Toboggan has occurred during the Run which, for any reason, caused the Toboggan to stop.
- 2.14.** Deductions: The subtraction of points from a Team's Overall Score due to noncompliance to the requirements set out by the rules or in violation of the intent of the competition. A complete list of Deductions is outlined in Section 12.2.
- 2.15.** Did Not Finish (DNF): A Run, which does not meet the criteria of a Crash as outlined in Section 2.13, in which the leading edge of the Toboggan does not cross the finish line
- 2.16.** Disqualification: The removal of a Team or Competitors from all Competition events, including the forfeiture of any points accrued by the Team or Competitor in question at the time of infraction.



- 2.17.** Frame: A Superstructure component designed to protect Racers should the Toboggan experience a Crash.
- 2.18.** GNCTR: Great Northern Concrete Toboggan Race.
- 2.19.** Judge: An Impartial, knowledgeable, industry and/or academic professional appointed by the Organizing Committee. Judges are responsible for reviewing various aspects of the Competition and assigning scores within their respective categories. Judges are divided into the following categories:
- 2.19.1.** Concrete Judge: Responsible for evaluating the quality of design and construction of the concrete elements of the Toboggans. Concrete Judges will allocate points based on concrete mix design, concrete reinforcement design, performance of concrete during Race Day, ingenuity, and construction quality.
 - 2.19.2.** Mechanical Judge: Responsible for evaluating the design and construction of the Toboggan mechanical components, including the Braking System, Steering System, frame, and safety features.
 - 2.19.3.** Safety Judge: Part of the Safety Committee, and responsible for reviewing and evaluating the safety features of Toboggans.
 - 2.19.4.** Spirit Judge: Former GNCTR Competitors responsible for promoting and encouraging Team and Competition Spirit as well as evaluating Team Spirit.
- 2.20.** Opening Ceremonies: The Opening Ceremonies include an opening banquet, introduction of the Teams and the Organizing Committee, and a social event.
- 2.21.** Organizing Committee (OC): The Organizing Committee is responsible for
- 2.22.** Petition: An official complaint regarding the scoring of the Competition.
- 2.23.** Racecourse: A marked area on the race hill that defines a Toboggan's intended trajectory for a Run. The Racecourse begins with a starting line and ends with a finish line.
- 2.24.** Race Day: Consists of a series of solo and head-to-head racing events with the intent of evaluating Toboggan performance.



- 2.25.** Race Official: A Volunteer or Organizing Committee member contributing to Race Day operations. Their responsibilities include organizing Teams at the Staging Area, preparing the Racecourse between Runs, measuring stopping distances, recording Run statistics, noting penalties or Disqualifications, and other tasks as required.
- 2.26.** Racer: Any Competitor that is riding in a Toboggan during a Run.
- 2.27.** Registration Package: A package produced by the Organizing Committee containing all pertinent information related to Team registration, transportation, and accommodations.
- 2.28.** Run: A single official attempt by a Team to ride its Toboggan down the race hill. A Run begins when the Toboggan crosses the starting line and ends when the Toboggan has come to a complete stop at the bottom of the hill or has been deemed unable to finish the Run.
- 2.29.** Safety Committee: Composed of impartial and knowledgeable industry professionals appointed by the Organizing Committee with previous GNCTR or other relevant experience. The Safety Committee is responsible for reviewing Safety Reports and administering Safety Inspections.
- 2.30.** Safety Inspection: Inspections to be completed by the Safety Committee to ensure each Team's compliance with the Competition Rules, Safety Report and design drawings.
- 2.31.** Safety Report: A submission outlining the safety features included in the design of a Toboggan.
- 2.32.** Sliding Surface: Any portion of the Toboggan that is in contact with the snow for the majority of the duration of the Run which conforms with Section 7.2. Braking and Steering components will not be considered to be part of the Sliding Surface unless they are intended to be in constant contact with the snow.
- 2.33.** Sliding Surface Mix: Concrete mix design which was used in the fabrication of the of the Sliding Surface



- 2.34.** Spirit Captain: A Competitor designated as the primary point of communication between the members of their Team and the Spirit Judges.
- 2.35.** Spirit: The promotion of positive experience for all Competitors, propelled by the Team's Theme. Rooted in the principles of fair play and good sportsmanship, GNCTR Spirit encompasses how Competitors enthusiastically support their Team, their school, other Teams, schools and Competitors, and the Competition as a whole.
- 2.36.** Sponsor: Person, business, or company that donated capital or services to GNCTR.
- 2.37.** Staging Area: The defined area at the top of the race hill where Toboggans prepare for and begin a Run.
- 2.38.** Steering System: The mechanical system designed to change the direction of a Toboggan during a Run.
- 2.39.** Superstructure: the portion of the Toboggan that is not in contact with snow for the majority of the duration of a Run.
- 2.40.** Team: Any Competing or Non-Competing Team registered and participating in the Competition.
- 2.40.1.** Competing Team: Any Team registered for the Competition that is eligible to receive points and win the Competition.
- 2.40.2.** Non-Competing Team: Any Team registered for the Competition that is not eligible to receive points or win the Competition.
- 2.41.** Technical Display: A Team's display at the Technical Exhibition for the purpose of communicating the technical features of its Toboggan, often incorporating elements of its Theme.
- 2.42.** Technical Exhibition: A trade show style event in which Teams present their Toboggans to the public, the Judges, and fellow Competitors. The Technical Exhibition includes the initial Toboggan Safety Inspection, Weigh-In, Technical Presentations and a Spirit presentation.



- 2.43.** Technical Poster: A poster or posters created to communicate design features of a Team's Toboggan in an interesting and visually pleasing manner.
- 2.44.** Technical Presentation: A presentation made by members of a Competing Team to communicate technical select aspects of the design and construction of the Team's Toboggan, including safety considerations. This is a formal presentation and is made to Judges. The Technical Presentations are:
- Concrete Mix & Reinforcement Presentation
 - Superstructure, Steering & Braking System Presentation
- 2.45.** Technical Report: A document containing descriptions of all design features of a Competing Team's Toboggan, design calculations, and drawings as required in Section 6.5 - Technical Report.
- 2.46.** Theme: A chosen topic to lead a Team's choices regarding Spirit components of the Competition.
- 2.47.** Volunteer: Any individual officially assisting with running the Competition, who is not part of the Organizing Committee.
- 2.48.** Weigh-in: An official measurement and recording of the Toboggan's unloaded (empty) weight, executed during the Technical Exhibition.



3. Competition Logistics

This section outlines the logistical requirements for Teams at the Competition.

- 3.1.** The Organizing Committee will provide a schedule of events consisting of Opening Ceremonies, Competitor Interaction Day, the Technical Exhibition, Race Day, Closing Ceremonies, and a number of social events.
- 3.2.** The Organizing Committee will host Captain's meetings each day of Competition. The intent of these meetings is to disseminate logistical information to Competitors (transportation, food, etc.) and address any issues that have arisen. Captains will be notified of the time and location of these meetings in advance. Teams that fail to attend Captain's meetings could face a Deduction of one (1) point for each infraction at the discretion of the Organizing Committee.
- 3.3.** Spirit Judges will host Spirit Captain's meetings each day. The intent of these meetings is to disseminate information regarding Spirit to Competitors (Spirit Challenges, Theme Nights, etc.) Spirit Captains will be notified of the time and location of these meetings in advance.
- 3.4.** All Teams are required to attend a Competition orientation session upon arrival at the hotel prior to participating in any Competition events. The time and location of this session will be communicated to Team Captains in advance. This session will serve as the submission deadline for concrete test cylinders and Technical Report hard copies.
- 3.5.** All Teams are required to arrange for their Toboggans to be transported to the Competitions warehouse and arrive between January 16th - 31st. Transportation to Technical Exhibition and Race Day venues will be completed by the selected shipping company by the OC. The Toboggan crate must follow the maximum measurements of: 8' x 4' x (6'-7') and < 1500lbs. Anything outside the maximum dimensions/weight is not acceptable and Teams found to be non-compliant will be accountable for additional costs for storage and transportation, as well as point deduction(s).



Warehouse Address:

Bob Ledrew & Sons Inc. Moving Services
78 Glencoe Drive
Mount Pearl, NL
A1N 4S9

No Surprise Crate Checklist must be completed by all teams and to be returned to VP Race Day, raceday@gnctr2024.ca, by **Friday, December 15th, 2023, at 11:59:59pm NST.**

3.6. The Organizing Committee will provide all official communications prior to Competition through one of the following platforms. Teams are expected to monitor both:

3.6.1. The official GNCTR 2024 website: www.gnctr2024.ca

3.6.2. Email: The Organizing Committee will send emails to Captains and Spirit Captains based on the addresses provided through registration.

3.7. The Organizing Committee will provide additional material through the following communication platforms. It is recommended that Teams monitor these in addition to those defined in Section 3.6. Additional communication platforms in this category may be defined at a later date.

3.7.1. Instagram: @gnctr2024

3.7.2. Website: www.gnctr2024.ca

4. Competition Code of Conduct

This section outlines the expectations of Competitors at GNCTR 2024.

4.1. A supplementary document, the Competitor Code of Conduct, will be posted on the GNCTR 2024 website at least one month prior to the start of Competition.



- 4.2.** All Competitors, Alumni, Volunteers, Judges, Sponsors, OC, and all other persons/participants attending the Competition must conform to the Competitor Code of Conduct.
- 4.3.** All Competitors, Alumni, Volunteers, Judges, Sponsors, OC, and all other persons/participants will be required to sign an agreement to the Competitor Code of Conduct at the Competition orientation session.
- 4.4.** The Organizing Committee reserves the right to remove or Disqualify any Competitor or Team from the Competition or any Competition event for violation of the Competitor Code of Conduct, or for any behaviour that is determined to be detrimental to the reputation of the Competition. Behaviors that may warrant such action include, but are not limited to:
 - 4.4.1.** Social media posts showing inappropriate behavior;
 - 4.4.2.** Abuse and/or harassment of the Organizing Committee, Judges, fellow Competitors, Safety Committee, Race Officials, Volunteers, sponsors, and/or venue employees;
 - 4.4.3.** Consumption of alcohol or cannabis at unlicensed or public locations during the Competition;
 - 4.4.4.** Possession or consumption of illegal drugs at any time during the Competition;
 - 4.4.5.** Breaking of any specific Rules defined by event venues;
 - 4.4.6.** Breaking of any Rules specified in this document;
 - 4.4.7.** Causing damage to property.
- 4.5.** Any participant or Team removed from the Competition will not be permitted to participate in any subsequent activities and may be removed from the hotel. Registration fees will not be refunded and cost of transportation back to the home city will be the responsibility of the participant or Team.
- 4.6.** Infractions may be issued by the Organizing Committee and the Spirit Judges to Teams for Competitor conduct that is against the Spirit of the Competition. Infractions will be investigated on a case by case basis and may result in Spirit points being Deducted.
- 4.7.** All Competitors, Alumni, Volunteers, Judges, Sponsors, OC, and all other persons/participants will be required to sign a waiver releasing the Organizing



Committee from all responsibility for any and all losses and/or injuries, including death, resulting from participation in the Competition activities. A signed waiver will be required for participation in any and all Competition events and will be provided prior to the start of the Competition. Signed waivers of all competitors must be included in final registration of Team. Final registration will not be accepted without signed waivers.

- 4.8.** Bribery of any event officials, (including OC, spirit judges, safety judges, etc.) is not permitted, and may result in a point penalty or other disciplinary action.



5. Registration

The following section pertains to the required attributes of a Team wishing to register to compete in GNCTR 2024

- 5.1.** All documents included in The Registration Package will be uploaded to www.gnctr2024.ca as they become available.
- 5.2.** In order to secure a spot at the Competition, all Teams (Competing and Non-Competing inclusive) must complete the initial registration. Initial registration will open **September 22nd, 2023**, and Teams must complete it by **October 15th, 2023, at 11:59:59pm NST**. The complete registration process will be outlined in the Registration Package. The process will include filling out registration documents and paying an initial deposit (equal to a flat fee). The intent of this registration is to allow the Organizing Committee to plan events for the anticipated number of Teams and Competitors. The initial deposit is non-refundable and will guarantee a Team's right to participate in GNCTR 2024.
 - 5.2.1.** Competitor fees for GNCTR 2024 will be determined at a later date. This fee applies to participants on both competing and non-competing teams.
 - 5.2.2.** Payment due at initial registration will be determined at a later date.
- 5.3.** Teams that are unable to register by the deadline outlined in Section 5.2 may be eligible to register later. Teams should contact the Organizing Committee Chairs at cochairs@gnctr2024.ca should they require an extension. Extensions will be handled on a case-by-case basis and are not guaranteed.
- 5.4.** Final payments and registration will open on **October 22nd, 2023**, and are due on **November 18th, 2023, at 11:59:59pm NST**.
- 5.5.** All registration fees must be provided to the Organizing Committee via e-transfer to registration@gnctr2024.ca or cheque sent to the address included in the Registration Package. These fees and their associated deadlines will be outlined clearly in the Registration Package.



- 5.6.** Due to limited venue capacities, teams will be capped at a maximum of 24 participants. Non-competing and alumni teams may bring up to 24 participants, however, competing school teams will be prioritized for admissions to events and activities. The organizing committee reserves the right to expand the capped limit at a later date upon the review of initial registration numbers.
- 5.7.** Competing Teams must be composed solely of students who are enrolled in full-time or part-time undergraduate studies at a single post-secondary institution.
- 5.7.1.** Competing Teams are allowed to register with full-time graduate program students. Competing Teams will be capped at a maximum of 2 full-time graduate program students. Non-Competing Teams will have no cap.
- 5.7.2.** Any student that graduated prior to the Fall 2023 (September – December) semester and are not enrolled in graduate studies, are not eligible.
- 5.8.** Competing Teams must be composed solely of current undergraduate students (except as noted in Rule 5.7.1), at least 60% of whom are enrolled in an undergraduate applied science program.
- 5.9.** Only one (1) Competing Team may be registered per post-secondary institution. Additional Teams may be registered as Non-Competing Teams.
- 5.10.** Each Team must provide the Organizing Committee with a letter of support from the administration at their institution in order to participate in the Competition. This does not apply to Non-Competing Teams that do not associate with an institution.
- 5.11.** The Organizing Committee reserves the right to limit the number of Teams that are registered in the Competition. Notice of limited registration capacity will be communicated clearly via the GNCTR 2024 website.
- 5.12.** On **June 16th, 2023**, a simple form will be posted on the webpage noted in Section 5.1. This form will allow Teams to “pre-register,” which will allow Teams to reserve their Theme and be added to the official GNCTR 2024 mailing list. Teams that complete this form will still be required to submit all documents outlined in the Registration Package to guarantee participation in GNCTR 2024.



5.12.1. Included in this form Teams will be able to declare use of 2023 competition parts and designs. To be eligible teams must also submit their 2023 technical reports, which will be used to compare at the 2024 competition to ensure that the reports are not plagiarized.

5.12.2. Theme selection and pre-registration information must be received by **June 30th, 2023, at 11:59:59 PM NST**. If teams elect not to pre-register, the same declarations and registration requirements are included in the initial registration in Section 5.2

5.13. All Competitors must be 18 years of age or older as of **February 7th, 2024**.



6. Competition Deliverables

The following section outlines the submission requirements for the deliverables to be submitted by all Teams participating in GNCTR 2024.

6.1. Deliverable Due Dates

6.1.1. Deliverable due dates are listed in Table 1 and Table 2. All deliverables are due at 11:59:59pm NST on the noted date. This list should be used as a project management tool and is not an exhaustive list of Competition requirements.

Table 1: Deliverable Due Dates for Competing Teams

| Deliverable | Due Date |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Job Hazard Analysis – Fabrication (digital) | Start of construction |
| Field Level Hazard Analysis (FLHA) | To be submitted on the 5 th of each following month, at 11:59:59pm NST (i.e Oct 5 th for September’s FLHAs) |
| Safety Report 1 (50% of design) | October 20 th , 2023, at 11:59:59pm NST |
| Baseline Project Schedule and Budget | October 20 th , 2023, at 11:59:59pm NST OR start of construction, whichever is earlier |
| Safety Report 1 Response | November 3 rd , 2023, at 11:59:59pm NST |
| Safety Report 2 (80% design) | November 24 th , 2023, at 11:59:59pm NST |
| Job Hazard Analysis – Toboggan Racing (digital) | November 24 th , 2023, at 11:59:59pm NST OR prior to testing of toboggan, whichever is earlier |
| Safety Report 2 Response | December 8 th , 2023, at 11:59:59pm NST |
| No Surprise Crate Checklist | December 15 th , 2023, at 11:59:59pm NST |
| Technical Report (digital) | January 19 th , 2024, at 11:59:59pm NST |
| Technical Presentation (digital) | February 2 nd , 2024, at 11:59:59pm NST |

Table 2: Deliverable Due Dates for Non-Competing Teams

| Deliverable | Due Date |
|---------------|-----------------------------------------------------|
| Safety Report | November 24 th , 2023, at 11:59:59pm NST |



6.2. Required Formats for Competition Deliverables

- 6.2.1. Reports must be submitted in English. Any Teams that would prefer to submit in another language shall email the VP Technical (technical@gnctr2024.cate) no later than **September 29th, 2023, at 11:59:59pm NST**.
- 6.2.2. The Safety Reports, FLHAs, and JHA must be submitted electronically in PDF format by the dates specified in Section 6.1 to the VP Safety via email at: safety@gnctr2024.ca.
- 6.2.3. Technical Report, Baseline Project Schedule & Budget and Technical Presentation must be submitted electronically in PDF format by the dates specified in Section 6.1 to the VP Technical via email at technical@gnctr2024.ca.
- 6.2.4. Teams are not required to submit a physical hard copy reports.
- 6.2.5. Teams are not required to submit a hard copy of the Safety Report or Technical Poster. However, it is strongly recommended that Teams print all deliverables and have them available for reference at the Competition.
- 6.2.6. Team name, cylinder number, and mix number (if applicable, see Section 6.6) must be clearly marked on each concrete test cylinder with permanent marker prior to submission.
- 6.2.7. All files used for the Technical Presentations must be Microsoft PowerPoint files (.ppt or .pptx).



6.3. Project Schedule and Budget

6.3.1. All competing teams are required to submit a Baseline Project Schedule, Baseline Project Budget, Progressed Project Schedule, and Actual Project Budget. The Baseline Project Schedule and Budget must be submitted along with Safety Report 2 either before construction commences or according to the deadline prescribed in Table 1. The Progressed Project Schedule and Actual Project Budget are to be submitted as part of the Technical Report.

6.3.2. The Project Schedule must be done in Microsoft Project and must be submitted in GANTT Chart format and include all elements as described in the Schedule KPI Audit Rubric attached in Appendix D. The Project Schedule work breakdown structure must include for each task or milestone:

- Activity ID
- Activity Description
- Activity Duration
- Baseline Start and Finish
- Actual Start and Finish
- Start and Finish Variance

Schedule Submission: The Baseline Project Schedule and Progressed Project Schedule must be submitted both in .pdf format and .mpp format. The PDFs shall be printed on 11"x17" sheet(s) for electronic submission. In total, 4 files are expected to be submitted for schedule scoring.

6.3.3. The Project Budget must include all header's as shown below in Table 3. Subtotal rows, projected sponsorship, and Total Projected and Actual Costs must also be shown. The Project Budget must include for each aspect of the competition, and include a subtotal row for each:

- Construction Materials (may be further broken down into multiple sections. Must be noted if cost is covered by a Sponsor(s))
- Travel & Accommodations
- Registration & Competition Fees
- Spirit
- Safety
- Administration (if applicable)
- Contingencies



6.4. Safety Reports

6.4.1. Each Competing or Non-Competing Team must submit two brief safety reports outlining the compliance of the Teams' toboggan design with the requirements outlined in Section 7. The details of each safety report is listed below:

6.4.2. Safety Report 1

6.4.2.1. Safety Report 1 should include a general overview and conceptual design of the toboggan's technical components. The purpose of this report is to see preliminary progress in the team's design, not to see a final polished product. Designs may change from here on, as long as all safety and performance requirements are met as outlined in Safety Report 2.

6.4.2.2. Deliverables of Safety Report 1 include:

- A brief design description along with 3D CAD model of each of the toboggan's main components (superstructure, braking, steering, mounts, ski mounts).
- A brief overview of preliminary concrete mix design and reinforcement.

6.4.3. Safety Report 2

6.4.3.1. Safety Report 2 should include more details about the design of the toboggan, such as adherence to safety requirements, design calculations, and detailed construction drawings.

6.4.3.2. Deliverables of Safety Report 2 will be split into three sections; basic safety requirements, technical requirements, and safety design mitigations as outlined below:

6.4.3.2.1. Basic Safety Requirements required for disclosure are as follows:

- Racer configuration
- Minimum head clearance
- Toboggan enclosure
- Rider floor area design
- Hand grip locations and design
- Estimated Weight



- Tow Cable Design and Location
- Brake Center of Gravity
- Steering Limiter Design
- Center of Gravity
- Egress strategy
- Basic lifting plan for weigh-in

6.4.3.2.2. Technical Requirements required for disclosure are as follows:

- Frame crash calculations as detailed in section 7.3.2
- Braking impact calculations as detailed in section 7.4.1.3
- Ski mount calculations as detailed in section 7.4.3.2
- Steering calculations as detailed in section 7.4.2.4
- Detailed construction drawings of all components. Drawings must be of sufficient quality that the safety committee can clearly evaluate the effectiveness of the design and identify potential risks. Drawings must be on 11x17 sheet size.
- Sliding surface structural calculations as detailed in section 7.2.5. These calculations should reflect reasonable assumptions regarding the properties of the Sliding Surface Mix.

6.4.3.2.3. Common reasons for toboggan crashes or injuries have been identified from past competitions and are listed below. Teams should describe the measures they have taken to avoid these problems when racing.

- Toboggan over-steering causing contact with the side barrier or tipping;
- Lateral instability caused by a high center of gravity when the Toboggan is loaded;
- Tipping caused by Concrete Sliding Surface edge digging into snow;
- Ejection of Racers during the Run (including during braking), specifically front Racers;
- A Toboggan egress strategy for the scenario of a serious crash in which riders are unconscious or seriously injured. (See Section 7.6.11.)
- Show how their Toboggan will mitigate an overturning moment caused by lateral instability (See Section 7.6.13)

6.4.4. The Safety Reports will have a word limit of 2500 each excluding appendices. Calculations and construction drawings must be presented in the appendices,



while illustrations, graphs, figures, etc. may be included within the body of the report to aid in the flow of contextual presentation.

- 6.4.5. The Safety Committee will review all Safety Reports submitted by the prescribed deadline, and feedback will be provided to Teams no later than **November 3rd, 2023, at 11:59:59pm NST** for Safety Report 1 and **December 8th, 2023, at 11:59:59pm NST** for Safety Report 2.
- 6.4.6. Competing Teams that submit the Safety Reports after the deadlines will receive a 1-point Deduction from their total score for each day the submission is late up to a maximum of 10 points. If point deduction exceeds category total due to lateness in submission, the deduction will be applied to the Team's overall score. Regardless of any late submissions, Safety Reports are required to be submitted to compete on Race Day.
- 6.4.7. The Safety Committee reserves the right to request a response to all or part of the feedback given with the Safety Report review. If response to feedback is required of a Team, responses must be submitted by a date set by the Safety Committee based on the level of requested changes and questions. The entire safety report shall be re-submitted with all changes and responses highlighted and clearly indicated.
- 6.4.8. Teams that are required to respond to feedback provided by the Safety Committee and fail to respond or justifiably request an extension to their feedback deadline will receive a 0.5-point Deduction from the total score for each day the response is late up to a maximum of 5 points or expulsion from the competition if deemed necessary from the Safety Judges.
- 6.4.9. If a Team (Competing or Non-Competing) fails to submit a Safety Report or a response to Safety Report feedback prior to the Safety Inspection as part of the Technical Exhibition, the Team will not be permitted to race its Toboggan.
- 6.4.10. Teams are to submit two (2) Job Hazard Analysis (JHA) forms, one for hazards related to manufacturing and one for hazards relating to the testing and racing of toboggans. The form can be found on our website or Appendix H.
- 6.4.11. Teams are to submit all Field Level Hazard Analysis (FLHA) forms. These are to be completed daily, as a pre-task Toolbox Talk, and are compiled and submitted



for the month, 5 days after the last day of that month. The form can be found on our website or Appendix H

6.4.12. Late submissions of JHA and FLHA forms will result in 0.1 point deduction per day, up to a maximum of 1point.

6.5. Technical Report

6.5.1. Each Competing Team must submit a report outlining all aspects of the design and construction of its Toboggan.

6.5.2. The Technical report must include the following, at minimum:

- 6.5.2.1.** All design concepts and justification for the Toboggan and its components including all assumptions;
- 6.5.2.2.** Proof of compliance with all Toboggan requirements outlined in Section 7; A checklist of these details can be found in Appendix A;
- 6.5.2.3.** Safety and risk analysis for both design and construction;
- 6.5.2.4.** Risk mitigation through design;
- 6.5.2.5.** Description of a substantial innovation in the design approach with specific attention paid to one part or subsystem within the Toboggan, with justification provided to the potential benefit in Toboggan performance;
- 6.5.2.6.** Sustainability considerations in the design and construction of the Toboggan;
- 6.5.2.7.** Construction methods and justification;
- 6.5.2.8.** Quality control and assurance measures for construction;
- 6.5.2.9.** Any testing methodology and results, including concrete mix design;
- 6.5.2.10.** Project management considerations such as budget, schedule, critical path, milestones, and schedule variances.
- 6.5.2.11.** Technical calculations as laid out in the superstructure sections of section 7.

6.5.3. The Technical Report must be clear and concise. The body of the Technical Report shall not exceed 10,000 words. There will be a one (1) point Deduction from a



Team's overall score for every 500 words in excess of the limit, rounded up the nearest 500 words. No word limit is imposed on the appendices.

- 6.5.4. Technical Report point Deductions may be assessed for inclusion of false or exceptionally superfluous information as determined by the Judges over the course of the Competition.
- 6.5.5. Appendices shall be for supporting documentation only, i.e. design calculations, drawings, construction photographs, and testing reports.
- 6.5.6. All reports submitted to the GNCTR 2024 Competition must be original and produced solely by the registered members of the Competing Team. Reports may be subject to plagiarism-checking software.
- 6.5.7. Construction drawings for the Toboggan must be included with the Technical Report as an appendix. All drawings must be submitted on 11x17 sheets. Drawings should be neat, legible, and sufficiently detailed that a third party could construct the Toboggan without clarification from the design Team. The drawing package will be available to Judges and the Organizing Committee and will not be distributed to any other parties.
- 6.5.8. Competing Teams that submit the Technical Report after the deadline will receive a 1-point Deduction on their Technical Report score per day that the report is late, up to a maximum of 10 points. If point deduction exceeds category total due to lateness in submission, the deduction will be applied to the Team's overall score. Regardless of any late submissions, Technical Report is required to be submitted to compete on Race Day.

6.6. Concrete Test Cylinders

- 6.6.1. All Competing Teams are required to provide sample concrete cylinders upon arrival at the Competition.
- 6.6.2. Three (3) concrete test cylinders are required to be submitted by each Competing Team of their Sliding Surface Mix(s). These will be used to verify quality control, the compressive strengths listed in the Technical Report, and the validity of Sliding Surface calculations.



- 6.6.3. Teams utilizing multiple concrete mix designs in the construction of their Toboggan must submit three (3) sample cylinders of each Sliding Surface Mix that could be used on Race Day.
- 6.6.4. Test cylinders shall be 100 mm diameter by 200 mm height, be made and cured according to the CSA A23.2-3C standard, be of the final concrete mix design(s) used, be unbroken, and have ends pre-ground ready for compressive testing.
- 6.6.5. Test cylinders shall be cast at the time of Sliding Surface casting.
- 6.6.6. Test cylinders shall be cured in the same condition as the Sliding Surface components for a minimum period of 28 days. Teams pouring Sliding Surface components late that are unable to achieve a 28-day cure period must note this in their Technical Report along with projected compressive strength at time of testing.
- 6.6.7. The Organizing Committee, and/or designated representatives of them, will conduct compressive strength testing of the sample cylinders during the Competition in accordance with CSA A23.2-9C. If all three (3) submitted cylinders are found to have an individual compressive strength less than 85% or more than 115% of the compressive strength reported in the Technical Report, the Team will be assessed a two (2) point Deduction to their overall total score.
- Teams will not receive the two-point deduction if anyone (1) of their cylinders falls within the 85% to 120% range of the reported compressive strength.*
- 6.6.8. Competing Teams that fail to submit concrete test cylinders on the first day of Competition will receive a 0.5-point Deduction from the total score for each day that cylinders have not been submitted up to a maximum of 1 point. Teams that fail to submit their cylinders by **February 8th, 2024, at 11:59:59am NST (Noon)** will receive zero (0) points in the Ski Design section in the Scoring Rubric.
- 6.6.9. If Teams choose to design for backwards compatibility with Sliding Surface(s) used in previous GNCTR events, they must provide full test results and calculations reflected of said Sliding Surface(s) as an appendix to the Technical Report. Sliding Surface(s) used in previous GNCTR events will result in a 50% score Deduction with a maximum of a 4-point deduction on any Event where said Sliding Surface(s) are used in a Run.



6.7. Technical Exhibition Booth Display

- 6.7.1. Each competing team must present a technical poster or some form of multimedia which showcases the major design components of their toboggan, to be displayed at their tech-ex booth.
- 6.7.2. Technical display formats could include but are not limited to: Posters, Slideshows, Videos, etc.
- 6.7.3. Teams are encouraged to treat the technical display as a “marketing” exercise for their toboggan by showcasing major innovative or engineering accomplishments within their design.
- 6.7.4. Teams that use multimedia for their technical display must provide all necessary resources for setup at the technical exhibition (i.e. projectors, TV’s, HDMI cables, etc.) and communicate power requirements in team registration.

6.8. Technical Presentation Material

- 6.8.1. Each competing team must submit their power point presentation for their technical presentations. For further details, see section 9.3.

6.9. Non-Competing Team Deliverable Requirements

- 6.9.1. Non-Competing Teams must provide a Safety Report and pass the Safety Inspection to participate in any races.



7. Toboggan Requirements

The following section outlines the minimum requirements for a Toboggan to compete in Competition.

7.1. General

7.1.1. Toboggan Weight:

- 7.1.1.1. The Toboggan must weigh no more than 350 lbs. (159 kg) in its heaviest unloaded racing configuration. This configuration must include all safety equipment specified in the Safety Report and identified by the Safety Judges during the review of the Safety Report. The heaviest racing configuration is defined as the racing configuration of the Toboggan with all required components that have the greatest weight. This is important for Teams with multiple racing configurations (such as multiple sets of Sliding Surfaces).
- 7.1.1.2. Additional material may be added to the Toboggan in excess of the 350 lbs. weight limit (up to a maximum of 10 lbs. additional weight), for necessary modifications identified during the pre-race Safety Inspection. These additional material requirements must not have been previously identified in the Safety Report review. This rule does not exempt Teams from the deductions outlined in Section 7.1.1.3.
- 7.1.1.3. Toboggans weighing greater than 350 lbs. will be allowed to race but will be penalized one (1) point per lb. in excess of the limit (rounded up to the nearest half lb.) from their Toboggan Design score, up to a maximum of 50 points (i.e. Maximum 50 point deduction allows for maximum of 400 lbs. toboggan). Toboggans exceeding the maximum weight will be allowed to adjust toboggan, without removing any safety features, to weigh within acceptable limit. Toboggans must re-weigh at the end of the Technical Exhibition and be less than or equal to 400 lbs. Toboggans over the limit at re-weigh will not be permitted to race at final. The final point deduction will be applied after final weigh in. No weigh-in will take place after the end of the Technical Exhibition or during Race Day.
- 7.1.1.4. Toboggans will be weighed using a digital scale with a resolution of 0.2 lbs.



7.1.2. The Toboggan's final weigh-in weight will be compared to the calculated weight submitted in the team's Technical Report. Teams will be scored based on the following sliding scale:

- 1 point for 90%-110% of estimated weight
- 0.8 points for 80%-120% of estimated weight
- 0.6 points for 70%-130% of estimated weight
- 0.4 points for 60%-140% of estimated weight
- 0.2 points for 50%-150% of estimated weight
- 0 points for not meeting 50%-150% of estimated weight

7.1.3. The Toboggan must be able to accommodate safely and comfortably, as a maximum, five (5) Racers using a standard height and weight of a person (6'0", 200 lbs.). Teams must be able to demonstrate this at the Technical Exhibition and during all pre-race Safety Inspections, if requested.

7.1.4. The Toboggan must have an attachment point for a tow cable to pull the Toboggan to the top of the race hill. A 50 mm diameter (minimum) eyelet, U-bolt, or similar is typically sufficient for this, however, a connection point that can accept a variety of connections is recommended. Teams should demonstrate in their Technical Reports that this attachment point can withstand the forces generated from towing up the incline. Teams that do not provide an attachment point will not be transported to the top of the hill and will not be able to race.

7.1.5. All Toboggan and component designs submitted to previous Competitions are considered to be in the public domain and are valid to be replicated by Competing Teams, provided that proper technical justification is given, evidence of new construction is provided, and adherence to design rules is demonstrated in the technical documents.

7.1.6. The Team should use commonly accepted engineering practices and formulas in developing design loadings and in calculation of member capacities.

7.1.7. All design calculations must be provided with clearly stated assumptions such as load points, operating conditions, load distributions, etc.



7.1.8. Toboggans should be designed for use on the Race Course depicted in Appendix C.

7.1.9. Toboggans shall be conceived, designed, and constructed solely by the Team's Competitors, without direct involvement from professional engineers, professors, or related professionals. Professional engineers, professors or related professionals must not make design decisions or drawings; however, they are permitted to offer high level theoretical advice. Welders are exempt from this rule, as they are required as per Section 7.5.5.

7.2. Toboggan Sliding Surface

7.2.1. The Toboggan's Sliding Surface must be composed entirely of concrete.

7.2.2. There are no restrictions on the number of cementing materials required in the concrete mix.

7.2.3. Wax is the only permissible coating for the Sliding Surface. The material data sheet for the type used and method of application must be clearly indicated in the Technical Report.

7.2.4. The profile of the Toboggan's running surface must include geometric feature(s) which intend to prevent the Toboggan from experiencing yaw rotation (fishtailing). The development of this profile must be clearly indicated in the Technical Report.

7.2.5. Teams are required to demonstrate in their Technical Report and Technical Presentation, through design calculations and material testing, that their concrete and reinforcement can safely withstand all loading scenarios that are likely to be experienced during a Run.

7.2.6. See section 6.6.9 regarding the use of Sliding Surface(s) which have been used at previous GNCTR events.

7.2.7. Teams should calculate the load capacity of any connections of the Superstructure to the concrete Sliding Surface and demonstrate that the load capacity exceeds likely demand during all foreseeable race conditions. This should be included in the Technical Report as part of the concrete team's section(s).



7.3. Toboggan Frame

7.3.1. The Toboggan must have a frame that can act as a Roll Cage to withstand any foreseeable crash impact and protect all Racers.

7.3.2. Three crash scenarios must be analyzed, calculated, and presented in the technical report. These scenarios include front and rear impact, roll-over impact, and side impact into side barriers. The minimum design parameters used to calculate loads on the frame in each scenario are as follows:

1. Front and Rear Impact
Weight: 1350 lbs. (5 riders + toboggan weight)
Toboggan Speed: 60 km/hr
Impact Duration: 0.5 seconds
2. Roll-over Impact
Weight: 1350 lbs.
Toboggan Speed: 45 km/hr
Impact Duration: 0.5 seconds
3. Side Impact into the crash/side barriers
Weight: 1350 lbs.
Toboggan Speed: 30 km/hr
Impact Duration: 0.5 seconds

7.4. Mechanical Systems

7.4.1. Braking System:

7.4.1.1. The Toboggan must have a Braking System capable of safely bringing the Toboggan to a stop within the braking zone at the conclusion of each Run. Forces due to braking should be justified in the report.

7.4.1.2. The portion of the Braking System acting on the snow and generating the Toboggan's stopping force must be placed behind the Toboggan's center of gravity. The Braking System itself may be mounted or otherwise located forward of the Toboggan's center of gravity if the above criteria is adhered to.



- 7.4.1.3. The brakes must have a foolproof method of deployment, teams are encouraged to add redundancy in their deployment methods to avoid a crash scenario. Deployment of brakes must be completed by an individual who has a clear line of sight out of the front or sides of the toboggan.
- 7.4.1.4. The brake release mechanism must not transmit any force to the brake operator during or after the deployment of the brakes.
- 7.4.1.5. Teams are required to analyze, calculate, and present their braking in the technical report. The minimum design parameters used to calculate loads on the brakes in a stopping scenario are as follows:
- Weight: 1350lbs. (5 riders + toboggan weight)
 - Toboggan Speed: 60km/hr
 - Stopping time: 0.5 seconds

7.4.2. Steering System:

- 7.4.2.1. The Toboggan must have a Steering System. The use of Racer body weight as the sole Steering mechanism is not permitted.
- 7.4.2.2. Steering Systems must be designed with a limiter to prevent oversteering during a Run. The limit on the angle of turn is up to the discretion of the team but must be justified in the technical report.
- 7.4.2.3. Additional provisions for Toboggan stability (if any) during a turn should be provided in the Technical Report.
- 7.4.2.4. The steering system must be able to safely withstand all dynamic race loads, turning forces, and rider input torque during the operation of the toboggan. Detailed calculations must be provided.

7.4.3. Ski Mount System:

- 7.4.3.1. The toboggan must have a mounting system to act as an interface between the ski's and the superstructure of the toboggan.
- 7.4.3.2. The ski mount system must be able to safely hold the weight of the toboggan and its passengers under dynamic race conditions. Detailed calculations must be provided.



7.4.4. Other Mechanical Systems:

- 7.4.4.1. Justification for the use of all additional mechanical systems must be provided in the Technical Report.
- 7.4.4.2. Suspension geometry, spring rate and damping must be justified with supporting calculations.

7.5. Construction

7.5.1. All Competing Teams must construct an entirely new Toboggan, containing no part or component which has been used in construction of a previously submitted Concrete Toboggan. Teams that incorporate components of a past competition's toboggan, without seeking Organizing Committee's approval, will automatically receive an innovation score of zero (0), equivalent to a four (4) point deduction. The Team's overall design score for the reused components will also automatically be zero'd (0), which is equivalent to an eight (8) point deduction for Concrete Design, five (5) point deduction for Frame Design, five (5) point deduction for Braking Design and/or a five (5) point deduction for Steering Design. If a Team receives approval from the Organizing Committee to reuse past Toboggan components, then only that design component's innovation will be deducted (1 point for each component). The overall design score for said component will still be zero'd (0). The following is the only exceptions:

- 7.5.1.1. The repurposing of salvaged raw materials such as individual lengths of roll frame tube is permitted. Teams are greatly encouraged to seek approval from the Organizing Committee prior to proceeding with such a modification.

7.5.2. If the Toboggan used by a Non-Competing Team has competed in a past GNCTR, the Toboggan will generally be held to the standards set out by the rules of the year in which it competed. This is subject to review by the Organizing Committee on a case-by-case basis. If the Toboggan is a new build, it will be held to the standards set out by the rules of GNCTR 2023. It is the Team's responsibility to reach out to the Organizing Committee if members have concerns regarding the Safety Inspection.

7.5.3. All Toboggans must be constructed exclusively by the Team with photographic documentation of the construction process provided in the Technical Report. The



contracting of specialized work, such as welding or CNC machining, is permitted if some specific licensure is required to perform the work, if it is deemed to be too severe of a safety risk for a Team member to complete the work, or if the work requires specialized equipment.

7.5.4. Teams must be able to demonstrate the integrity of all connections, fasteners, and welds. Applicable testing (i.e. Non-Destructive Test, etc.) must be completed to provide verification. This must be included in the Technical Report.

7.5.5. All welds may be subject to inspection except for those performed by a licensed professional for whom a license number has been provided in the Technical Report.

7.6. Safety Features

7.6.1. The rules listed in this section are additional safety requirements to those mentioned in the previous sections.

7.6.2. There must be clear space for roll protection between the head of each rider to the inside of the Frame. This distance must be at a minimum 2 inches and at a maximum 6 inches. Teams may be asked to demonstrate this clearance during safety inspections.

7.6.3. All sides of Toboggan must be enclosed to ensure no part of any Racer can be ejected from the Toboggan during a Crash. The Toboggan will be considered to be enclosed if well-secured paneling or mesh is fixed to the Toboggan, and it is deemed to be sufficient to contain the Racers in the event of a Crash. Teams must include their securement method along with the Technical Report.

7.6.4. The Racers' seating area shall be free from bolts, Frame members, or other protruding objects. All pinch points inside the toboggan shall be adequately covered.

7.6.5. No sharp objects are permitted inside or outside of the Toboggan.

7.6.6. All Frame components that present risk to Racers on impact shall be padded with foam ($\frac{1}{4}$ inch minimum thickness). This includes any members inside the Toboggan, such as a Steering column or frame members.



- 7.6.7. Soft hand grips must be provided for all Racers such that they can hold onto the Toboggan with both hands.
- 7.6.8. Individual Racer seats may be utilized. Seats must be securely fastened to the Toboggan. Seats and mounting systems must be designed to accommodate forces exerted during a collision. All seats must have at minimum four-point restraints to keep Racers from leaving them during the Run. Lap belts are not permitted.
- 7.6.9. All riders must be able to exit the Toboggan independently without assistance from someone outside of the Toboggan.
- 7.6.10. All riders must be able to enter and exit the Toboggan without removing their racing helmets.
- 7.6.11. Teams must provide a Toboggan egress strategy for the scenario of a serious crash in which riders are unconscious. Unconscious riders must be able to be easily removed from the Toboggan by a medical team without any significant movement of a rider's spine. This can be accomplished in any number of ways, the most common way likely being that the rear face of the toboggan is easily removable. Teams are required to show their compliance with this rule in the Safety Report.
- 7.6.12. Smoke grenades, fireworks, or any other similar explosive or incendiary devices are not to be attached to a Toboggan or deployed in any way during a run.
- 7.6.13. Teams must provide preliminary calculations in the Safety Report and final calculations in the Technical Report showing how their design mitigates an overturning moment, based on the location of the center of gravity. Teams are required to define the worst-case scenario which they have designed for. The following diagram is a general reference for defining the overturning moment of a toboggan. The point of rotation will vary with toboggan design; however, it is generally defined as the furthest point from the centre line of the toboggan that is in contact with the snow. Teams may include additional forces and conditions beyond those shown below.

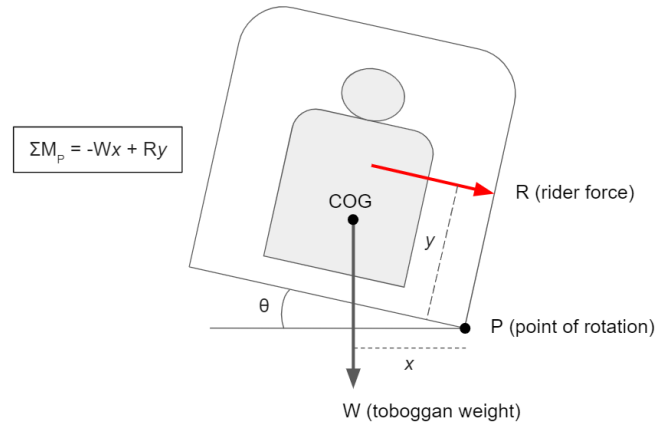


Figure 1: Overturning Moment Diagram

7.6.14. Teams are recommended to lift their Toboggan with a minimum of six (6) Team members at all times throughout the Competition.



8. Toboggan Inspections

The following section outlines the Rules surrounding the Toboggan inspections which will allow Teams to participate in Race Day activities.

- 8.1.** All Toboggans will be subject to a Safety Inspection by the Safety Committee. The official Toboggan Weigh-In will occur following a successful Safety Inspection.
- 8.2.** The Safety Inspection will be completed during the Technical Exhibition. The Safety Inspection order will be announced prior to the Technical Exhibition Day and the Organizing Committee will endeavor to ensure Safety Inspections do not conflict with the Technical Presentations.
- 8.3.** Teams may only have a maximum of four (4) Team members present at the Safety Inspection to answer questions. All other Team members required to help carry the Toboggan must immediately leave the area until called back to remove the Toboggan. Teams will receive a point Deduction to their safety score at the discretion of the Safety Judges if they fail to adhere to this limit.
- 8.4.** All toboggans must be in race-ready condition, with Skis and any other detachable components mounted as they will be during the race. If there are multiple configurations, all variations must be presented, and the heaviest configuration will be used for the official weigh-in. Deductions will be applied if Toboggans show up to their Safety Inspection without all components mounted and in race-ready conditions.
- 8.5.** Each toboggan will be subject to a static tilt test of 50 degrees during the safety inspection to determine if their toboggan can mitigate an overturning moment. Details on the testing criteria can be found in Appendix F. Deductions will be applied if toboggans show up to their safety inspection without all components mounted and in race-ready condition. Toboggans will be scored based on the following: 50deg = 100% of points; 30deg = 0% of points; less than 30deg = not able to race.
- 8.6.** Teams that fail to attend their scheduled Safety Inspection will be Deducted two (2) points from the Team's overall score and must be available to participate in a safety inspection at any point in the remainder of Tech-Ex.
- 8.7.** Teams that do not pass their Safety Inspections or are found to exceed the Toboggan weight limit will be permitted to make modifications to the Toboggan and have it re-



inspected and/or re-weighed following the scheduled Safety Inspections, on a first-come, first-served basis.

- 8.8.** Hot work (grinding, welding, brazing, etc.) will not be permitted at the Technical Exhibition venue. Teams found not complying with this rule will receive a point deduction(s) from their safety score, upon severity of the actions, determined by the Safety Judges and will be liable for any damages to the venue. A minimum of a 1-point deduction will occur for any team not complying, regardless. An alternative location may be available for hot work, however, anything required to complete the work (transportation, lifting, equipment/tools, etc.) will be solely the Team's responsibility.
- 8.9.** Any Toboggan that does not pass the Safety Inspection and fails to make revisions as per the requirements of the Safety Judges, or fails to pass subsequent Re-Inspection, will be prohibited from racing.
- 8.10.** Toboggans must be re-inspected and weighed following any modifications that are made after the initial Safety Inspection. Such modifications include but are not limited to: Changes to Steering and Braking Systems; Replacement of Sliding Surfaces; Changes to the Racer safety features; Addition or removal of any components.
- 8.11.** Following the Safety Inspection and Weigh-In teams will be provided with a sticker, to be placed on their toboggan, indicating they have completed all requirements. At this point no further modifications to the Toboggan will be permitted without the knowledge and permission of the Judges and Safety Committee.
- 8.12.** Toboggans must be re-inspected after any Crash or other potentially damaging event that occurs during Race Day Runs before being permitted to race again.
- 8.13.** Any Team caught racing or attempting to race without having their Toboggan re-inspected following modifications or a Crash will be penalized at the discretion of the Organizing Committee, up to and including removal from all remaining Runs and forfeiture of all points earned during Race Day.
- 8.14.** Toboggans can be inspected at any time before any Run at the discretion of the Organizing Committee or Safety Committee.



9. Technical Exhibition

The Technical Exhibition (Tech-Ex) is the part of competition where teams get an opportunity to display their toboggan to the other teams, sponsors, and the general public. It is a chance to practice their presentation and marketing skills, along with their engineering prowess. The following section outlines the Rules that govern the Technical Exhibition Day as well as the specifications of the Technical Exhibition and the general guidelines for Technical Presentations. Additional rules defined by the venue must also be followed.

9.1. General

- 9.1.1. All Competing Teams must be present at the Technical Exhibition and adhere to the requirements of this section.
- 9.1.2. Teams are prohibited from any activities on the premises of the Technical Exhibition which could damage the facility, such as performing any modifications to the Toboggan or Technical Display including grinding, painting, waxing etc.
- 9.1.3. All Team members are required to be knowledgeable about the general design and construction of the Toboggan.
- 9.1.4. Teams must ensure that all materials brought into the Technical Exhibition area are removed with the team, and their space is left clean at the end of the day. Teams found leaving the Technical Exhibition and not thoroughly having their space cleaned will be subject to point deductions at the discretion of the Organizing Committee.

9.2. Technical Display

- 9.2.1. Each Competing Team must present a Technical Display showcasing their Toboggan, design approach, and manufacturing processes. The display may include any form of media, including posters and video displays, and should market the main features of the team's toboggan to a non-technical audience. See section 6.7 showcasing their toboggan.
- 9.2.2. The Toboggan and any components to be used during the Run must be present at the Technical Display.



- 9.2.3. A panel of Technical Exhibition Judges will conduct walk throughs of each Competing Team's Technical Display. Teams shall be present and prepared to conduct an informal five (5) minute presentation of their display and toboggan. A five (5) minute question period will follow the presentation.
- 9.2.4. Design and aesthetics of the Technical Display should incorporate the Theme. Spirit Judges will judge the Technical Display for relevance to the Theme.
- 9.2.5. Each Team must have at least three (3) Team members present at its Technical Display for the duration of the scheduled Technical Exhibition.
- 9.2.6. Each Team will be allotted a space within the Technical Exhibition to display its Toboggan and Technical Display. Each Team will be given one 10'x20' area which must entirely contain all components of the Toboggan and the Technical Display.
- 9.2.7. Each Team is required to provide flooring protection for their Technical Display. Teams not supplying floor protection will not be permitted to set up their Technical Displays and will consequently score a 0 for their technical display. A rug or similar material is typically sufficient floor protection.
- 9.2.8. Technical Displays should be limited to 10' in height. Teams that have Technical Displays taller than 10' or those containing an accessible suspended floor must contact the GNCTR 2024 Organizing Committee for approval by **November 17th, 2023, at 11:59:59pm NST**. Technical Displays shall comply with applicable local building codes regarding the construction of temporary structures.
- 9.2.9. Technical Displays should be completely set up (i.e. no further manipulation required by Team members) when the Technical Exhibition is opened to the public.
- 9.2.10. Electricity access will be coordinated with the venue. Teams requiring this access must inform the Organizing Committee as outlined in the Registration Package.
- 9.2.11. No outside food or drink is permitted in the venue and no food or drink samples may be given out at a Technical Display.



9.3. Technical Presentations

- 9.3.1. Each Team will conduct two (2) formal presentations on the design features of their Toboggan. One presentation will focus on concrete mix and concrete reinforcement, while the other will focus on the Toboggan's Superstructure, Steering System, and Braking System components.
- 9.3.2. Presentations will be scheduled during the Technical Exhibition. Teams will be provided with the schedule prior to the Technical Exhibition
- 9.3.3. Presentations will be strictly limited to five (5) minutes of presentation followed by five (5) minutes for questions from the Judges. Presentations exceeding these time limits will be cut short which may impact the perceived quality of the presentation.
- 9.3.4. A projector and laptop will be provided in each presentation room for the use of the presenters. All presentations must be saved as a .ppx or .pptx file and emailed to technical@gnctr2024.ca on **February 2nd, 2024 at 11:59:59pm NST**.
- 9.3.5. Teams that fail to attend their scheduled presentation times will score zero (0) on their Technical Presentations.



10. Race Day

The following section outlines Competitor requirements at Race Day events. In addition to this section, rules defined by the venue must be followed.

10.1. General

- 10.1.1. Race Day will consist of three types of Events as defined in Section 10.6 - Race Events. The races will be conducted in the following order: Drag Race; Giant Slalom; King of the Hill.
- 10.1.2. The Organizing Committee reserves the right to remove, add, or modify race specific rules prior to, or during Race Day due to weather and track conditions, time constraints, or other unforeseen circumstances.
- 10.1.3. All competitors are expected to follow resort rules and guidelines while on resort properties.

10.2. Competitor Safety

- 10.2.1. Racers are not permitted to be under the influence of Drugs or Alcohol while racing. Teams caught with a Racer under the influence of Drugs or Alcohol will immediately be prohibited from racing and will lose all points for Race Day activities accrued up to the time of the infraction.
- 10.2.2. Racers must wear NL Motor Vehicle Act compliant helmets during all Runs; helmets may not be removed until the competitor has safely left the Race Course. Helmets will be inspected for compliance during Tech-ex. A helmet shall conform to the requirements of the:
 - 10.2.2.1. Canadian Standards Association Standard D 230, Safety Helmets for Motorcycle Riders, as amended, and the helmet shall bear the monogram of the Canadian Standards Association Testing Laboratories;
 - 10.2.2.2. United States Federal Motor Vehicle Safety Standard 218, as amended, and the helmet shall bear the DOT symbol as used by the United States Department of Transportation; or



- 10.2.2.3. United Nations Economic Commission for Europe, ECE Regulation 22 incorporating the 05 series of amendments, as amended, and the helmet shall bear the approval mark as required by the regulations.
- 10.2.3. Racers must wear boil-and-bite style mouth guards during all Runs. The mouth guards must be boiled and fitted to the mouth of each individual rider prior to Race Day.
- 10.2.4. Teams are highly encouraged to have their riders wear motocross-style neck braces during all Runs. These braces are not mandatory, as they can be very expensive. Feel free to reach out to the Organizing Committee on brace purchase suggestions.
- 10.2.5. Racers must remain seated, have themselves and all their limbs inside the Toboggan during the entire Run; and may not exit the Toboggan until it has come to a complete stop. In the event that a Racer leaves the Toboggan during the Run or before the Toboggan has come to a complete stop, the Run will be considered a DNF.
- 10.2.6. The boundaries of the Race Course will be clearly marked. Spectators (anyone not riding a Toboggan) are not allowed on the Race Course at any time. Violation of the Rule by any Competitor may result in that Team's forfeiture of Race Day points at the discretion of the OC.
- 10.2.7. All Racers must be dressed in an appropriate manner for a Run. The starting official may direct participants to change their attire prior to a Run.
- 10.2.8. Any competitor who may be pregnant is not permitted to race.
- 10.2.9. Race day will take place on an active ski hill. Any competitor who does not stay within the competition's boundaries, may result in that Team's forfeiture of Race Day points at the discretion of the OC and the potential removal of the competitor from the competition.

10.3. Race Hill Geometry

- 10.3.1. Races will take place on a ski hill. Specific hill geometry has been provided in Appendix C.
- 10.3.2. A starting line will be drawn at the top of the hill.



- 10.3.3. Two lines will be painted at the bottom of the race hill. The area between these two lines represents the Braking Zone. The line at the start of this zone (i.e. the line closer to the top of the hill) is referred to as the finish line.
- 10.3.4. The racing lane immediately adjacent to the viewing area is only to be occupied by the Organizing Committee, Volunteers, and medical staff. This lane will be clearly marked off with a physical barrier. Any competitor entering this lane without the express consent of a member of the Organizing Committee will cause their team to receive a score of zero (0) in the Race Day category.

10.4. Race Starts

- 10.4.1. A Team's Racers, pushers, and Toboggan must be present in the starting Staging Area at least five (5) minutes prior to the start of their Run. Failure to do so may result in the Team forfeiting their Run.
- 10.4.2. Teams must not start their Run until directed to do so by a Race Official.
- 10.4.3. Toboggans are to be placed such that the leading edge of the Toboggan is located behind the starting line.
- 10.4.4. A Team can have two (2) members from their Team help push their Toboggan at the start of the Run. Only these people may push the Toboggan.
- 10.4.5. Teams who do not have enough Team members to push their Toboggan should contact Race Officials prior to Race Day. Pushers will be assigned to such Teams by Race Officials.
- 10.4.6. Those pushing the Toboggan must push against the Toboggan and not against the Racers.
- 10.4.7. Those pushing the toboggan shall commence their efforts while in contact with the frame.
- 10.4.8. Pushing of the toboggan can only occur while behind the start line.
- 10.4.9. Only Racers and pushers are allowed in the Staging Area when the race begins. The Organizing Committee and Race Officials may ask Competitors and viewers to move to different viewing areas during the races.



- 10.4.10. The toboggan may not gain any forward momentum from anything other than the pushers. This includes mechanical devices that may add potential energy to aid the pushers in reaching a faster speed.

10.5. Toboggan Crashes and Reinspection

- 10.5.1. In the event of a Crash or Brake Deployment Failure defined by rules 2.12 and 2.1 prior to the completion of the Race Course, no attempt to continue the Run shall be made. The Organizing Committee will direct teams how to proceed in this scenario. Crashes will result in DNF and/or score deduction.
- 10.5.2. In the event of a Crash or Brake Deployment Failure, the Toboggan must pass an additional Safety Inspection in order to be allowed to race again. Teams who make any modifications to their toboggans between runs are required to pass an additional safety inspection.

10.6. Disqualifications, DNF Scoring, and Penalties

- 10.6.1. Failure of Competitors to listen to Race Officials may put the Team at risk of Disqualification and Race Day points deducted at the discretion of the Organizing Committee.
- 10.6.2. If race officials suspect that pushers have not maintained contact with the toboggan during pushing as noted in rule 10.4.7, will receive a DNF scoring for that said run.
- 10.6.3. Teams will receive a DNF scoring if any portion of the pushers feet extended past the starting line while pushing detailed in rule 10.4.3.
- 10.6.4. Brake failures defined by rule 2.1 can result in successive point deductions.
- 10.6.5. During king of the hill, teams who begin pushing before officials initiate the race will be disqualified.
- 10.6.6. Any member who does not abide by the racer code of conduct set by the organizing committee or the resort code of conduct set by White Hills, may place their team in risk of disqualification at the discretion of the organizing committee.
- 10.6.7. Failure to show up to the tow-up area within 15 minutes of being asked by a race day official will receive a point deduction to their Race Day score.



10.6.8. During King of the Hill tournament, Teams in excess of 10 minutes between leaving the run and returning to the tow-up area will be disqualified. Their place will be assumed by the team to last lose to the disqualified team. In the event that a team is disqualified under this rule in the first bracket, the OC reserves the right to adjust the brackets or grant a bye as they see fit.

10.7. Race Events

10.7.1. Drag Race:

- 10.7.1.1. The Race Course will be oriented in a straight line.
- 10.7.1.2. The objective of this Run is to complete the course in the shortest time possible, and to stop the Toboggan by engaging the Brakes within the Braking Zone in the shortest distance possible.
- 10.7.1.3. Each Team will be permitted one attempt to complete the Drag Race Course with the exception of Teams that have not passed all required Safety Inspections (including Section 10.5.4).

10.7.2. Giant Slalom:

- 10.7.2.1. The Race Course will be set up with three to five sets of gates, staggered laterally across the width of the course. The geometry of the Slalom course will be shared at a later date.
- 10.7.2.2. The objective of this Run is to complete the course while passing through each set of gates without contacting the gate markers, and to stop the Toboggan by engaging the Brakes within the Braking Zone in the shortest distance possible.
- 10.7.2.3. Each Team will be permitted one attempt to complete the Giant Slalom course with the exception of Teams that have not passed all required Safety Inspections (including Section 10.5.4).

10.7.3. King of the Hill Tournament:

- 10.7.3.1. Any Team that successfully completes at least one of the drag race or giant slalom race (i.e. did not Crash or receive a DNF), and has passed any necessary safety Re-Inspections, will be entered into the King of the Hill tournament. Crashes will result in DNF and/or score deduction.



- 10.7.3.2. Teams will be seeded for the tournament based on ranking of their fastest Run time in either the Drag Race or Giant Slalom race. The tournament bracket will be posted at the Race Day venue prior to the tournament start.
- 10.7.3.3. In each round, two (2) Teams will race down the hill simultaneously in separate lanes. The Team that crosses the finish line first will advance to the next round. The other Team will be 'eliminated' and removed from the bracket.
- 10.7.3.4. Teams that are assessed a DNF will not continue in the tournament. It is possible that both Teams in a race receive a DNF, in which case neither Team will continue.
- 10.7.3.5. Teams that fail to pass necessary Safety Inspections between Runs will no longer be allowed to race.
- 10.7.3.6. The tournament bracket style will be released at a later date. The bracket will be chosen by the Organizing Committee based on the number of teams that qualify for the tournament. The bracket may be modified at any point, for any reason, at the discretion of the Organizing Committee and Race Officials.
- 10.7.3.7. In the event of an odd number of Teams qualifying for the tournament, at the discretion of the Race Officials, the Team with the Fastest Run Time (see Section 12.7.1.1 - Fastest Run) may be granted a 'bye' to the next round of the tournament. Additionally, the Team with the longest run time may be eliminated from the tournament. Teams eliminated from the tournament as a result of this rule will be scored as a team who lost their first race in the tournament.
- 10.7.3.8. Non-Competing Teams may have the opportunity to compete in a separate King of the Hill competition following the same rules, if time permits.



11. Spirit

The following section outlines expectations for the unique Spirit component of GNCTR. The Spirit category is one unique to GNCTR compared to other design competitions. Teams are awarded points based on how they live and exemplify the values of GNCTR and the overall Spirit and culture of the Competition. Rooted in the principles of fair play, sportsmanship, diversity, and inclusivity, GNCTR Spirit encompasses how Competitors enthusiastically support their Team, their school, other Teams, schools and Competitors, and the Competition as a whole.

11.1. Theme

- 11.1.1.** Each Team may choose its Theme. The Organizing Committee reserves the right to reject any Theme for any reason and require that the Team selects a new one.
- 11.1.2.** Any offensive or insensitive Theme or Theme content may result in Disqualification or a Spirit score of zero (0) at the discretion of the Organizing Committee and/or Judges.
- 11.1.3.** No Teams may have the same Theme or similar Themes. Themes will be allocated on a first come, first serve basis. Similarity will be determined by the Organizing Committee.
- 11.1.4.** Teams may register and reserve their Theme as part of pre-registration as outlined in the Registration Package.
- 11.1.5.** All Teams must develop a coherent brand related to their Theme. Elements of this brand should include costumes and Technical Display aesthetics at a minimum. Other aspects such as logos, chants/cheers, social media, patches/giveaways, and Toboggan decorations are encouraged.

11.2. Participation

- 11.2.1.** Competitors will be evaluated on their overall attitude and engagement throughout the duration of the Competition. Evaluation of competitor spirit will NOT be associated with the consumption of alcohol.
- 11.2.2.** The Competition will include two (2) evening events that will have unique themes prescribed by the Spirit Judges. Competitors are encouraged to wear costumes



relating to these unique themes on these evenings. Unique themes will be announced no later than one (1) month prior to the Competition.

11.2.3. Competitor Interaction Day will include events that allow Competitors to get to know those on other Teams and further develop the Spirit of GNCTR.

11.2.4. Bribing the Spirit Judges is not allowed. Any bribing of the Judges will result in a score of zero (0) in their overall Spirit scoring.

11.2.5. Gifting the Organizing Committee is encouraged. All teams are encouraged to present each member of the Organizing Committee with all variations of their team's swag items (patches, pins, etc.) during the Team's Orientation. This will not have any effect on the competition outcome, as OC members are not involved in any subjective scoring categories.

11.2.6. Competitors are encouraged to start cheers/chants at any and every opportunity throughout the Competition, provided they respect the Organizing Committee's orders to stop chanting when necessary. Offensive or insensitive cheers will not be permitted and may result in a Spirit score of zero (0) or disqualification. The appropriateness of cheers are left up to the discretion of the Organizing Committee and dealt with on a case-by-case basis.

11.2.7. Opening Ceremonies Spirit Presentation:

11.2.7.1. Each Team will be given four (4) minutes (from seat to seat) to present a short introduction of their Theme to the Spirit Judges and fellow Competitors.

11.2.7.2. The venue will provide audio and visual capabilities. Any audio or visual media to be used in this presentation must be provided to the Organizing Committee in advance. A deadline will be provided to Captains at least one (1) week prior to its arrival.

11.2.7.3. The order of presentations will be provided to Captains prior to Opening Ceremonies.

11.2.8. Tech Ex Spirit Presentation:

11.2.8.1. A presentation to the Spirit Judges will be scheduled for each Team during the Technical Exhibition. The intent of this presentation is to showcase the Team's Spirit in the context of the Technical Display. Teams are



encouraged to find creative ways to use the Technical Display in this presentation.

- 11.2.8.2. Presentations will be no longer than five (5) minutes long and will begin when the Spirit Judges arrive at the Team's Technical Display.
- 11.2.8.3. The order of presentations will be released to Competitors in advance.
- 11.2.8.4. It is the responsibility of the Spirit Captains to be aware of the Spirit Judges' estimated time of arrival, as based on their current location and the predefined order of presentations. The Organizing Committee will assist in communicating estimated time of arrival.
- 11.2.8.5. Teams may be required to give Technical Presentations and Spirit presentations simultaneously but will not be required to attend the Safety Inspection and Weigh-In and give the Spirit presentation simultaneously.

11.2.9. Spirit Challenges:

- 11.2.9.1. Each Team will be tasked with completing several Challenges defined by the Spirit Judges at their discretion. These challenges may be issued and have due dates before or during the Competition.
- 11.2.9.2. Spirit Challenges issued after the start of the Competition will be communicated to the Spirit Captains as the Spirit Judges see fit.
- 11.2.9.3. Spirit Challenges issued prior to the start of the Competition will be communicated via email sent to Captains and Spirit Captains. It is the responsibility of each Team to provide correct email addresses for these parties to the Organizing Committee per the Registration Package.
- 11.2.9.4. Teams submitting Spirit Challenges late will receive a score of zero (0) for that challenge unless previously discussed and allowed by the Spirit Judges.
- 11.2.9.5. All Spirit Challenges and Spirit Judges proposed method of communication will be reviewed and must be deemed acceptable by the OC prior to being released to Spirit Captains.



12. Scoring and Judging

- 12.1.1. To preserve the integrity of the Competition, the Organizing Committee, Judges, and the Safety Committee reserve the right to add, delete, or modify any judging criteria (and their associated score values) at any time prior to or during the Competition. Teams will be notified immediately in the event of any major changes to the rules. Teams are expected to check the RFI feed on the website regularly for rule clarifications. Responses to all RFIs will be posted publicly on the competition website, and the team that asked for clarification will be notified directly when a response to their question is complete and available. RFI responses will not contain any information identifying which school the request came from.
- 12.1.2. Points will be awarded to Teams based on their performance in a number of different categories. Table 4 and Table 5 describe these categories and show the points available to Teams for each subcategory. Refer to Appendix B of these rules for a more detailed breakdown of the Scoring Rubric:

Table 3: Scoring Rubric

| Category | Subcategory | Available Points |
|----------------------------------|--------------------------------------------|------------------|
| Toboggan Design | | 32 |
| | Concrete Mix | 3 |
| | Concrete Reinforcement and connection | 3 |
| | Geometric Profile and Formwork | 2 |
| | Frame | 5 |
| | Braking System | 5 |
| | Steering System | 5 |
| | Innovation | 4 |
| | Aesthetics | 2 |
| | Sustainability in design and manufacturing | 2 |
| | Toboggan Weight Accuracy | 1 |
| Project Management | | 2 |
| | Schedule | 1 |
| | Budget | 1 |
| Reports and Presentations | | 17 |
| | Technical Report | 6 |



| | | |
|----------------------|---------------------------|------------|
| | Technical Presentation | 4 |
| | Technical Display | 7 |
| Race Day | | 30 |
| | Fastest Run | 7 |
| | Steering Performance | 7 |
| | Braking Performance | 7 |
| | King of the Hill Rank | 9 |
| Safety | | 9 |
| | Safety Report | 2 |
| | Safety Documentation | 2 |
| | Safety Design | 3 |
| | Safety Inspection | 2 |
| Team Spirit | | 10 |
| | Planned Spirit Activities | 5 |
| | Vibes | 5 |
| Overall Total | | 100 |

12.1.3. Scores for individual categories will be determined by Judges for the respective category. Every effort will be made by the Organizing Committee and Judges to ensure impartial and consistent judging of all Teams.

12.1.4. A detailed breakdown of individual Team scores will be available on the GNCTR 2024 website on **February 26th, 2024**.

12.1.5. The maximum points a Team can be awarded is 100.

12.1.6. Raw scores in any category may be mathematically redistributed to utilize the full range of the available points at the discretion of the Organizing Committee.

12.2. Deductions

The following section includes a list of possible Deductions to a Team's Overall Score. This section does not include Deductions that are used as the mechanism by which scores are assigned. Any deductions that results in the deduction exceeding the category total will be deducted from the Team's total score.



12.2.1. The scoring rubric outlined in Section 12.1.2 is subject to Deductions. A Team's score in each category will be reduced by the amount of Deductions they incur in that category.

12.2.2. The Deductions that a Team can incur are outlined in the following table and include, but are not limited to:

Table 4: List of Deductions

| Section | Description of Deduction | Team Deduction | Category Deducted From |
|---------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 2.2 | Brake deployment failure | First occurrence: 0 points; Second: 1 point; Third: 2 points; Fourth & more: 3 points | Braking Performance |
| 2.13 | Race Day Crash | 1 point per crash | Race Day |
| 3.2 | Missed Captain's meeting | 1 point per missed meeting | Project Management |
| 3.5 | Non-Compliant Toboggan Crate | 0.75 points: Non-compliance length 0.75 points: Non-compliance width 0.5 points: Non-compliance height 0.5 points: Non-compliance weight 0.5 points: Incomplete, inaccurate, or late 'No Surprise Crate Checklist' 2.0 points: Sending more than one (1) crate, even if crates are within specified dimensions | Project Management |
| 6.4.6 | Late submission of the Safety Report | 1 point per day, up to 10 points | Safety Report |
| 6.4.8 | Failure to highlight changes on resubmitted reports | 0.5 points per day; up to 5 points | Safety Report |
| 6.4.12 | Late submission of the JHA and FLHA forms | 0.1 points per day, up to 1 point | Safety Documentation |
| 6.5.3 | Technical Report over the word limit | 1 point per each 500 words, rounded up to the nearest 500 words | Technical Report |
| 6.5.4 | Superfluous information in Technical Report | 0.5 point per item, up to 5 points | Technical Report |
| 6.5.8 | Late submission of the Technical Report | 1 point per day, up to 10 points | Technical Report |



| | | | |
|---------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 6.6.7 | Concrete test cylinders having inaccurate compressive strength | 2 points | Concrete Design |
| 6.1.1 | Late submission of concrete test cylinders | A score of zero (0) in the Ski Design section of the Scoring Rubric | Concrete Design |
| 6.6.9 | Use of Sliding Surface(s) used in previous GNCTR events | 50% point reduction with a maximum of 4 points for Event(s) where the Sliding Surface(s) are used in a Run | Race Day |
| 7.1.1.3 | Toboggan over 350 lbs | 1 point per lb., up to 50 points | Superstructure Design |
| 7.5.1 | Use of Previously Constructed Toboggan Component | <p>Without OC approval: A score of zero (0) in Innovation (4-point deduction) A score of zero (0) in respective re-used component in Toboggan Design (5- to 8-points deduction)</p> <p>With OC approval: A score of zero (0) in respective re-used component in Innovation score (1- to 4-points deduction) A score of zero (0) in respective re-used component in Toboggan Design (5- to 8-points deduction)</p> | Toboggan Design & Innovation |
| 8.3 | Over four (4) members at Safety Inspection | 0.5 points per additional person | Safety Inspection |
| 8.4 | Incomplete Toboggan at Safety Inspection | 1 point | Safety Inspection |
| 8.6 | Team failing to attend Safety Inspection | 2 points | Safety Inspection |
| 8.8 | Hot work completed at Technical Exhibition venue | Minimum of 1 point. Higher point deduction at discretion of Judges/OC | Technical Display |
| 10.6.7 | Failure to show up a minimum of 15-minutes prior to tow-up | 1 point per occurrence | Race Day |
| 10.6.8 | Excess of 10-minutes to return to towing between runs during King of the Hill tournament | Disqualification of next race | King of the Hill |
| 11.2.4 | Bribing Spirit Judges | A score of zero (0) in the Spirit section of their Scoring Rubric | Spirit |
| 12.3.5 | Failed petitions | 0.5 point for first failed petition, doubling for each failed petition thereafter | Project Management |



12.2.3. Spirit Points may be deducted from Teams for Competitor conduct that is against the Spirit of the Competition on a case-by-case basis.

12.2.4. Judges reserve the right to assign additional Deductions in the event that Teams violate the rules outlined in this document or otherwise violate the intent of the Competition.

12.3. Petitions

12.3.1. Teams that feel that they have been unfairly judged during the Competition, including but not limited to Deductions, can submit a written Petition to the Organizing Committee. Petitions can be emailed to cochairs@gnctr2024.ca. Please make the subject line of your email "Petition - <Team Name>".

12.3.2. A Team's Petition should include as much information as possible, including how they believe judging was unfair, any relevant rule sections, and the desired result of the Petition.

12.3.3. Petitions must be submitted at least two (2) hours prior to the start of the Closing Ceremonies, except as stipulated in Section 12.3.6. Petitions submitted within two (2) hours of Closing Ceremonies will not be considered.

12.3.4. Petition decisions will be made by the Organizing Committee and Judges prior to the Closing Ceremonies. All decisions will be final.

12.3.5. Failed petitions will result in a deduction of 0.5 points, doubling in severity for each failed petition thereafter (i.e., First failed petition is a deduction of 0.5 points, second failed petition is a deduction of 1 point, third failed petition is a deduction of 2 points, etc.).

12.3.6. In the event that a major issue arises after Closing Ceremonies (i.e. the Organizing Committee makes a mistake in calculating scores), Petitions may be submitted up to two (2) weeks after the official scores have been posted. Any failed petitions will come with a 1-point deduction per failed petition from overall score.



12.4. Toboggan Design

12.4.1. Toboggan design will be judged by the respective Concrete and Superstructure judges. Preliminary scoring will be based on the team's submitted technical reports and scores will be finalized after the technical presentations. Scores shall be based on the detailed scoring rubric in Appendix B.

12.4.2. Each sub-category of Toboggan Design shall be scored on the following criteria:

12.4.2.1. Design Justification:

- What challenge(s) are you trying to address?
- How will your design address the challenge?
- Why is your design best optimized to handle the challenge?

12.4.2.2. Accuracy and Quality of Calculations/Simulations:

- How accurate is your calculations/simulations in comparison to real life application?
- How thoroughly is each member/item evaluated for applied stresses?

12.4.2.3. Construction and Execution:

- Teams will be marked on the quality, detail, and level of professionalism of their engineered drawings.
- Explanation of your fabrication process and why it was chosen.
- Explanation of how your final product meets the requirements of your design.

12.4.3. Innovation will be assessed as a measure of the originality, uniqueness, and degree of engineering thought put into the design with regards to performance, safety, and functionality. Innovation will be assessed by the Concrete and Mechanical Judges and evaluated through the Technical Report and Technical Presentation.

12.4.4. Toboggan aesthetics will be judged by how visually appealing the toboggan is and how well it matches the teams theme. The aesthetics score will be determined by a combination of communal team vote as well as OC vote.



12.4.5. Sustainability in design and manufacturing shall be scored on the following criteria:

- Describe in detail the environmental impacts of the materials you are using in your design.
- In the manufacturing of your toboggan and tech-ex, describe ways in which you have been sustainable?
- After competition, describe in detail what will happen to your toboggan. I.e. disassembled, recycled, put on display, used as a fundraiser, etc.

12.5. Project Management

12.5.1. Schedule:

12.5.1.1. The project schedule will be evaluated in two parts, the technical report discussion (25% of the points) and the completeness of the schedule as outlined in Appendix D: Schedule KPI Audit Rubric (75% of the points). The technical report must contain a section discussing the results of the project schedule. Teams will be evaluated based on discussion which focuses on:

- Predicted vs actual timelines
- Causes for delays
- Suggested solutions for delays
- Suggestions for future project schedules

12.5.1.2. The Schedule KPI Audit Rubric will account for 75% of the points allocated to the schedule. The following formula will be used to calculate the points awarded to the Team:

$$P_i = P_a \times t$$

- Where P_i is the points awarded to the Team
- Where P_a is the maximum points available to be won
- Where t is the Team's total score from the Schedule KPI Audit Rubric



12.5.2. Budget:

- 12.5.2.1. See Appendix E for an example of what is expected for the budget submission.
- 12.5.2.2. The project will be evaluated based on the expected revenue and expenses vs. actual revenue and expenses incurred, and a justification for any discrepancy between the two. Points will not be deducted if the actual expenses result in a surplus or shortfall. The focus of the budget section is to ensure that teams are able to justify and explain why a surplus or shortfall may have occurred, and how this risk could be mitigated in the future. The following rubric will be used to calculate the points awarded to the team: (See next page)



| Budget Marking Rubric | | | | |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 | 0.25 | 0.5 | 0.75 | 1.0 |
| No budget submitted. | An insufficient number of categories and line items are provided to demonstrate a robust and comprehensive budget for the project. | An ample number of categories are provided, but the number of line items are insufficient to demonstrate a robust and comprehensive budget for the project. Line items are not listed under specific categories or are listed under incorrect categories. | An ample number of line items are provided to demonstrate a robust and comprehensive budget for the project. The majority of line items are logically categorized, but there may be some items out of place. | An ample number of categories are provided and line items listed demonstrate a robust and comprehensive budget for the project. Line items are logically categorized. |
| | No formulas are used. | Formulas and reference cells show errors and do not calculate what is intended | The majority of formulas and reference cells are properly formatted, but some errors or incorrect calculations may be present. | Formulas and reference cells are properly formatted, calculations are correct. |
| | Expected revenue or expenses are omitted from the budget and no comparison between expenses vs. actual expenses are shown. | Expected revenue and expenses and actual revenue and expenses are not represented in their own columns and are difficult to follow within the spreadsheet. | Expected revenue and expenses and actual revenue and expenses are represented in their own columns, but are not easily followed within the spreadsheet. | Expected revenue and expenses and actual revenue and expenses are clearly represented in their own columns and easy to follow within the spreadsheet. |
| | No justification for the budget shortfall or surplus is provided. | An attempt at a justification for the budget shortfall or surplus is provided, but does not provide sufficient detail to explain the discrepancy between expected revenue and expenses vs. actual revenue and expenses | A justification for a budget shortfall or surplus is provided but lacks sufficient detail or provides a weak explanation for the discrepancy between expected revenue and expenses vs. actual revenue and expenses | A detailed justification for a budget shortfall or surplus is provided that clearly explains the discrepancy between expected revenue and expenses vs. actual revenue and expenses |



12.6. Reports and Presentations

12.6.1. The Technical Report, Technical Presentations, and Technical Display will be scored by the respective judges according to the criteria described in detailed scoring rubric in Appendix B.

12.7. Race Day

12.7.1. Fastest Run:

- 12.7.1.1. The Fastest Run for each Team shall be the lesser of the Run times recorded for the Drag Race and Giant Slalom Runs.
- 12.7.1.2. Points will be awarded to any Team that completes at least one of the Drag Race or Giant Slalom Runs. If a Team fails to complete either of the Runs, they will be awarded zero (0) points.
- 12.7.1.3. Points will be allocated based on a Team's Fastest Run time relative to the best and worst overall recorded Run times. The following formula will be used to calculate the points awarded to a Team:

$$P_i = 0.5 + 6.5 \left(\frac{\max(t) - t_i}{\max(t) - \min(t)} \right)$$

- Where P_i is the number of points awarded to Team.
- Where t_i is the fastest time in seconds it took for Team to finish the Run in either Giant Slalom or Drag Race.
- Where $\max(t)$ is the maximum time any Team took to finish either Giant Slalom or Drag Race.
- Where $\min(t)$ is the minimum time any Team took to finish either Giant Slalom or Drag Race.
- For the above calculations, DNF results are ignored. Teams who DNF in both races will receive zero (0) points.

12.7.2. Steering Performance:

- 12.7.2.1. Steering Performance will be judged solely based on a Team's performance in the Giant Slalom race.
- 12.7.2.2. All Teams will have 7 points prior to the start of the Giant Slalom and will be assessed Faults for infractions during the Run. Each Fault will be a loss of points from the total 7, as follows:



- 1.5 Fault for contacting a gate marker, per occurrence.
- 3 Faults for entirely missing a gated area, per occurrence.
- 3.5 Faults for striking the side barrier of the course, per occurrence.

12.7.2.3. Minimum possible score in Steering Performance is zero (0) points.

12.7.2.4. Points are therefore allocated using the following formula:

$$P_i = 7.0 - F_i$$

- Where P_i is the number of points awarded to Team
- Where F_i refers to the summation of Faults of Team

12.7.3. Braking Performance:

12.7.3.1. Braking Performance will be judged for any Run in either the Drag Race or Giant Slalom events. Braking performance will not be judged for any subsequent King of the Hill Runs, though a safe Braking performance is still required to avoid a DNF result.

12.7.3.2. Points may be awarded to any Team that completes at least one of the Drag Race or Giant Slalom Runs. If a Team fails to complete either of the Runs, they will be awarded zero (0) points for braking. Only Runs in which the Braking System is deployed within the Braking Zone will be graded for braking performance.

12.7.3.3. The braking score for any particular Run will be based on a combination of ability of the Toboggan to engage Brakes inside a specified 5m long Braking Zone and the calculated average deceleration of the Toboggan. The Toboggan speed will be recorded at the crossing of the finish line. The stopping distance will be measured from the indentation in the snow where the Brake was first applied to the Brake location in the Toboggan's final resting place. The rate of average deceleration will be calculated for each Run using this information.

12.7.3.4. The following formula will be used to calculate the points awarded to a Team:

$$P_i = 0.5 + 6.5 \left(\frac{A_i - \min(a)}{\max(a) - \min(a)} \right)$$

- Where P_i is the number of points awarded to Team



- Where A_i is the highest average deceleration of the Team's Toboggan during braking in either of the Drag Race or Giant Slalom Runs
- Where $\min(a)$ is the minimum overall average deceleration by any Team
- Where $\max(a)$ is the maximum overall average deceleration by any Team
- The Runs in which a Team does not successfully deploy their Brakes are not considered while calculating $\min(a)$ and $\max(a)$

12.7.4. King of the Hill Tournament:

12.7.4.1. All Teams that participate in the King of the Hill tournament will receive points. Any Team which does not qualify for the King of the Hill tournament will be awarded zero (0) points in this category

12.7.4.2. Teams will receive points based on the following formula:

$$P_i = 1.5 + 7.5 \left(\frac{W_i}{R_{tot}} \right)$$

- Where P_i is the number of points awarded to Team
- Where W_i refers to the number of wins the Team has in the tournament. Note that all "byes" and wins by default are considered wins.
- Where R_{tot} is the number of total elimination rounds in the King of the Hill tournament.

12.8. Safety

12.8.1. Safety documentation will be scored based on the following criteria:

- Job Hazard Analysis (JHA) completed before task execution.
- Field Level Hazard Assessments (FLHA) completed during manufacturing.

12.8.2. Each subcategory of safety of design will be scored based on the following criteria and criteria listed under Section 7.6:

- What dangers, hazards, and failure modes have you identified?
- How will your design effectively mitigate the identified risks and ensure rider safety?



- What additional safety features have you added (if any) to ensure rider safety?

12.8.3. Safety inspection will be scored based on the following criteria:

- Presentation to judges.
- Ability to respond to questions.
- Tilt test results.
- Meets safety criteria for race day.

12.9. Spirit

12.9.1. Spirit will be scored by the Spirit Judges according to the detailed scoring rubric in Appendix B.



13. Awards

The following are the awards that will be presented to Teams during the Closing Ceremonies at the end of the Competition. All awards are allocated based on overall point totals from the Scoring Rubric in Section 12. One award will be given out per category winner, as well as an award for overall highest score, who will be crowned tournament champion. A second and third place runner up for each category will also be announced during the awards ceremony.

Please note: these awards are the category titles as per the Scoring Rubric from Section 12. For a detailed breakdown of how points are allocated in each category, please refer to said section.

- 13.1. First Place, Overall Champion & Recipient of the CSCE Cup:** Awarded to the team with the highest overall score, or any team satisfying two (2) “win by default” clauses outlined in Section 14 of the GNCTR 2023 Official Competition Rules;
- 13.2. Second Place:** Awarded to the Team with the second highest overall score;
- 13.3. Third Place:** Awarded to the Team with the third highest overall score;
- 13.4. GNCTR Excellence in Safety Award:** Awarded to the Team scoring the highest Safety score. Display of safety practices and culture on Race Day will contribute to selection.
- 13.5. Best New Team:** Awarded to the new Team with the best overall score. A “new team” is defined as a team that has never competed at GNCTR before, or has not competed in the most previous in-person year (GNCTR 2023 in Kelowna);
- 13.6. Best Non-Competing Team:** Awarded to the Non-Competing Team with the highest overall non-competing team score, based solely on Race Day performance and spirit;
- 13.7. People’s Choice:** Awarded to the Team that other Teams deem to be the most spirited, fun, innovative and one that enhances the competition for other teams around it. The People’s Choice Award is voted on at the final captain’s meeting prior to Closing Ceremonies;
- 13.8. Most Improved Team:** Awarded to the Team that has competed in the previous GNCTR competitions (GNCTR 2023 and 2024) and posted the greatest overall score improvement from the 2023 competition;



- 13.9. Most Sustainable Team:** Awarded to the team that best demonstrates in their Technical Report and Technical Display how the team was sustainable in both the choice and use of materials in the design process, construction, and disposal of their Toboggan. The award will be based on the sustainability of the following criteria: concrete mix design; ski and/or slab formwork; toboggan frame; toboggan mechanical systems; the team's construction methods; and the team's technical display;
- 13.10. Best Theoretical Toboggan:** Awarded to the Team with the highest Toboggan design score;
- 13.11. Most Innovative Design:** Awarded to the Team with the highest innovation score;
- 13.12. Best Concrete Mix Design:** Awarded to the Team with the highest concrete mix design score;
- 13.13. Best Concrete Reinforcement Design:** Awarded to the Team with the highest concrete reinforcement design score;
- 13.14. Best Geometric Profile and Formwork;** Awarded to the Team with the highest Geometric Profile and Formwork score;
- 13.15. Best Braking Design:** Awarded to the Team with the highest Braking System design score;
- 13.16. Best Steering Design:** Awarded to the Team with the highest Steering System design score;
- 13.17. Most Aesthetically Pleasing Toboggan:** Awarded to the team who the Judges and competitors deem to have designed and built the most aesthetically pleasing Toboggan;
- 13.18. Best Technical Display:** Awarded to the team with the highest Technical Display score based on the informative content of the display, incorporation of the team's theme, and overall aesthetics of the display;
- 13.19. Best Technical Report:** Awarded to the team with the highest Technical Report score;



- 13.20. Best Technical Presentation:** Awarded to the team with the highest Technical Presentation score;
- 13.21. Best Performing Toboggan:** Awarded to the team with the highest Race Day score;
- 13.22. King of the Hill:** Awarded to the team that places first in the King of the Hill tournament on Race Day;
- 13.23. Fastest Run Time:** Awarded to the team with the fastest run time;
- 13.24. Best Braking Performance:** Awarded to the team with the highest braking performance score;
- 13.25. Best Superstructure Frame Design:** Awarded to the Team with the highest Superstructure Frame design score;
- 13.26. Best Team Spirit, and Recipient of the Spirit Cup:** Awarded to the team with the highest overall Team Spirit score;
- 13.27. Best Costumes:** Awarded to the team with the best themed costumes.
- 13.28. ThereMedia Best On-Screen Performance:** Awarded to the Team who is considered to have the best performance captured by the Competition's video production sponsor: ThereMedia.
- 13.29. Additional Awards:**

This Section outlines the additional awards that will be given at the Competition

- 13.29.1. Corporate Awards:** In addition to awards outlined above, several corporate sponsored awards will be available. These awards are judged by the corporate sponsors and are not reflected in any official GNCTR 2023 scores. The criteria and prize associated with each award will be announced by the corporate sponsor later.



13.29.2. Spirit Awards: In addition to the Spirit Cup, the Spirit Judges will be allowed to determine additional Spirit awards. Similar to the Corporate Awards, these will not be reflected in any official GNCTR 2024 scores and the criteria and prize associated will be announced at a later date. Some of these awards will be decided by the Spirit Judges and some of them will be decided via Team voting



14. Win by Default

Any Team may be awarded the title of overall GNCTR Champion if they are able to completely satisfy at least two (2) of the following requirements, hereby causing a “win by default”. Winners by default will be awarded regardless of actual Competition performance.

14.1. Requirements for a Win by Default

- 14.1.1. The Team must successfully transport their Toboggan to one of the producing oil rigs offshore in the Jean D’arc Basin. The Toboggan must be placed on the rig and photographic evidence and a written confirmation signed by the platform’s lead must be provided.
- 14.1.2. The team must purchase, document, and consume Purity Jam Jams in the amount of weight equivalent to the Memorial University of Newfoundland clock tower during Technical Exhibition Day.
- 14.1.3. The Team must train a moose to successfully haul the Team’s toboggan to the top of the Race hill during Race Day and have a successful Run with the following onboard: Buddy the Puffin, Sammy the Seahawk, Rick Mercer and the Premier of Newfoundland and Labrador.
- 14.1.4. The Team must successfully bargain the price of snow crab to be above \$8 per pound. Signed documentation proving your Team is the sole reason for the price increase is required.
- 14.1.5. The team must successfully campaign for Jimmy Fallon to be elected as Mayor of Dildo, Newfoundland & Labrador where he must be dressed as Captain Dildo in his acceptance speech on the wharf. The Team must provide documentation that they were Mr. Fallon’s campaign manager and have written confirmation from the town of Dildo that they have dismissed Jimmy Kimmel as their honorary Mayor and that Mr. Fallon is now their permanent full-time Mayor.



Appendices

Appendix A: Technical Report Requirement Checklist

The following checklist is provided as a courtesy and serves as a summary of the details to include in the Technical Report as per Section 7 – Toboggan Requirements. Teams are encouraged to go above and beyond the list below. The checklist includes but is not limited to:

1. Justifications and calculations to support all design assumptions made.
2. Justification for the towing attachment used on the Toboggan.
3. Final Mix Design composition for the Sliding Surface.
4. Load capacity calculation of the connection between the Superstructure and Sliding Surface.
5. Geometric Profile used to prevent the Toboggan from experiencing yaw rotation.
6. Type and method of ski wax application.
7. Design Calculation for flexural and compressive loading scenarios for the concrete and reinforcement.
8. Design calculations and justification that the Toboggan frame can withstand a front, rear, side or roll-over impact cases.
9. Design calculations and justification that the braking system can withstand braking forces.
10. Design calculations and justification that the ski mounts can withstand dynamic race forces.
11. Design calculations and justification that the steering system can withstand dynamic race forces, turning forces, and rider input torque.
12. Proof that the Toboggan is capable of safely bringing the Toboggan to a stop within the braking zone at the design speed.
13. Proof that the portion of the braking system creating the stopping force is located behind the Toboggan's center of gravity.
14. Explanation of the limiter device or design used to prevent oversteer of the Toboggan along with the maximum angle of turn.
15. Justification for any additional systems included on the Toboggan.
16. Construction photographs of the Toboggan.
17. Justification of the integrity for all connections, fasteners, and welds.
18. Profession Welders license number (if applicable).
19. Securement method for the enclosure around the Superstructure of the Toboggan.
20. Design calculations and justification for the mitigation of an overturning moment of the Toboggan.

Appendix B: Detailed Scoring Rubric

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|------------------------------------------------------------------|---------------------|----------------|-------------|
| Toboggan Design | | | |
| a. Concrete Design | | | |
| i. Concrete Mix | | | |
| 1. Design Justification | 33 | 1 | |
| 2. Accuracy and Quality of Calculations | 33 | 1 | |
| 3. Construction and Execution of Design | 33 | 1 | |
| Sub-Category Total: Concrete Mix | | | /3.0 |
| ii. Concrete Reinforcement and Connection | | | |
| 1. Design Justification | 33 | 1 | |
| 2. Accuracy and Quality of Calculations | 33 | 1 | |
| 3. Construction and Execution of Design | 33 | 1 | |
| Sub-Category Total: Concrete Reinforcement and Connection | | | /3.0 |
| iii. Geometric Profile and Formwork | | | |
| 1. Design Justification | 33 | 0.66 | |
| 2. Accuracy and Quality of Calculations/Procedures | 33 | 0.66 | |
| 3. Construction and Execution of Design | 33 | 0.66 | |
| Sub-Category Total: Geometric Profile and Formwork | | | /2.0 |
| Category Total: Concrete Design | | | /8.0 |
| b. Superstructure Design | | | |
| i. Frame | | | |
| 1. Design Justification | 33 | 1.66 | |
| 2. Accuracy and Quality of Calculations | 33 | 1.66 | |
| 3. Construction and Execution of Design | 33 | 1.66 | |

| | | | |
|----------------------------------------------|----|------|--------------|
| Sub-Category Total: Frame | | | /5.0 |
| ii. Braking System | | | |
| 1. Design Justification | 33 | 1.66 | |
| 2. Accuracy and Quality of Calculations | 33 | 1.66 | |
| 3. Construction and Execution of Design | 33 | 1.66 | |
| Sub-Category Total: Braking System | | | /5.0 |
| iii. Steering System | | | |
| 1. Design Justification | 33 | 1.66 | |
| 2. Accuracy and Quality of Calculations | 33 | 1.66 | |
| 3. Construction and Execution of Design | 33 | 1.66 | |
| Sub-Category Total: Steering System | | | /5.0 |
| Category Total: Superstructure Design | | | /15.0 |
| c. Innovation | | | |
| i. Innovation in Concrete Running Surface | 25 | 1.0 | |
| ii. Innovation in Frame Design | 25 | 1.0 | |
| iii. Innovation in Brake Design | 25 | 1.0 | |
| iv. Innovation in Steering Design | 25 | 1.0 | |
| Category Total: Innovation | | | /4.0 |
| d. Aesthetics | | | |
| i. Team Captains Communal Vote | 75 | 1.5 | |
| ii. Organizing Committee Communal Vote | 25 | 0.5 | |
| Category total: Aesthetics | | | /2.0 |
| e. Sustainability | | | |
| i. Environmental Impact of Materials | 40 | 0.8 | |
| ii. Manufacturing Sustainably | 40 | 0.8 | |
| iii. End of Life Toboggan Use | 20 | 0.4 | |
| Category Total: Sustainability | | | /2.0 |
| f. Toboggan Weight Accuracy | | | |



| | | | |
|-------------------------------------------------------|-----|---|--------------|
| i. Accuracy of Physical Weight vs. Theoretical Weight | 100 | 1 | |
| Category Total: Toboggan Weight Accuracy | | | /1.0 |
| Toboggan Design Total | | | /32.0 |

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|---------------------------------|----------------------------|-----------------------|-------------------|
| Project Management | | | |
| a. Schedule | | | |
| i. Schedule report discussion | 25 | 0.25 | |
| ii. Schedule KPI Audit Rubric | 75 | 0.75 | |
| Category Total: Schedule | | | /1.0 |
| b. Budget | | | |
| i. Budget Performance | 75 | 0.75 | |
| ii. Budget Report | 25 | 0.25 | |
| Category Total: Budget | | | /1.0 |
| Project Management Total | | | /2.0 |

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|---------------------------------------------------------------------|----------------------------|-----------------------|-------------------|
| Reports and Presentations | | | |
| a. Technical Report | | | |
| i. Conciseness and Clarity of Technical Language | 30 | 1.8 | |
| ii. Effective use of Graphics, Tables Figures and Appendices | 30 | 1.8 | |
| iii. Completeness and Clearness of Calculations and Design Drawings | 30 | 1.8 | |
| iv. Report Formatting | 10 | 0.6 | |



| | | | |
|-----------------------------------------------------------------|------|------|--------------|
| Category Total: Technical Report | | | /6.0 |
| b. Technical Presentations | | | |
| i. Conciseness and Clarity of Technical Language | 22.5 | 0.9 | |
| ii. Effective use of Graphics, Tables Figures and Appendices | 22.5 | 0.9 | |
| iii. Oral Presentation (Preparation Level, Confidence, Clarity) | 22.5 | 0.9 | |
| iv. Response to Questions from Judges | 22.5 | 0.9 | |
| v. Professionalism | 10 | 0.4 | |
| Category Total: Technical Presentations | | | /4.0 |
| c. Technical Display | | | |
| i. Display of Technical Content (Tech Ex Judge) | 25 | 1.75 | |
| ii. Presentation to Judges (Tech Ex Judge) | 25 | 1.75 | |
| iii. Visual Appeal (Spirit Judges) | 25 | 1.75 | |
| iv. Incorporation of Theme (Spirit Judges) | 25 | 1.75 | |
| Category Total: Technical Display | | | /7.0 |
| Reports and Presentations Total | | | /17.0 |

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|---------------------------------------|----------------------------|-----------------------|-------------------|
| Race Day | | | |
| a. Fastest Run | | | |
| i. Calculated as per Section 12.7.1.3 | 100 | 7 | |
| Category Total: Fastest Run | | | /7.0 |



| | | | |
|---------------------------------------------|-----|---|--------------|
| b. Steering Performance | | | |
| i. Calculated as per Section 12.7.2.4 | 100 | 7 | |
| Category Total: Steering Performance | | | /7.0 |
| c. Braking Performance | | | |
| i. Calculated as per Section 12.7.3.4 | 100 | 7 | |
| Category Total: Braking Performance | | | /7.0 |
| d. King of the Hill | | | |
| i. Calculated as per Section 12.7.4.2 | 100 | 9 | |
| Category Total: King of the Hill | | | /9.0 |
| Race Day Total | | | /30.0 |

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|--------------------------------------------------------------------|----------------------------|-----------------------|-------------------|
| Safety | | | |
| a. Safety Reports | | | |
| i. Report Deliverables (see section 6.4) | 30 | 0.6 | |
| ii. Conciseness and Clarity of Technical Language | 20 | 0.4 | |
| iii. Effective use of Graphics, Tables Figures and Appendices | 20 | 0.4 | |
| iv. Completeness and Clearness of Calculations and Design Drawings | 20 | 0.4 | |
| v. Report Formatting | 10 | 0.2 | |
| Category Total: Safety Reports | | | /2.0 |
| b. Safety Documentation | | | |
| i. Field Level Hazard Assessments (FLHAs) | 50 | 1.0 | |
| ii. Job Hazard Analysis (JHA) | 50 | 1.0 | |



| | | | |
|---------------------------------------------|----|------|-------------|
| Category Total: Safety Documentation | | | /2.0 |
| c. Safety Design | | | |
| i. Frame | 25 | 0.75 | |
| ii. Brakes | 25 | 0.75 | |
| iii. Steering | 25 | 0.75 | |
| iv. Sliding Surface | 25 | 0.75 | |
| Category Total: Safety Design | | | /3.0 |
| d. Safety Inspection | | | |
| i. Presentation to Judges | 15 | 0.3 | |
| ii. Ability to Respond to Questions | 15 | 0.3 | |
| iii. Tilt Test Results | 20 | 0.4 | |
| iv. Meets Safety Criteria for Racing | 50 | 1.0 | |
| Category Total: Safety Inspection | | | /2.0 |
| Safety Total | | | /9.0 |

| Overall Team Score | Criteria Weight (%) | Weighted Score | Team Score |
|--------------------------------------------------|----------------------------|-----------------------|-------------------|
| Team Spirit | | | |
| a. Planned Spirit Activities | | | |
| i. Costumes | 20 | 1 | |
| ii. Opening Ceremonies Spirit Presentation | 20 | 1 | |
| iii. Pre-Competition Spirit Challenges | 10 | 0.5 | |
| iv. Competition Spirit Challenges | 10 | 0.5 | |
| v. Technical Exhibition Spirit Presentation | 20 | 1 | |
| vi. Theme Execution and Cohesion | 20 | 1 | |
| Category Total: Planned Spirit Activities | | | /5.0 |
| b. Vibes | | | |
| i. Team Participation | 100 | 5 | |
| Category Total: Vibes | | | /5.0 |
| Team Spirit Total | | | /10.0 |



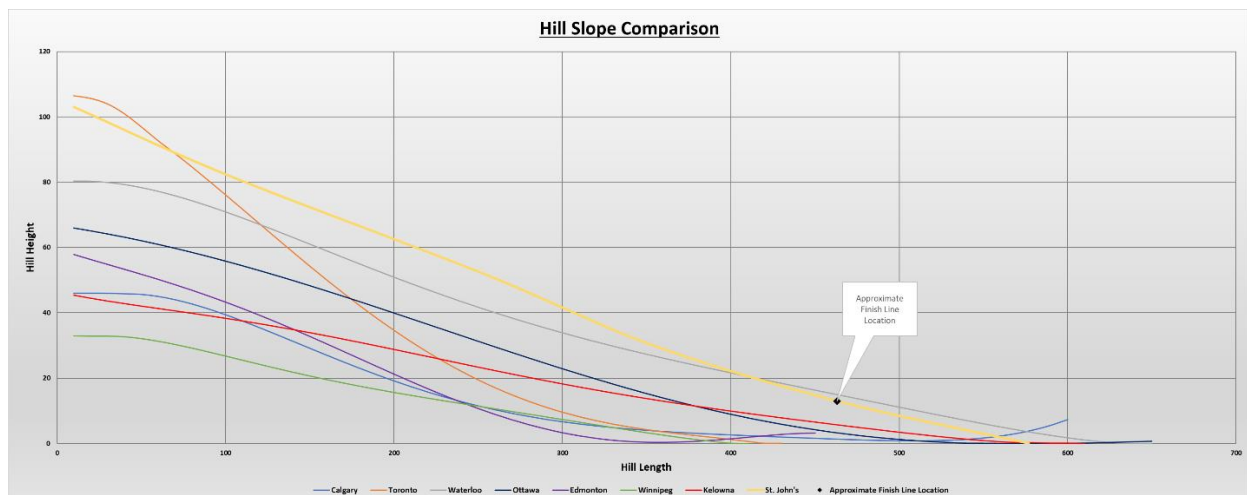
Appendix C: Hill Information

Disclaimer: The following information is intended to be used as reference material and may not reflect the actual conditions during the competition. The layout, length, and width may vary depending on winter site conditions. The GNCTR 2024 Organizing Committee reserves the right to modify the venue or layout at any time providing adequate justification.

General Information:

The 2024 GNCTR Competition will be conducted in St. John's, NL. Race day events will be held at White Hills Resort in Clarenville, NL on a designated ski slope. Amenities such as tents, heaters, and seating will be available for competitors throughout the day. Washrooms are located near the tube hill in the lodge, but additional facilities may be placed for the event. Historical weather patterns suggest the weather should range between 0 to -10 degrees Celsius however competitors should view the weather prior to the event and pack accordingly. White Hills will be at full operation during Race Day. Safety barriers and anything else required to delineate between GNCTR Race Day operations and White Hills operations will be in place. All participants of Race Day must adhere to all safety protections implemented or may be subject to point deduction and/or removal from Race Day.

Hill Slope:



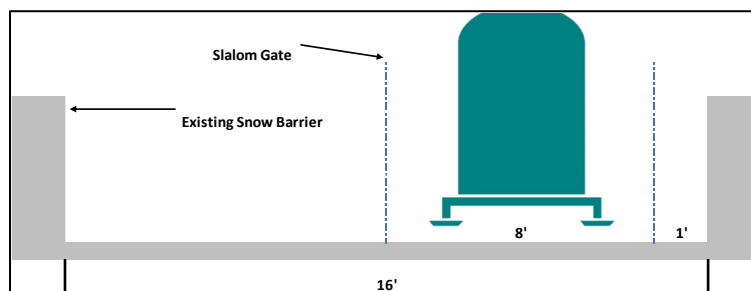
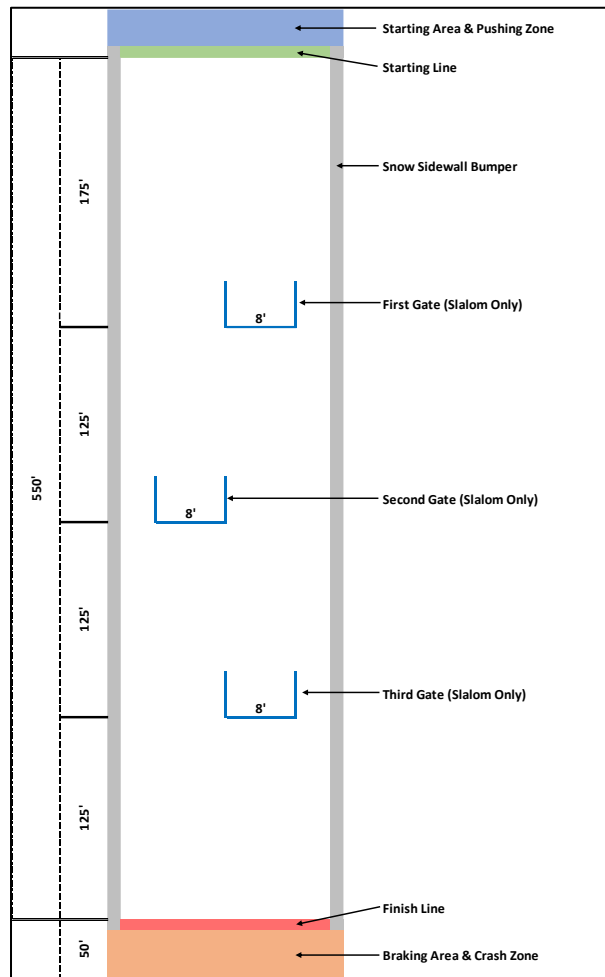
Overall Layout:

The following image reflects the anticipated overall site locations. Toboggans will be unloaded prior to team arrival in the storage area. Only members required for assembly should make their way to this area after unloading the bus. A volunteer will be present there and can be contacted for crate locations and assist if any unforeseen issues arise. The remaining team members can proceed to the lodge for a light snack and hot drink.



Slalom Layout:

The following figures reflect the anticipated slalom gate distances however measurements may change based on snow conditions. Gates will be placed to highlight the lateral movement of the toboggan with an adequate safety factor for corrections. The Organizing Committee would like to test the steering capabilities of the toboggan and may adjust the width of the gates and distances between them to encourage sharper turning.





Appendix D: Schedule KPI Audit Rubric

| KPI Audit Rubric | Weight | Score | Team Score |
|---------------------------------------------------------------|--------|-------|------------|
| 2=Correct/NA, 1=Needs Improvement, 0=Missing/Incorrect | | | |
| Schedule Presentation | | | /8 |
| Project Name and Schedule in Center Header | 0.5 | /2 | |
| Team Logo in Right Header, OC Logo in Left Header | 0.5 | /2 | |
| Date, Revision, Page number in Footer | 0.5 | /2 | |
| Team Name in footer | 0.5 | /2 | |
| Project Start/Finish, Duration, BL in Footer | 0.5 | /2 | |
| Progress Layout - BL Start, BL Finish, BL Variance | 0.5 | /2 | |
| Gantt Chart - Critical Path, Baseline, Data Dates are Correct | 0.5 | /2 | |
| Time Scale - weeks/months are correct | 0.5 | /2 | |
| Project Baseline | | | /16 |
| Correct Baseline Imported | 2 | /2 | |
| Is Original Backup Baseline Saved | 2 | /2 | |
| Gantt Chart Links Through Actual not Baseline | 2 | /2 | |
| Appropriate Level of Detail (4 week max duration) | 2 | /2 | |
| Critical Path | | | /30 |
| Critical Path is Displayed in Red | 3 | /2 | |
| Competition is Linked to Critical Path | 3 | /2 | |
| CP is Correct, Longest Path or Total Float equals 0 days | 3 | /2 | |

| | | | |
|-------------------------------------------------------------------------------------------|---|----|------------|
| Cp is at a Minimum from the first task to the last task | 3 | /2 | |
| No Lag on the Critical Path | 3 | /2 | |
| Project Milestones | | | /8 |
| Key Milestones are Displayed at top of schedule | 1 | /2 | |
| Milestones are Linked to main Body of Schedule | 1 | /2 | |
| Correct Milestone Type Shown (Start/Finish) | 1 | /2 | |
| Correct Linkage to Main Body (FF/SS) | 1 | /2 | |
| Preconstruction/Procurement | | | /6 |
| Date of Contract Award (Rules Issued) | 1 | /2 | |
| Design Development Shown | 1 | /2 | |
| Construction Drawings Issued (=Can be done in Phases is applicable) | 1 | /2 | |
| Calendars | | | /12 |
| Appropriate Calendars Imported into Project (I.E Academic Calendar for Teams Institution) | 2 | /2 | |
| Appropriate Calendar Assigned to Activities | 2 | /2 | |
| Default Calendar set to Project Calendar | 2 | /2 | |
| Schedule Logic | | | /60 |
| No Constraint used | 6 | /2 | |
| Long Lags used (4 weeks and greater) | 6 | /2 | |
| Tasks have Correct multiple Predecessors | 6 | /2 | |
| Tasks have Correct Multiple Successors | 6 | /2 | |
| Milestones Linked Correctly | 6 | /2 | |



| Progress Accuracy | | | /36 |
|-------------------------------------------------|---|----|------------|
| The Schedule Has Been Progressed | 2 | /2 | |
| Durations Updated as Schedule Progress | 2 | /2 | |
| Baseline Updated if Required | 2 | /2 | |
| Links Updated as Schedule Progresses | 2 | /2 | |
| Each Progress has been saved separately | 2 | /2 | |
| Milestones have been Progressed | 2 | /2 | |
| Actual Dates are Accurate and not in the Future | 2 | /2 | |
| Remaining Durations have been updated | 2 | /2 | |
| Data Date is Correct | 2 | /2 | |



Appendix E: Budget

University of _____ Concrete Toboggan Team Budget 2024

TO DATE AS OF YYYY/MM/DD
PREPARED BY: _____

Project Budget for GNCTR 2024 : EXPENSES

| Administration & Finance | 2024 Estimated | 2024 Actual |
|--------------------------|-----------------|-----------------|
| Courrier fees | \$50 | \$32 |
| Printing | \$200 | \$209 |
| Registration | \$8,250 | \$8,250 |
| Sponsor thank-you gifts | \$250 | \$250 |
| Team meals | \$100 | \$134 |
| Team wear | \$1,200 | \$1,162 |
| Total | \$10,050 | \$10,036 |

| Concrete | 2024 Estimated | 2024 Actual |
|-----------------------|----------------|--------------|
| Mix materials | \$75 | \$72 |
| Ski form construction | \$240 | \$268 |
| Wax | \$110 | \$100 |
| Total | \$425 | \$439 |

| Events | 2024 Estimated | 2024 Actual |
|---------------|----------------|--------------|
| Events cost 1 | \$80 | \$72 |
| Events cost 2 | \$30 | \$28 |
| Events cost 3 | \$50 | \$48 |
| Events cost 4 | \$150 | \$152 |
| Events cost 5 | \$90 | \$90 |
| Total | \$400 | \$390 |

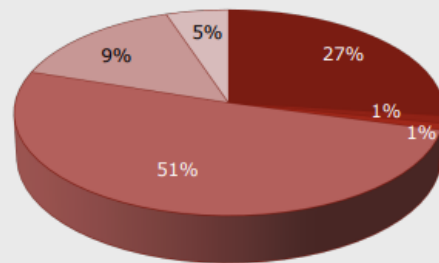
| Logistics | 2024 Estimated | 2024 Actual |
|----------------|-----------------|-----------------|
| Accommodations | \$6,000 | \$5,267 |
| Shipping | \$1,700 | \$1,539 |
| Travel | \$12,000 | \$12,072 |
| Total | \$19,700 | \$18,878 |

| Superstructure | 2024 Estimated | 2024 Actual |
|-----------------------|----------------|----------------|
| Brake materials | \$200 | \$150 |
| Flooring | \$45 | \$25 |
| Frame materials | \$1,000 | \$975 |
| Siding | \$400 | \$400 |
| Ski mount materials | \$50 | \$5 |
| Steering materials | \$100 | \$125 |
| Paint | \$130 | \$130 |
| Welding and shop fees | \$4,500 | \$3,700 |
| Total | \$6,425 | \$5,510 |

| Technical Interaction | 2024 Estimated | 2024 Actual |
|--------------------------------------|----------------|----------------|
| Costumes | \$700 | \$683 |
| Crate/technical display construction | \$350 | \$340 |
| Paint | \$75 | \$65 |
| Patches | \$525 | \$533 |
| Props | \$100 | \$65 |
| Spirit | \$250 | \$235 |
| Total | \$2,000 | \$1,920 |

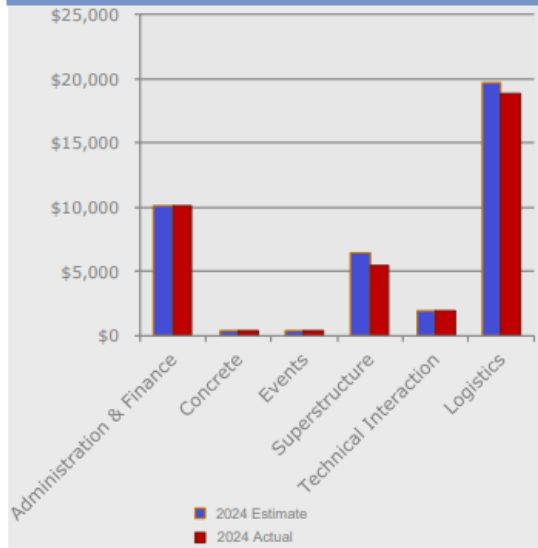
| Total Expenses | 2024 Estimated | 2024 Actual |
|----------------|-----------------|-----------------|
| | \$39,000 | \$37,173 |

Actual Cost Breakdown



■ Administration & Finance ■ Concrete
■ Events ■ Logistics
■ Superstructure ■ Technical Interaction

Estimated vs. Actual





University of _____ Concrete Toboggan Team Budget 2024

TO DATE AS OF YYYY/MM/DD
PREPARED BY: _____

Project Budget for GNCTR 2024 : INCOME

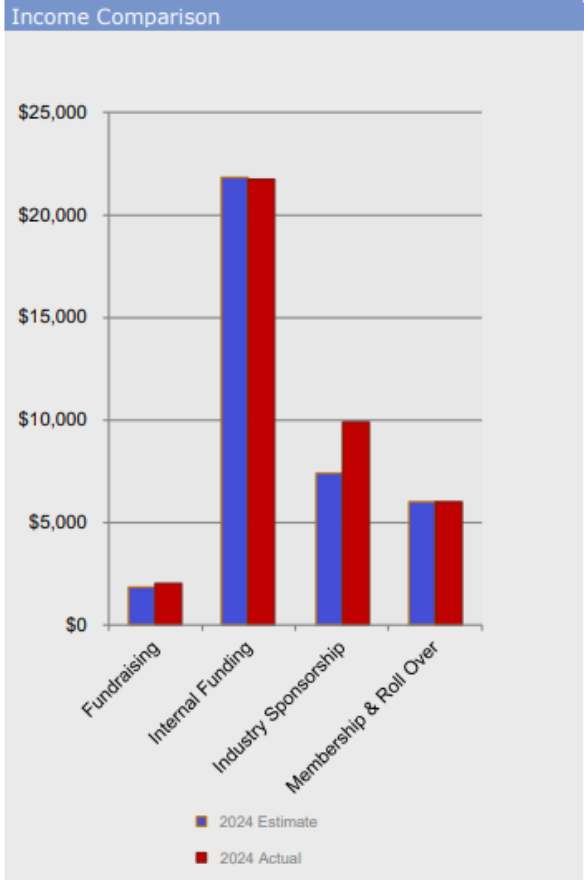
| Fundraising | 2024 Estimated | 2024 Actual |
|---------------------|----------------|----------------|
| Fundraising event 1 | \$500 | \$252 |
| Fundraising event 2 | \$800 | \$1,078 |
| Fundraising event 3 | \$500 | \$700 |
| Total | \$1,800 | \$2,030 |

| Internal Funding | 2024 Estimated | 2024 Actual |
|----------------------|-----------------|-----------------|
| University funding 1 | \$5,340 | \$5,267 |
| University funding 2 | \$2,000 | \$2,000 |
| University funding 3 | \$14,500 | \$14,500 |
| Total | \$21,840 | \$21,767 |

| Industry Sponsorship | 2024 Estimated | 2024 Actual |
|----------------------|----------------|----------------|
| Sponsor 1 | \$500 | \$500 |
| Sponsor 2 | \$250 | \$0 |
| Sponsor 3 | \$1,000 | \$500 |
| Sponsor 4 | \$500 | \$0 |
| Sponsor 5 | \$250 | \$0 |
| Sponsor 6 | \$500 | \$500 |
| Sponsor 7 | \$500 | \$500 |
| Sponsor 8 | \$500 | \$3,000 |
| Sponsor 9 | \$500 | \$670 |
| Sponsor 10 | \$600 | \$1,000 |
| Sponsor 11 | \$1,000 | \$1,500 |
| Sponsor 12 | \$250 | \$250 |
| Sponsor 13 | \$1,000 | \$1,500 |
| Total | \$7,350 | \$9,920 |

| Membership & Roll Over | 2024 Estimated | 2024 Actual |
|--------------------------|----------------|----------------|
| Membership & Roll Over 1 | \$1,000 | \$1,000 |
| Membership & Roll Over 2 | \$5,000 | \$5,000 |
| Total | \$6,000 | \$6,000 |

| Total Income | 2024 Estimated | 2024 Actual |
|--------------|-----------------|-----------------|
| | \$36,990 | \$39,717 |





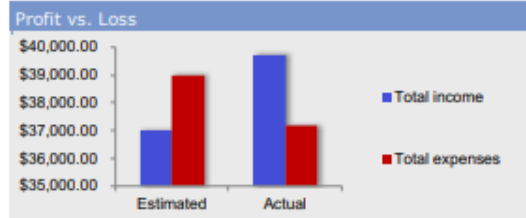
University of _____
 Concrete Toboggan
 Team Budget 2024

TO DATE AS OF YYYY/MM/DD
 PREPARED BY: _____

Project Budget for GNCTR 2024 : PROFIT/LOSS SUMMARY

| | Estimated | Actual |
|----------------|-------------|-------------|
| Total income | \$36,990.16 | \$39,716.89 |
| Total expenses | \$39,000.00 | \$37,173.11 |

| Total profit (or loss) | |
|------------------------|---------------------------------------|
| | (\$2,009.84) \$2,543.78 |

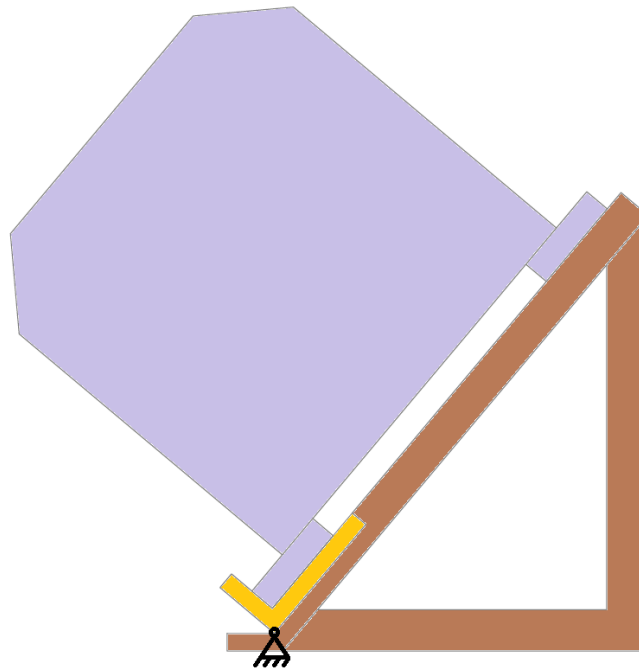




Appendix F: Tilt Test

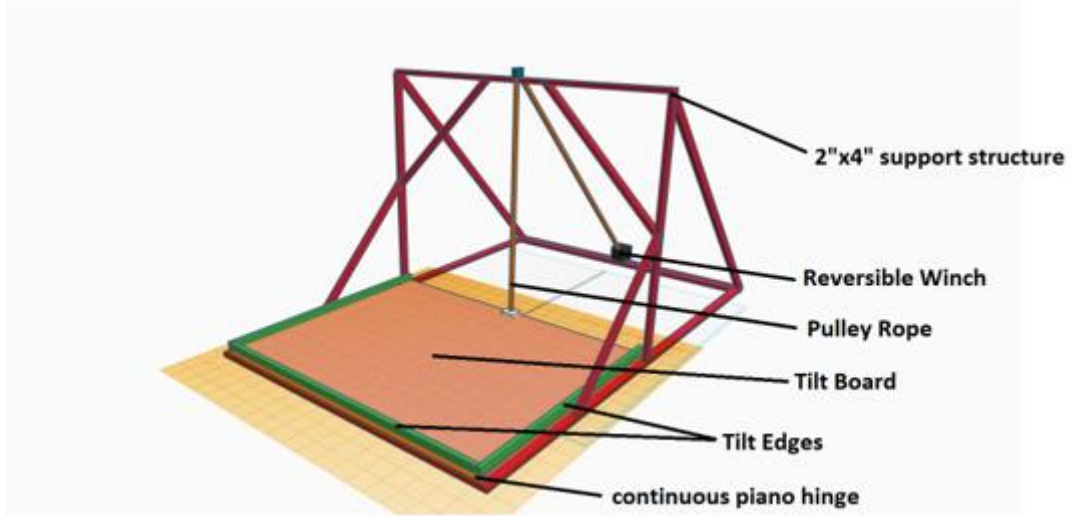
Each sled will be placed sideways on a 50 deg angled slope (depicted below) to test the capability of the sled to resist an overturn moment.

The sled will not have riders in it during the test. All concrete running surfaces must be attached at the time of the Static Tilt, attachment methods must be the same as those intended to be used for racing. If teams have multiple concrete designs or racing configurations, all variations must be displayed. Teams must provide center of gravity information for each configuration. The configuration to be tested will be determined by the judges.



The orange section will be able to rotate freely in the overturn direction. Safety straps will secure the sled so it is unable to fall. Any lifting of the uphill ski will result in a test failure and the sled will be deemed unsafe. Unsafe sleds will not be allowed to compete in dynamic events.

Please see figure below for a drawing of the tilt tester.





Appendix G: Safety Inspection Checklist

Safety Inspection Checklist

Filled out by: _____

School name: _____

This checklist provides key elements of the GNCTR 2024 Official Competition Rules regarding toboggan design requirements. All Toboggans MUST pass this checklist in order to be allowed to race. However, Safety Judges may require additional safety features as they deem necessary that are not outlined in this checklist to allow for any Toboggan to race.

| Feature | Y | N | Notes |
|--------------------------------------------------------|---|---|-------------------------------|
| Weight under 350lbs at heaviest configuration (7.1.1) | | | Heaviest weight in lbs: _____ |
| Accommodates 5 riders (7.1.2) | | | |
| Towing eyebolt exists (7.1.3) | | | |
| Towing eyebolt is secured (7.5.4) | | | |
| Towing eyebolt diameter >50mm (7.1.3) | | | |
| Roll cage exists (7.3) | | | |
| Sliding surfaces are concrete (7.2.1) | | | |
| Braking system deploys (7.4.1) | | | |
| Braking system touches the ground (7.4.1) | | | |
| Brakes behind CoG (7.4.1.2) | | | |
| No brake force on operator (7.4.1.4) | | | |
| Steering exists (7.4.2.1) | | | |
| Steering limiter exists (7.4.2.2) | | | |
| Weld quality passes visual check (7.5.5) | | | |
| Distance b/w head w/ helmet and roll cage >2in (7.6.2) | | | |
| Toboggan is enclosed (7.6.3) | | | |
| Seating has no protrusion (7.6.4) | | | |
| Foam padding all around (7.6.6) | | | |
| Hand grips (7.6.7) | | | |
| If has seats, mounting points are secured | | | |
| If has seats, restrains exist and are secured | | | |
| Riders can exit independently (7.6.9) | | | |
| Serious crash egress strategy (7.6.11) | | | |
| 50 degree tilt test (8.4) | | | |
| Helmet certification check (10.2.2) | | | |
| Team has 6 x bit guards (10.2.3) | | | |

Additional safety features required:

CONCLUSION:

| PASS | FAIL | REVISIT (time permitting) |
|-------------|-------------|-------------------------------------|
| | | |



Appendix H: Hazard Analysis Forms



JOB HAZARD ANALYSIS (JHA)

| | | | | |
|---------------------------|---------------------------|------------|-------------|--------------------------|
| Created by: | Name | JHA Title: | Title | Date Created: YYYY-MM-DD |
| Version Rev'd / App'd by: | Reviewed by / Approved by | | Role Title: | Title / Title |
| Project Manager: | Name | | | |

| | | |
|-------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------|
| Required PPE • | Specialty PPE (if required) • | Pre-Task Requirements: • Review of JHA • Workers to complete FLHA card / Foreman to review and sign-off |
|-------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------|

| Level | Likelihood | Description |
|-------|----------------|-------------------------------------------------|
| 1 | Rare | Not expected to occur but still possible. |
| 2 | Remote | Not likely to occur under normal circumstances. |
| 3 | Occasional | Possible or known to occur. |
| 4 | Frequent | Common occurrence. |
| 5 | Almost Certain | Continual or repeating experience. |

| | | SEVERITY: | | | | | | |
|-----------------------|------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------|
| | | Consequence Risk Matrix | | | | | | |
| | | Regimes | Health and Safety | Environmental Impacts | Financial and Asset Loss | Reputation Damage | Production/ Projects | Information Technology |
| Potential Consequence | Catastrophic (5) | Minor or more fatalities, irreversible health problems for employees and/or community | Minor or off-site spill causing groundwater pollution, with potential long-term effects | Major financial loss or asset cost impact. (>\$2 million but < \$5 million) | Regional loss of reputation/damaging national TV exposure with impact on customers | Indefinite cessation of production and/or operational downtime with permanent loss of critical data integrity | System failure and operational downtime, with loss of critical data integrity and/or confidentiality | |
| | Major (4) | Partial or medium-term disabilities with major health problems for employees | On-site release, contained with medium-term effects on community health and/or ground water | Major financial loss or asset cost impact. (>\$1 million but < \$2 million) | National loss of reputation/damaging national TV exposure with impact on customers | Long term production outback (project) schedule slip of 60-75% of plan | System failure and operational downtime, with loss of critical data integrity and/or confidentiality | |
| | Moderate (3) | Lost time injuries or potential medium-term health problems for employees | On-site release contained and retained with medium-term effects on employees/groundwater | Moderate financial loss or asset cost impact. (>\$100,000 but < \$1 million) | Regional loss of reputation/damaging regional TV and newspaper reports with impact on customers | Medium term production outback (project) schedule slip of 20-30% of plan | System downtime with operational impact, reduced loss of data integrity and/or confidentiality | |
| | Minor (2) | Minor, very short-term injuries or recordable injury cases | On-site release, immediately contained and retained with short-term effects | Tolerable financial loss or asset cost impact. (>\$10,000 but < \$100,000) | Loss of regional reputation by word of mouth regarding safety performance or behavior of workers | Short term production outback (project) schedule slip of 10-20% of plan | Limited downtime recoverable data loss with limited operational impact and no security breach | |
| | Negligible (1) | Infinitely safe, unlikely to cause health problems | Minor localized spill with insignificant effects on employees and/or community | Relatively low financial loss or asset cost impact. (<\$10,000) | Uncharacterized rumors with slight to moderate impact on reputation | Very short term production outback (project) schedule slip of <10% of plan | Limited downtime recoverable data loss, Workaround possible and no security breach | |



JOB HAZARD ANALYSIS (JHA)

RISK MATRIX

| Likelihood/Severity | Rare (1) | Remote (2) | Occasional (3) | Frequent (4) | Almost Certain (5) |
|---------------------|-------------|---------------|-------------------|-----------------|-----------------------|
| Catastrophic (5) | 5 | 10 | 15 | 20 | 25 |
| Major (4) | 4 | 8 | 12 | 16 | 20 |
| Moderate (3) | 3 | 6 | 9 | 12 | 15 |
| Minor (2) | 2 | 4 | 6 | 8 | 10 |
| Negligible (1) | 1 | 2 | 3 | 4 | 5 |

ACTIONS FOR RISK LEVELS

| Risk Level | Risk Acceptability | Recommended Actions |
|---------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Risk | Acceptable | <ul style="list-style-type: none"> No additional risk controls may be needed. Frequent review and monitoring of hazards to ensure risk level is accurate and doesn't increase. |
| Moderate Risk | Tolerable | <ul style="list-style-type: none"> Management attention is required. A careful evaluation of hazards should be carried out to ensure risk level is as low as reasonably practicable. Interim control measures may be implemented while longer term measures are being established. |
| High Risk | Not Acceptable | <ul style="list-style-type: none"> Management review is required before work may commence. High level risk must be reduced before work may commence. |

| NO. | TASK SEQUENCE | HAZARDS | RATING W/O CONTROLS | CONTROLS TO REDUCE OR ELIMINATE HAZARD (Engineering, Administrative, PPE) | RATING W/ CONTROLS |
|-----|---------------|---------|---------------------------|------------------------------------------------------------------------------|--------------------------|
| 1. | | • | 1 | • | 1 |
| 2. | | • | 2 | • | 2 |
| 3. | | • | 3 | • | 3 |
| 4. | | • | 4 | • | 4 |
| 5. | | • | 5 | • | 5 |
| 6. | | • | 6 | • | 6 |
| 7. | | • | 10 | • | 7 |
| 8. | | • | 15 | • | 8 |
| 9. | | • | 20 | • | 9 |
| 10. | | • | 25 | • | 10 |

Note: If at any point any unforeseen hazard presents itself the supervisor shall halt the work until a decision is made on how to proceed safely.



Field Level Hazard Assessment (FLHA)

Date:

Name:

Site Location:

Work Area:

| Weather | | Emergency Information | | | |
|------------------------------------|----------|--------------------------------------------|----------|----------------------------------|----------|
| Temperature: | | Emergency Contact Name: | | First Aid Kit Location: | |
| Wind: | | Emergency Contact Phone #: | | Fire Extinguisher Location: | |
| Precipitation: | | Primary Communication Method: | | Eye Wash Location: | |
| Supporting Documentation | | Pre-Job Checklist | | | |
| Lock Out Tag Out (LOTO) | YES / NO | Are we working on the right component? | YES / NO | | |
| Job Hazard Analysis (JSA) | YES / NO | Are we competently trained for the task? | YES / NO | | |
| Standard Operating Procedure (SOP) | YES / NO | Do we have all the correct tools required? | YES / NO | | |
| Confined Space Permit | YES / NO | Do we have all the required materials? | YES / NO | | |
| Hot Work Permit | YES / NO | | | | |
| Potential Hazards | | | | | |
| Human Factors | | Environmental Hazards | | Tool Hazards | |
| Distracted | YES / NO | Excessive heat / heat stress | YES / NO | Excessive loud noises | YES / NO |
| Rushing | YES / NO | Excessive cold / hypothermia | YES / NO | Rotating tools | YES / NO |
| Frustrated | YES / NO | Wildlife encounters | YES / NO | Cutting tools | YES / NO |
| Complacent | YES / NO | Spills into sensitive area | YES / NO | Dust / vapours / fumes | YES / NO |
| Work scope understood | YES / NO | Slippery conditions / snow / ice | YES / NO | Hazardous chemicals | YES / NO |
| | YES / NO | Poor lighting / visibility | YES / NO | GFCI protected power tools | YES / NO |
| | | | | | |
| Ergonomic Hazards | | Job Site Hazards | | Equipment Hazards | |
| Heavy manual lifting | YES / NO | Other crews working in area | YES / NO | Clear communication / spotter | YES / NO |
| Repetitive motion | YES / NO | Energized or pressurized equipment | YES / NO | Unobstructed view of area | YES / NO |
| Awkward body position | YES / NO | Hot surfaces / steam / extreme cold | YES / NO | Aerial work platform | YES / NO |
| Pinch points | YES / NO | Dropped objects / overhead work | YES / NO | Crane or other lifting equipment | YES / NO |
| Crush points | YES / NO | Interactions with the public | YES / NO | Overhead lines | YES / NO |
| Uneven/elevated work surface | YES / NO | | YES / NO | Steep grades | YES / NO |
| | | | | | |



Field Level Hazard Assessment (FLHA)

List all tasks that are planned for the work shift, any hazards that arise from these tasks, and the implemented control measures to mitigate this hazards.

| Job Tasks | Specific Hazards | Control Measures | | |
|-------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------|----------------------------|-----------------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Names of workers involved in these tasks, must understand and agree to hazards and mitigations above. | | | | |
| Name | Signature | Name | Signature | |
| 1 | | 7 | | |
| 2 | | 8 | | |
| 3 | | 9 | | |
| 4 | | 10 | | |
| 5 | | 11 | | |
| 6 | | 12 | | |
| Did any incidents occur during the shift? | YES / NO | Are tools and materials stored securely? | YES / NO | List remaing hazards: |
| Who were the incidents reported to: | | Are there any hazards left at job site? | YES / NO | |
| Foreman name | Signature (start of shift) | Foreman Name | Signature (Close of shift) | |
| | | | | |
| Audit of FLHA | Auditor Name: | Needs Improvement / Good / Excellent | | |