



RoboCup Junior Tasmania

Guide to Rescue



This document is only a Guide to the National rules produced by members of the Tasmanian RoboCup Junior committee to assist competitors.

2009

A terrible earthquake has hit the city and caused a large chemical storage unit to rupture spilling thousands of litres of toxic chemicals in the centre of the city. There is a person trapped on a sinking water tank in the middle of the chemical spill. Rescue crews are having trouble entering the city with the amount of rubble around and rescue from the air has also been ruled out due to the noxious gases rising around the city.

It has been decided that the best form of rescue is the deployment of an autonomous robot that can navigate to the scene and rescue the stranded person by getting the water tank out of the chemical spill.

On the way the robot could encounter obstacles, bridges and short cut opportunities that will challenge the most intrepid programmer.

This Guide is provided by Robotics Tasmania to help teams prepare for the RoboCup Junior Tasmanian (RCJT) Rescue and Premier Rescue competitions. It summarises, but is not intended to replace, the official RCJA Rescue and Premier Rescue Rules (see www.robocupjunior.org.au for more details).

Note: An asterisk (*) indicates a modification of the national RCJA rules to suit the Tasmanian competition.

The mission: Rescue and Premier Rescue

In both *Rescue* and *Premier Rescue*, your team's mission is to design, build and program a robot to rescue the victim, on a water tank, as quickly as possible.

The robot is required to follow a line to the green chemical spill.

In *Rescue*, the mission is completed when the water tank is moved clear of the spill.

In *Premier Rescue*, the water tank must be carried out of the spill and placed on a raised platform adjacent to it.

The team*

Team members: Rescue teams consist of human team members and one robot. Substitution of robots at any time during a tournament is strictly forbidden.

Age limits (Rescue)*: There are two divisions of Rescue:

- Junior Rescue: Grade 7 and under
- Senior Rescue: Grade 8 and 9.

Students may not enter both divisions.

It is important to note that there is only one division of Rescue held at the Australian Open. The age cut-off for this event is 13 years and under at the date of 20th September, 2009 - RCJA Australian Open.

Age limits (Premier Rescue): Students up to Grade 12 or 18 years old are eligible to compete in Premier Rescue.

There is no minimum age limit for Premier Rescue and participants may enter both Rescue and Premier Rescue.

Competing in multiple events*: Although your team is welcome to register and compete in more than one event, please be aware that finals may run concurrently. Consequently, you must have enough robots and team members to cover all events.

For example, to enter both Rescue and Soccer, a team must have three robots and at least two human team members.

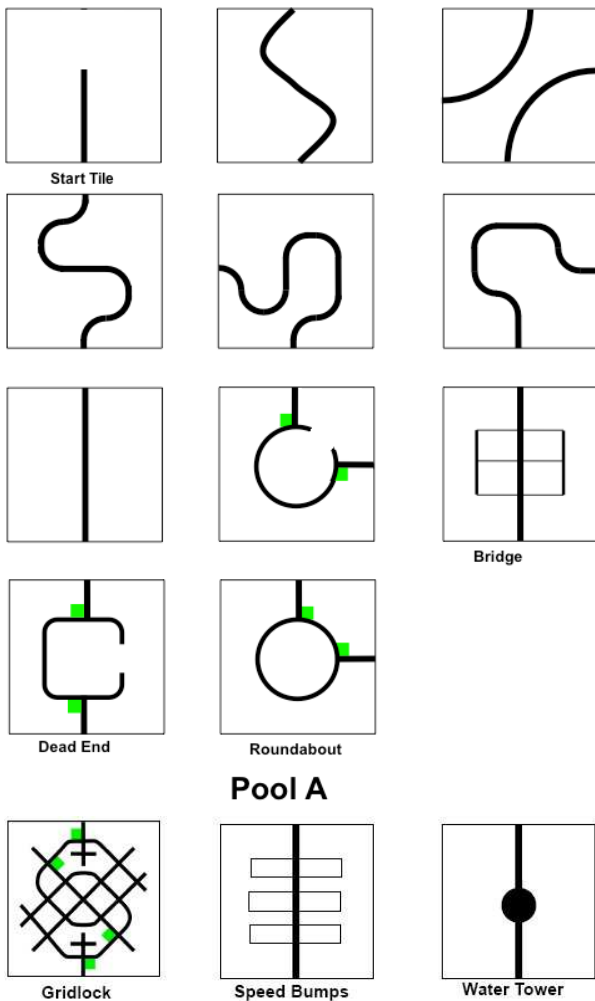
Event scheduling*

Northern Regional (11/7/09): Preliminary rounds of *Rescue* and *Premier Rescue* will be held on the morning of Saturday 11th July. All finals will commence in the early afternoon on this day.

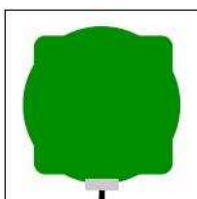
State Finals (1-2/8/08): Preliminary rounds of *Rescue* and *Premier Rescue* will be held on Friday 31st July throughout the day and during the morning of Saturday 1st August. All Finals will be held during the afternoon of Saturday 1st August.

If a *Rescue* or *Premier Rescue* team is unable to attend the preliminary rounds at the State Finals on Friday 31st July due to mitigating circumstances (e.g. travel issues or competing in another challenge (e.g. *RCJ Soccer*)), a written or emailed request must be received by the RCJT committee no later than 31/7/08. Provisions will be made for these teams to complete the Friday rounds early on the Saturday morning (1st August).

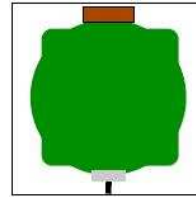
Playing field



The playing field for *Rescue* consists of all or some of the tiles in Pool A plus the speed hump tile from pool B and the green chemical spill tile:



The playing field for *Premier Rescue* consists of all, or some, of the tiles in Pool A and B plus the green chemical spill with the raised platform.



The same tile may be used more than once in a single playing field.

A mat of the Official RCJA Rescue Field tiles, consisting of all 15 of the above tiles, is available from MTA (www.teaching.com.au), listed as "ROB009 Rescue Field".

Although every effort will be made to eliminate raised gaps between tiles, it is recommended that robots are designed to cope with such gaps between the tiles of up to 3mm.

Lighting and magnetic conditions: Although organisers will aim to keep light levels consistent throughout the event and as low as possible, competitors must come prepared to calibrate their robots based on the lighting and magnetic conditions at the venue.

It is recommended that teams design their robots to cope with variations in lighting and magnetic conditions.

Additional requirements for the fields

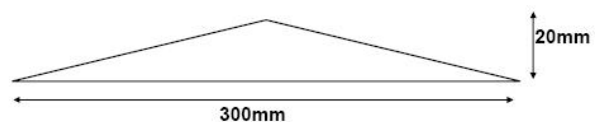
Water tank: The water tank, in the green chemical spill tile, is a standard 375ml aluminium can either with no markings or wrapped in aluminium foil (or aluminium foil tape).

The can contains material such as rice, the whole victim weighing 60 grams.

Liquid should not be used to add weight to the can.

Further details on how to build the water tank are available from RoboCup Junior Australia (www.robocupjunior.org.au).

Bridge: The *Bridge* tile consists of a white raised section with the following dimensions. A black line is placed across the middle of the bridge.



Aluminium foil: The point on the green chemical spill tile where the black line meets the spill area is marked by 40mm x 15mm reflective aluminium foil.

Speed Bumps: The speed bumps consist of rectangular sections, 200mm x 30mm, white in colour, with a minimum height of 5mm. A black line runs across the top surface of the speed bump.

Water Tower (Premier Rescue only): The water tower is a clear 1.25L PET soft drink bottle filled with water. The tower should not be intentionally moved from its location.

Evacuation platform (Premier Rescue only): The evacuation platform, located at the rear of the Premier Rescue chemical spill, is 60mm high, 200mm wide and 60mm deep.

The Interview and Journals*

Interview: During the event, each team is required to attend a 10-minute interview to discuss their entry. Although one purpose of the interview is to verify that the team's work is substantially their own, it is also an opportunity for teams to share their work and to be recognised for their efforts. In assessing the quality of team entries, the interviewers are looking for evidence of *engineering* and *programming* skills, *independence* and *commitment*.

Note: Along with sportsmanship and quality of play, the interview contributes to whether or not a team is selected to represent Tasmania at the Australian Open.

Interview questionnaire: Prior to the event, teams will be required to complete an interview questionnaire that will be used as a starting point for the interview.

Journals: It is expected that all teams maintain journals of their competition preparation. As well as being good learning/assessment tools, they provide an excellent point of discussion in the interview.

If your team isn't already keeping a journal, start now!

The Robot

Size (Rescue): In *Rescue*, each robot must fit inside an upright 18 cm diameter cylinder and be no more than 18 cm in height.

Size (Premier Rescue): In *Premier Rescue*, each robot must fit inside an upright 27 cm diameter cylinder and be no more than 27 cm in height.

To satisfy these requirements, the robot must be upright and at its maximum size. I.e. anything that protrudes from the robot must be fully extended. If a moving part extends in more than one direction, the robot must be able to operate without touching the measuring cylinder.

Control: The robot must be started manually by humans, but otherwise controlled autonomously. The use of a remote control of any kind is forbidden.

Marking and/or Colouring: Competitors are required to mark or decorate their robots to identify them.

Construction: Any commercial robot kit or raw hardware may be used as long as the design and construction are substantially the original work of the student(s).

Game play

Pre-game setup*: Access for calibration and testing will be provided to the venue one hour before the start of the event.

The Rescue and Premier Rescue events will be organised with up to five preliminary rounds, followed by a finals series.

Length of a game: Each run will be a maximum of 120 seconds.

Start of the game: The robot is placed at the starting position and checked by the referee. At the instruction of the referee, the robot's handler is to start the robot. The robot shall begin immediately following the line.

Restarts: A robot may restart the run as the handler deems necessary within the 120 seconds time limit. The robot must be positioned back at the start and checked by the referee. The clock will continue to run during all restarts. There is no limit to the number of restarts within the 120 seconds.

A robot must restart if:

- the robot ceases to follow the line
- the robot is touched by a human
- the robot moves off the field.

Following the line: The robot must follow the line completely to enter the spill.

Where there are multiple paths, the robot may take any path.

Where the line is discontinuous, the robot may search for the continuation of the line, but must not completely leave the tile before re-finding the line.

Some portion of the line that the robot is following must be under the "convex view" of the robot (viewed from the top). Should the robot stray from the line, it will be deemed to have ceased following the line and will have to restart.

Scoring*

Tiles: Teams will be awarded ten (10) points for each tile that their robot successfully negotiates.

A robot reaching the fourth tile has successfully negotiated three tiles and will be awarded 30 points.

Shortcut markers: Teams will gain an extra two (2) points for each shortcut marker that their robot correctly follows.

If a robot correctly follows both shortcut markers on the roundabout, it will be awarded 14 points (10 points for completing the tile and 4 points for correctly following the shortcut markers).

Rescuing the victim (Rescue): In *Rescue*, teams will be awarded an additional 20 points for successfully rescuing the victim. The victim is considered rescued when the water tank is completely outside the chemical spill.

Rescuing the victim (Premier Rescue): In *Premier Rescue*, teams will be awarded an additional 50 points for successfully gaining control of the water tank (e.g.: grasping and lifting the water tank). Another 50 points will be awarded for successfully placing and releasing the water tank on the evacuation platform, maintaining the tank's upright orientation.

Time limit: If the robot fails to rescue the victim in the allocated time, then the points from its best run during the game are awarded and a time of 120 seconds is recorded.

Event structure*

Preliminary rounds: There will be up to five (5) preliminary rounds. Each team will play one game per round.

Teams must be present at the start of a round. Teams failing to show at the start of the round may forfeit that round.

Water tank position: The water tank will be located in a new position in the chemical spill for each round. It will be in the same position for every game in that round.

Rankings: In calculating final rankings a team will drop their worst round. Teams will be ranked first by **total score** and second by the overall time taken to rescue the victim.

Semi-finals: The top four ranked teams will be in the semi-finals.

- 1st ranked team vs 4th ranked team
- 2nd ranked team vs 3rd ranked team

Semi-finals may be held as head-to-head competition on two separate fields (where possible) with the victim in the same position on both fields.

Teams in the semi-finals shall contest two (2) games, swapping fields (where available) between games.

The victim will be in the same position for all games.

Play-off for 3rd place: The play-off for 3rd place will consist of two rounds run like the semi-finals.

- Loser 1st/4th vs Loser 2nd/3rd

Grand final: The Grand Final shall consist of two (2) rounds between:

- Winner 1st/4th vs Winner 2nd/3rd

Teams shall swap fields (where possible) between games. The water tank will be placed in the same position for the first round and a different position for the second round. Scores from both rounds will be added together to determine final score.

Code of conduct

The aim of RoboCup Junior is to create an entertaining and educational experience that will continue into the future. To achieve this we all must create a spirit of collaboration, and not just competition. It is hoped that all entrants respect this aim.

Fair play: Humans (and robots for that matter) that cause deliberate interference to other robots or damage to the field or the victim will be disqualified.

Behaviour: All movement and behaviour at the event is to be of a subdued nature. Competitors are not to enter setup areas of other teams unless expressly invited to do so.

Mentors: Mentors are not to repair robots or be involved in programming of students' robots.

Sharing: It is an understanding of world RoboCup competitions that any technological and curricular developments should be shared with other participants after the event.

Resources and acknowledgements

RoboCup Junior Tasmania
(www.roboticstasmania.com.au).

For the official rules, please visit the RoboCup Junior Australia web site
(www.robocupjunior.org.au).

This Guide was prepared by Chris Bracken and Neil Harris and is based on the RoboCup Junior Australia Rescue and Premier Rescue Rules 2009 by RoboCup Junior Australia.