



Riley Rover Rescue

Primary Rescue

Secondary Rescue

Advanced Rescue

Victorian

Rescue Rules 2017



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Introduction

Spirit

Participants, students and mentors, will respect the aims and ideals of RoboCupJunior Australia as set out in [our mission statement](#). In turn, the volunteers, referees and officials will act within the spirit of the event to ensure the event is competitive, fair and most importantly fun. It is not whether you win or lose, but how much you learn that counts.

These Rules Apply in Victoria Only

These rules are derived from (with simplification and occasional modification) the RCJV National Rescue Rules. This is not a separate competition and the modifications are designed to allow greater accessibility to the competition in Victoria, whilst still preparing students to compete at the RCJA National Competition.

These rules only apply for the Victorian Warmup, Regional and State Rescue competitions. They do not apply in other states, or at the RCJA National competition.

Queries

Queries may be directed to Evan Bailey, RCJV Rescue Chair, evan@baileyfinance.com.au.

1 The Challenge, Participants and Teams

1.1 The Scenario

1.1.1 A terrible earthquake has hit the city and caused a large chemical storage unit to rupture spilling thousands of litres of toxic liquid in the centre of the city. There is a person trapped on a sinking water tank (represented by a soft drink can) in the middle of the chemical spill (represented by a green area on the final tile). 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 gasses rising from the toxic chemicals. It has been decided that the best form of rescue is the deployment of an autonomous robot that can navigate to the scene.

1.1.2 **Riley Rover Rescue and Primary Rescue:** The robot must navigate to the scene and rescue the stranded person on the water tank by pushing the tank completely out of the chemical spill.

1.1.3 **Secondary Rescue:** The robot must navigate to the scene and rescue the stranded person on the water tank by controlling the water tank and manoeuvring it out of the chemical spill.

1.1.4 **Advanced Rescue:** The robot must navigate to the scene and remove the water tank from the chemical spill and place it in its original orientation on the evacuation platform.

1.1.5 **Secondary Rescue and Advanced Rescue:** The robot must save itself by exiting the chemical spill and regaining the line.

1.2 Participants

1.2.1 Students must be of primary or secondary school age.

1.2.2 Students may participate in one of four divisions: Riley Rover Rescue, Primary Rescue, Secondary Rescue or Advanced Rescue as per the table below. Divisions are listed in order of difficulty (least to most).

Competition	Age Category	Maximum Years a Student May Compete
Riley Rover Rescue	Primary or secondary school students	One year
Primary Rescue	Primary school students	No limit
Secondary Rescue	Primary or secondary school students	See 1.2.3
Advanced Rescue	Primary school or secondary school students	No limit

1.2.3 Students may compete in Secondary Rescue an unlimited number of times, however they may only use the same hardware/software combination twice. The use of NXT/EV3 and the Lego programming environment is considered the same for the purposes of the entry in Secondary Rescue.

Some examples of hardware/software combinations that would entitle a student to compete in Secondary Rescue more than twice include:

Year 1 & 2: Lego NXT & NXT-G or Lego EV3 & EV3-G

Year 3: Lego NXT & NXC or Lego EV3 & [EV3Basic](#) for EV3 or [EV3Dev](#)

Year 4: Lego motors & sensors & Arduino/Raspberry Pi processor

Year 5: Arduino/Raspberry Pi processor & 3D printed components

Mentors: Before encouraging a student to enter under this rule, confirm the eligibility of the technology combination with your local Rescue technical committee.

1.2.3 Riley Rover Rescue is a beginner's competition. Mentors are asked to direct their students to participate in a more complex division should they be ready and capable of doing so. On competition day, students who show a skill level higher than expected of beginners may be directed to compete in a more complex division. Alternatively, they may opt to compete in Riley Rover Rescue and be ineligible for prizes.

1.2.4 Teams are required to ensure each participant's full name is correctly recorded in the registration system. Teams will have their members verified to ensure compliance with the past participation rules. Violations will result in all teams from the offending organisation being ineligible for prizes at the competition. Students may be asked to display Photo ID to assist with verification.

1.3 Teams

1.3.1 A team consists of from one to five students. A team does not include mentors (teachers, parents, older students or otherwise).

2 The Rescue Field

2.1 Field

2.1.1 The RCJV Rescue Field Specifications may be found here:

robocupjunior.org.au/vic/rescue

2.1.2 Tiles will be selected for each division as below:

	Base Pool	Physical Pool 1	Physical Pool 2	Logical Pool 1	Logical Pool 2
Riley Rover Rescue	✓	✓			
Primary Rescue	✓	✓	✓	✓	
Secondary Rescue	✓	✓	✓	✓	
Advanced Rescue	✓	✓	✓	✓	✓

2.1.3 Each field will consist of a city limits tile, chemical spill tile, and a minimum of three other tiles.

2.1.4 The field layouts will vary between rounds.

2.1.5 The city limits tile is a lead in tile and does not count for any points. Robots must start fully behind the join between the city limits and following tile.

2.1.6 Robots must be able to navigate through the doorway. The doorway will be centred over the line. It will be free standing and hence may easily fall over if knocked. If the doorway falls, the robot must restart. If a robot cannot pass through the Doorway, it will receive a score of zero and maximum time.

2.1.7 If the robot does not pass through the doorway due to the robot not navigating the tile for any reason, the robot must still be able to pass through the doorway or the robot will receive zero points and maximum time for this round.

2.2 Lighting

2.2.1 Teams must be prepared to calibrate their robots based on the lighting conditions available at the venue. Teams should test their robot under a variety of even and uneven light conditions and under light from a variety of sources.

2.2.2 The Rescue Chair will attempt to ensure that lighting is even and consistent and that infrared (IR) sources are kept to a minimum, but this cannot be guaranteed.

2.2.3 There may be other forms of interference present, both visible and non-visible. Concerned teams are advised to shield their sensors appropriately.

3 Robots

3.1 Control

3.1.1 Robots must operate autonomously. Remote control of any kind is forbidden.

3.1.2 Robots must be started manually by the robot handler.

3.2 Construction and Programming

3.2.1 Any robot kit or building materials may be used, providing that the robot fits within the specifications documented in these rules and the design and construction are substantially the original work of the team members.

3.2.2 Robots should be well engineered and constructed and should not fall apart during a Game. Should parts fall off the robot they will not be removed from the field during the round. Should a robot substantially fall apart, it will be deemed damaged by the referee and removed from the field. Damaged robots may be repaired and restarted during a game, however the game clock will not be paused or reset.

3.2.3 Commercial robot kits may be used; however they must be substantially modified.

3.2.4 Teams may not modify their robots once the game clock has started, however robots may be repaired.

3.2.5 The robot may be examined by the game referee at any time during the competition to ensure that the robot adheres to the rules.

3.2.6 **Riley Rover Rescue only:** Robots may have a maximum of three sensors and two motors. Robots may be constructed from any commercially available kit, plus incidental items such as tape, rubber bands, cable ties and omniwheels. Robots must be programmed using a graphical programming language such as NXTG or EV3G.

3.3 Violations

3.3.1 Any violations of the rules will prevent the robot from competing in a round until modifications are made and the robot conforms to the rules.

3.3.2 The competition will not be delayed to accommodate teams who need to make modifications.

3.3.3 Robots that cannot conform to the rules in time for a round will be disqualified from that round.

4 Game Play

4.1 Pre Competition Calibration and Practice

4.1.1 Prior to the beginning of the first round, teams will have access to the competition field(s) to gather sensor measurements and test their robots. Each competition field may be different. The Rescue Chair will publicise the times of this period and will ensure there is variety of tiles for teams to prepare on. Teams will have no further access to competition courses during the Competition except to compete.

4.1.2 There may be a practice field available for the competition. Robots may behave differently on this field. The practice fields may only be available periodically throughout the competition.

4.2 Game Zone

4.2.1 An area around the competition fields will be designated at the game zone. Only officials, referees and robot handlers may enter the game zone. Other team members may communicate to the robot handler from outside the game zone.

4.3 Game Length

4.3.1 Each division has a game length and calibration window as below:

Division	Game Length (Maximum Time)	Calibration Window
Riley Rover Rescue	120 Seconds	Prior to the Game Clock starting
Primary Rescue	120 Seconds	Prior to the Game Clock starting
Secondary Rescue	150 Seconds	Prior to the Game Clock starting

Advanced Rescue	240 Seconds	After starting the Game Clock
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4.3.2 Calibration prior to the game clock starting should take less than 30 seconds. Should recalibration be required once the game clock starts, the game clock will not be paused or reset.

4.4 Pre Game

4.4.1 One team member shall be elected as the robot handler.

4.4.2 The robot handler is the only team member who may communicate with the referee during the game.

4.4.3 The referee will ask the robot handler if they are ready to commence. The robot handler will confirm they are happy with the tile alignment and see-saw position.

4.5 Playing the Game

4.5.1 The referee will count down to the start and says 'Go' or similar. The game clock will commence and the robot or calibration, if applicable (Advanced Rescue only), may begin.

4.5.2 Robots must always work towards the chemical spill from the starting point. Robots may never work backwards, except when exiting the chemical spill as described in 4.9.7

4.6 Restarts

4.6.1 The robot handler may restart the robot due to malfunction, from any location, subject to the following penalties:

Riley Rover Rescue: Maximum time;

Primary Rescue: Maximum time and an one-off penalty of minus 10 points;

Secondary and Advanced Rescue: Maximum time and a penalty of minus 5 points each time the robot is touched. If the penalties accumulate, the lowest score the robot shall be awarded shall be zero.

4.6.2 Robots that have completed a Rescue but have not gained all points available, may restart from any location in an attempt to gain the missing points.

4.6.3 The game clock will continue running during all restarts.

4.6.4 Tiles that are completed multiple times due to restarts will not result in additional points being awarded.

4.6.5 The water tank will not be moved or reset to the initial position during restarts, however, should the water tank fall over, the referee may return it to an upright position approximately centred where it fell.

4.7 Following the line

- 4.7.1 Where there are multiple paths, the robot may take any path.
- 4.7.2 Where the path is discontinuous, the robot may search for recommencement of the line, but must not leave the tile before finding the line.
- 4.7.3 For the purpose of determining if a robot has left the line the Referee will use the convex hull of the robot. This is done by stretching an imaginary rubber band around the extremities of the robot and assuming the enclosed space is part of the robot.
- 4.7.4 If a tile has a continuous line, then some part of this continuous line must always be under the robot. If a tile has a discontinuous line, then some part of the robot must always be over the tile.
- 4.7.5 Once the robot enters the chemical spill it is no longer required to follow the line. It may enter the chemical spill in any direction. Should the convex hull of the robot leave the chemical spill prior to rescuing the victim the robot will have to restart.

4.8 Definition of Rescue

- 4.8.1 **Riley Rover Rescue and Primary Rescue:** The victim is considered rescued when the water tank, as viewed directly from above, is not over the chemical spill in any way.
- 4.8.2 **Secondary Rescue:** The victim is considered rescued when the water tank, as viewed directly from above, is not over the chemical spill in any way. Control of the tank means that if the robot is to move in any direction (including backwards) the water tank would move with it.
- 4.8.3 **Advanced Rescue:** The victim is considered rescued when the water tank is released in an upright position on the evacuation platform. The water tank is considered released when the robot is in a position that should it move left, right or backwards the water tank would not fall off the Evacuation Platform.

4.9 Scoring

- 4.9.1 Teams will be awarded 10 points for each tile the robot successfully navigates excluding tiles specified in 4.9.3.
- 4.9.2 Teams will gain an extra 4 points for each intersection marker they correctly follow.
- 4.9.3 Teams will receive points as per the below table for each of the specified tiles.

Tiles	Points
See-Saw	15
Bridge	15
Speed Bumps	15
Water Tower	20

4.9.4 **Primary Rescue:** Teams will be awarded an additional 50 points when the victim is successfully rescued.

4.9.5 **Secondary Rescue:** Teams will be awarded an additional 70 points for gaining control of the water tank, and 30 points for rescuing the victim. Points for control of the water tank and rescue of the victim are awarded independently. For example, a robot that rescues the victim but does not control the water tank will be awarded 30 points. If the robot loses control of the water tank as soon as it begins to move it is not eligible to receive control points, however may receive rescue points.

4.9.6 **Advanced Rescue:** Teams will be awarded an additional 50 points for successfully gaining control of the water tank (e.g. lifting the water tank to a height where it could be placed on the evacuation platform and maintaining this height when the robot moves). If the robot loses control of the water tank as soon as it begins to move it is not eligible to receive the relevant points. Another 50 points will be awarded for placing the water tank on the evacuation platform maintaining its original upright orientation.

4.9.7 **Secondary and Advanced Rescue:** Teams will be awarded 20 additional points for exiting the chemical spill. An exit is deemed successful when the robot has navigated beyond the tile immediately prior to the chemical spill (i.e. reach the second last tile prior to the chemical spill).

4.9.8 The time showing on the game clock is only awarded once all available points have been gained. If the robot was touched for a restart, maximum time shall be awarded.

4.10 Preliminary Rounds

4.10.1 A briefing will be held prior to the start of the preliminary rounds to advise how the competition will run. Team members are required to attend this briefing to be eligible to compete.

4.10.2 There will be three to five preliminary rounds.

4.10.3 Each team may attempt each round once.

4.10.4 The water tank may be in a different position for each round. The water tank will be reset to the same position for each competitor on a given round.

4.10.5 Teams must report for each preliminary round five minutes before their designated round time. Failure to do so may result in a score of zero points and maximum time.

4.10.6 After preliminary rounds have been completed, teams will be ranked by their combined raw score. Should multiple teams have the same raw score these teams will be ranked by order of the lowest combined time.

4.11 Finals Rounds

4.11.1 The top three teams from the preliminary rounds for each division will then proceed to the trophy final. If there are three teams or less in the division, all teams in the division will take part in the trophy final.

4.11.2 The trophy final will consist of one or more courses that each competing team will rotate through.

4.11.3 Points gained on each course will be combined to find the total score for each team. Time will also be combined to find total time for each team. The points gained and time recorded will be treated as in 4.9.6, with the resulting ranking determining the first, second and third place teams for each division.

5 Conflict Resolution

5.1 Refereeing and Officials

5.1.1 The referee's instructions and decisions must be adhered to. If you feel that a rule has not been correctly enforced, you or your mentor may raise the matter with the Rescue Chair immediately.

5.1.2 Rule clarification and handling of disputes will be dealt with by the Rescue Chair. The Rescue Chair's decision is final.

5.1.3 If a mentor feels a dispute has not been adequately addressed by the Rescue Chair, they may escalate the matter to the RoboCupJunior Victoria State Chair in writing within seven days of the competition.

5.1.4 At the conclusion of a competition once presentations have begun, the outcome of the competition is final.

5.2 Special Circumstances

5.2.1 Specific modification to the rules to allow for special circumstances, such as unforeseen problems and/or capabilities of a team's robots may be published at the time of the competition.

6 Conduct of Students and Mentors

6.1.1 Behaviour of students shall be as expected in a well-run classroom.

6.1.2 Mentor behaviour shall align with the [RoboCupJunior mission statement](#).

6.1.3 Mentors warrant that each entry is the work substantially of the students'.

6.1.4 At the RoboCupJunior national competition, mentors are not permitted in the student work area and this rule is strictly enforced. As the Victorian RobCupJunior year progresses with the *rescue warmup* and *Victorian regional events*, the complexity of the competition will increase. Mentors are asked to support the development of their students' independence.

6.1.5 Some students are developing their ability to problem solve and function under pressure. If a mentor feels they must assist their student in order for their student to have a good Robocup experience, they may do so but the student will be disqualified from placing in the top five.

6.1.6 If mentor assistance is provided to a student at the competition, the mentor must notify the rescue chair.

6.1.7 A team may be disqualified at the discretion of the Rescue Chair when excessive assistance has been provided to them by a mentor on competition day.

6.1.8 At the Victorian regional event, mentors may be prohibited from entering the student work area, but will be able to supervise their students from behind a nominal line.

7 Journals, Interviews, Sharing and Prizes

7.1 Journals

7.1.1 Journals are not required, however teams may elect to use a journal as an aide for their interview. There may be a prize for the best journal overall, or the best journal in each division.

7.2 Interviews

7.2.1 Teams may be required to attend an interview on the competition day. This will be used to check that the design, construction and programming of the robots are that of the students'. An interview schedule for all teams may be published, a team may be required to attend an interview at the discretion of the Rescue Chair.

7.2.2 Teams must bring a running laptop to their interview with their program open and be able to talk through the logic of the program with the interviewer. Screenshots of the program are not sufficient.

7.2.3 See the document RCJV Rescue Interview Guide at robocupjunior.org.au/vic/rescue.

7.2.4 Should the interviewer believe that the construction and programming of the robot is not that of the team, the team will be referred to the Rescue Chair. Should the Rescue Chair uphold the view of the interviewer, the team will be disqualified from the competition.

7.2.5 Interviews are not scored and subsequently do not affect a team's ranking. Interviews may be videotaped and published for educational purposes.

7.3 Sharing

7.3.1 Any technological and curricular developments may be shared with other participants after the competition. Details of competitors' hardware, software and ideas may be published after a competition, hence furthering the mission of RoboCupJunior as an educational initiative.

7.3.2 Participants are encouraged to ask questions of their fellow competitors to foster a culture of curiosity and exploration in the fields of science and technology.

7.3.3 Teams may be required to upload their robot design and program source code a week prior to competition. Programs are not expected to reflect the final week of robot preparations completed by teams. Robot design and program source may be published for future competitors to use as a learning resource.

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Student work may be published and shared under the Creative Commons license above.

7.4 Prizes

7.4.1 When the dates and divisions of a competition are published, the category of prizes shall also be published. For example, a completion may include prizes for:

- Journal
- Innovative Technology
- Collaboration