

# Engineering Technical Challenge

## Lower Primary Category

### Game Rules

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Organised by :



**SCHOOL OF**  
**ROBOTICS**

**SPRITE**  
ROBOTICS INNOVATION  
TECHNOLOGY ENTERPRISE

# ETC REGULAR CATEGORY CHANGE LOG

Version	Date of Change	Description of Change(s)

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# 1. General Information

Natural disasters are sudden and destructive events caused by natural processes of the Earth, which result in significant damage to life, property, and the environment. These catastrophic events can take many forms, including earthquakes, floods, hurricanes, tornadoes, droughts, and volcanic eruptions.

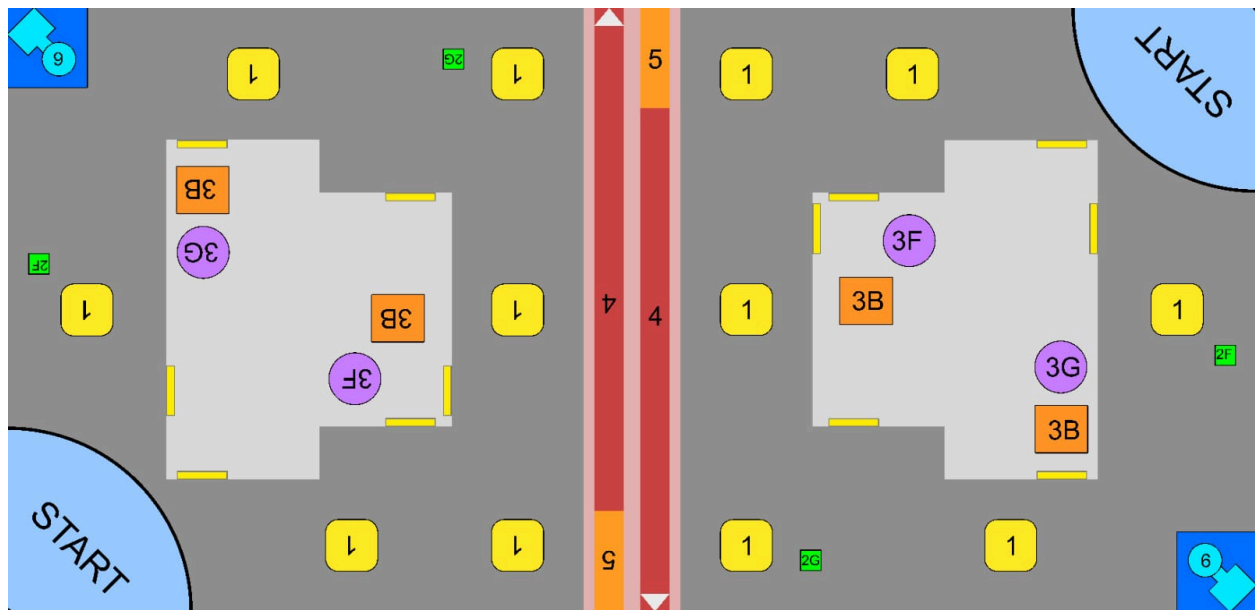
Disaster relief refers to the organised efforts undertaken to provide immediate assistance to communities affected by natural disasters. These efforts aim to meet the urgent needs of individuals and families, such as food, water, shelter, medical care, and safety, during the aftermath of an emergency.

We need to develop new technologies and strategies for 4 different phases; Mitigation, Preparedness, Response and Recovery. Robots are part of such new technologies and they can help us during natural relief. They can help us with rescues and repairs after a disaster has occurred.

**On the Lower Primary game field, the robot will aid to restore a city after a natural disaster. The robot will have to navigate its way around unsafe environmental conditions, retrieve and drop supplies such as food and gas, and restore transport infrastructures such as train tracks.**

## 2. Game Field

The following graphic shows the game field with the different objective areas.



The game field is split into 2 sides, thus at any given time, 2 teams can be on each side of the field on one table. This game field comes with 6 different missions, as indicated by the numbers:

1. Search and Rescue
2. Collecting Supplies
3. Delivering Supplies
4. Moving the Train
5. Fixing the Tracks
6. Starting the Generator

The number on the map represents where the mission's props are located at:

Label	Object
2F	Food Block initial location
2G	Gas Barrel initial location
2F	Food Block drop location
2G	Gas Barrel drop location
3B	Damaged Buildings
4	Train Tracks
5	Track Repairs
6	Power Generator

## 3. Sub-Category Game Rules

If there is any uncertainty during the robot attempt, the judge will make the final decision.  
The chief judge will decide in favour of the team if no clear decision is possible.

### 3.1 Pre-run

- Robot and robot's attachment will be inspected by referees according to the requirements prior to quarantine.
- Robot and its attachment(s) must be able to fit in a 25x25x25cm box.
- Robot and its attachment(s) must fit completely within the start area prior to launch.
- Teams are allowed to make physical adjustments to the robot at the home area before the start of the run.

### 3.2 Start of Robot Run

- Robots should be placed on the table, completely within the start area.
- Time begins when the judge gives the signal to start.
- Each robot attempt is 2 minutes (120 seconds).

### 3.3 During Robot Run

Teams are allowed the following only when their robot is completely within the start area:

- To change the location (by hand) of the starting point of the robot.
- To change the robot arm attachments, sensors and/or motors at the start area.
- To reposition or aim the robot for its next launch.

Teams are not allowed:

- To touch the robot when the robot is moving inside the playfield area.
- To reprogram and enter data into the robot during the robot run.
- When in autonomous mode, to control the robot using any form of remote or wireless control.

### 3.4 Ending of Robot Run

The run will end when:

- The robot attempt time (2 minutes) has ended.
- The robot has completely left the game table.
- The robot has completely stopped and is unable to return to any start and hence unable to continue and attempt other missions.
- The robot or the team violated rules or regulations.

A team member shouts "STOP" and the robot does not move anymore. If the robot is still moving, the robot attempt will only end once the robot stops by itself or is stopped by the team or judge.


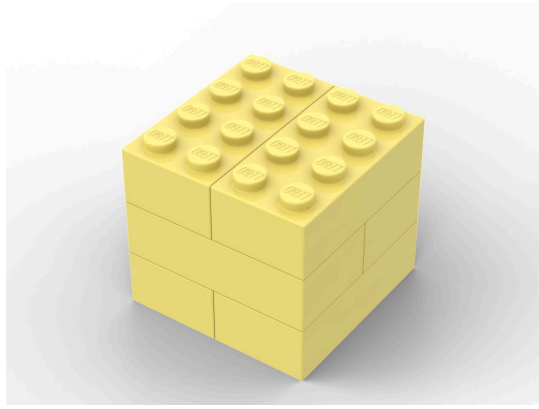
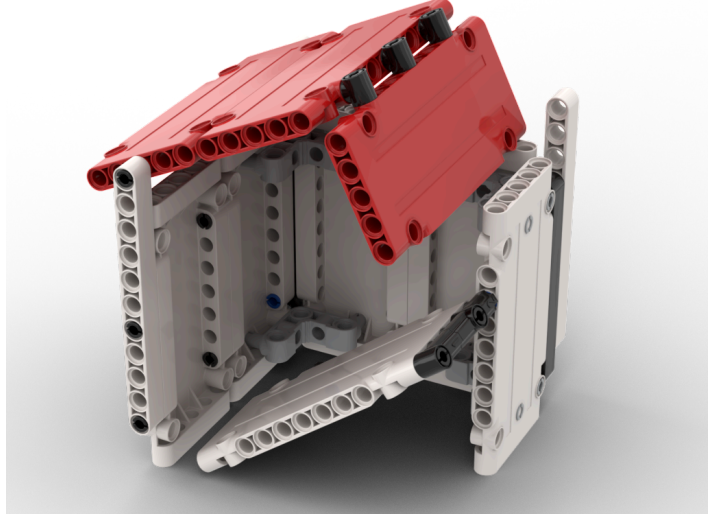
Once the robot attempt has ended, time is stopped, and the judge scores the attempt. The scores are noted on a scoring sheet (on paper), the team need to sign off the scores (on paper signature). Once the score is signed off no further complaint is no longer possible.

If a team does not want to sign off after a certain period, the judge can decide to disqualify the team for this round. It is not allowed for a team coach joins the discussion with judges on the scoring of the run. Video or photo proofs will not be accepted.

If a team finishes an attempt without having solved a (partial) task that yields positive points, The time of that run will be set at 120 seconds.

The ranking of teams depends on the overall tournament format. For example, the best attempt out of two rounds could be used and if competing teams have the same points, the ranking is decided by the record of time.

## 4. Game Objects and Positioning

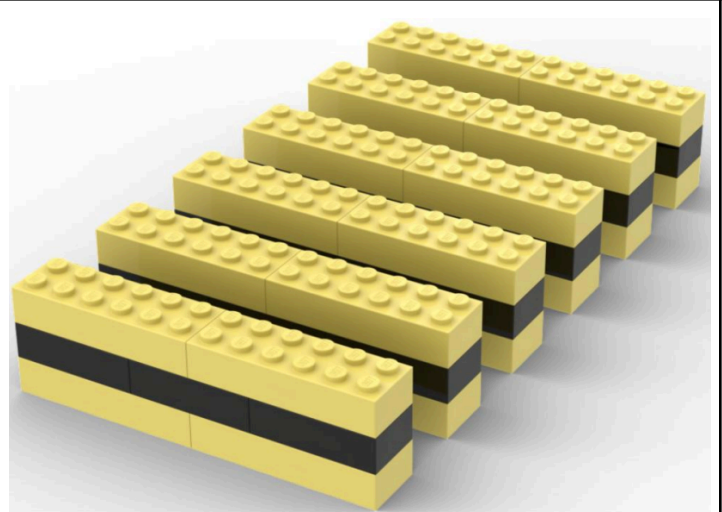
<p><b>Gas Barrel</b></p> <p>There will be a single gas barrel on the map, its location is fixed every round. <b>(2G)</b></p> <p>Transporting this barrel to its respective drop zone will award the team points. <b>(3G)</b></p>	
<p><b>Food Block</b></p> <p>There will be a single food block on the map, its location is fixed every round. <b>(2F)</b></p> <p>Transporting this block to its respective drop zone will award the team points. <b>(3F)</b></p>	
<p><b>Damaged Buildings x2</b></p> <p>There will be a total of 2 damaged buildings around the centre of the map, its location is fixed every round. <b>(3B)</b></p> <p>Teams will be awarded points if none of the houses are displaced while moving around in that area.</p>	



**Debris x6**

There will be 6 debris on fixed locations on the map.

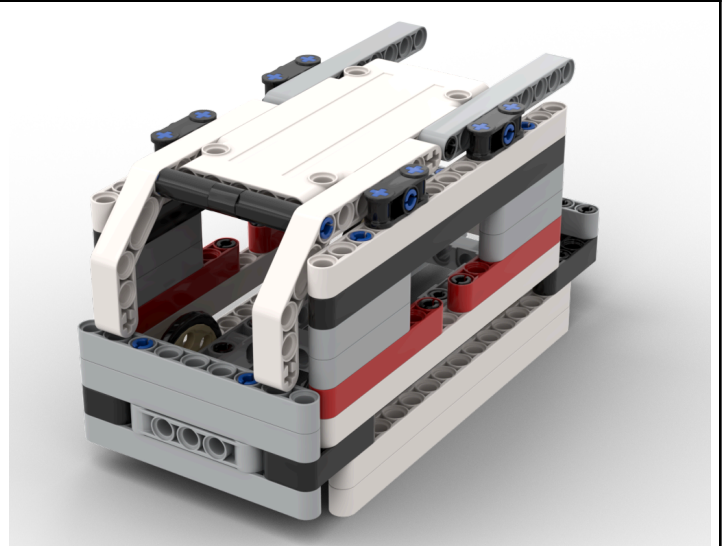
Points will be awarded based on how many debris are displaced from their starting position.



**Train**

The train starting position will be in front of the repair tracks. **(4)**

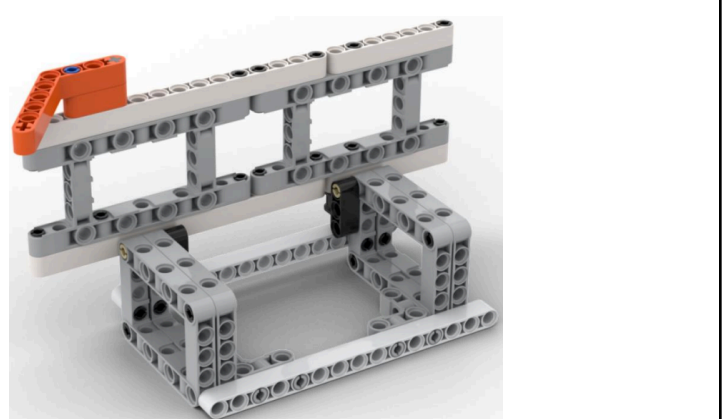
As the train travels forward and hits the flags down, points will be awarded



**Track Repairs**

This broken track will be stationed behind the train. **(5)**

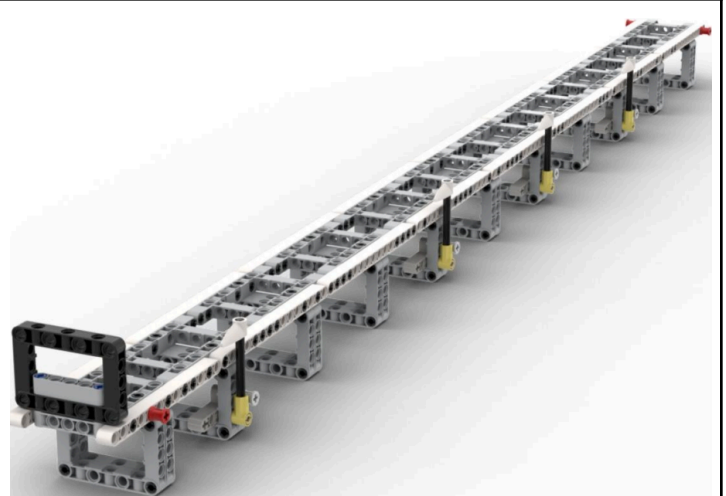
As long as the tracks sits on the support points will be awarded



### Train Track

The train would be moving along this train track. Along the tracks will be 4 flags which will be knocked over as the train moves through.

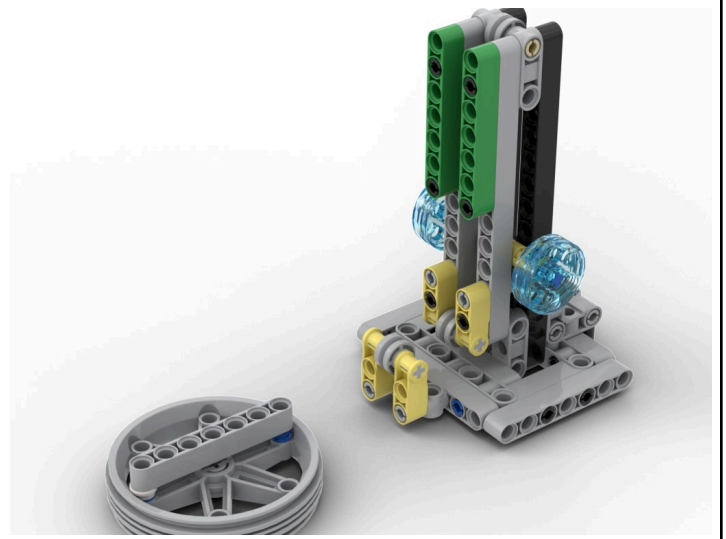
Points will be awarded based on the number of flags knocked down, the last flag being a higher point.



### Power Generator

There will be a generator on the map, its location is fixed every round. **(6)**

Teams will be awarded points if the blue wheels are at the top at the end of the run.



## 5. Robot Challenge

There are a total of 6 missions that can be attempted on the game field. The team can decide in which order they will do the missions.

Scoring for each mission will either be:

- Final State (scoring is done when the Robot Attempt ends)
- or In State (scoring is done during the Robot Attempt i.e. Robot is moving).

### 5.1 Building the Robot

Construct your robot to aid in the disaster relief effort.

Teams are required to build their robot on the spot without any external help such as, not limited to: photos of their robots, building instructions, aid from coaches etc.

Points will be voided if the team requested for external help at a judge's approval.

Final State	Points
Robot constructed with any external help	100

### 5.2 Search and Rescue

Program your robot to follow a designated path to search for survivors and resources at different checkpoints, watch out for debris on the way!

Teams may choose to at any point of time leave the path to pursue another mission before returning back to the path.

For each checkpoint box that the robot has stopped on, the team will be awarded points at the end of the robot run and tallied up to the total.

In State	Points
For every square box (6 in total) that the robot stops on	5 EACH
If all 6 Debris are not moved or/and damaged	20
If at least 4 Debris are not moved or/and damaged	10

If at least 3 Debris are not moved or/and damaged	0
<b>Maximum</b>	<b>50</b>

## 5.3 Collecting Supplies

The supplies have arrived to help this area, program your robot to collect the supplies dropped along the search path.

There will be 2 different supply zones where the supplies are located, move them away from their respective locations using your robot.

Final state	Points
Food Block is no longer touching its initial location (2F)	20
Gas Barrel is no longer touching its initial location (2G)	30
<b>Maximum</b>	<b>50</b>

## 5.4 Delivering Supplies

Once the supplies are retrieved, they should be delivered to the people in a designated safe zone to aid in their survival and restoration. There will be damaged buildings around this area so watch out to avoid colliding into them.

Teams are to drop the supplies collected from the previous missions here into the area. For every misplaced object teams would lose 5 points from this section.

Final state	Points
Food Block has been deposited completely inside its respective zone (3F)	20
Gas Barrel has been deposited completely inside its respective zone (3G)	30
For any misplaced objects surrounding the zones	-5 EACH
<b>Maximum</b>	<b>50</b>

## 5.5 Moving the Train

A train carrying more supplies has arrived in the area. Push the train across the tracks to help the supplies get to their designations.

As the train moves across the tracks, it will knock over checkpoint flags stationed at different sections of the tracks. For each checkpoint flag that the train has knocked over, the team will be awarded points at the end of the robot run and tallied up to the total.

Final state	Points
The 1st, 2nd and 3rd flag are knocked over by the train	10 EACH
The 4th and final flag is knocked over by the train	20
Maximum	50

## 5.6 Fixing the Tracks

The recent earthquake has damaged a part of the train tracks, and a new set of tracks has just arrived. Help is required to fix it so that more aid can arrive.

The track repair will begin in an upright state. Teams will have to flip the track down with their robot so that it aligns to the rest of the tracks.

Final state	Points
The track repair is resting downwards on the track	30
Maximum	30

## 5.7 Starting the Generator

The power lines have been damaged, and temporary generators have been set up to provide power to the area.

The generator is activated by pulling a cord attached to the ignitor. Teams will have to program their robot to pull on the generator cord till the blue ignitor is within the green level.

Final state	Points
The blue ignitor (wheel) is within the green level	40
Maximum	40

## 5.8 Parking the Robot

Return the robot back to the home base for charging before the timer runs out.

Teams can only score these if the robot has scored some points from missions 5.2 to 5.6.

Final State	Points
Robot is completely in home base	30

## 6. Competition Scores

The same field score is up to a maximum of 400 points scored as described in the table below.

Task	Points	Total/Max
<b>1. Building the Robot</b>		
Robot constructed with any external help		100
<b>2. Search and Rescue</b>		
For every square box (6 in total) that the robot stops on	5 EACH	30
If all 6 Debris are not moved or/and damaged	20	
If at least 4 Debris are not moved or/and damaged	10	
If at least 3 Debris are not moved or/and damaged	0	
<b>Maximum</b>		<b>50</b>
<b>3. Collecting Supplies</b>		
Food Block is no longer touching its initial location (2F)	20	
Gas Barrel is no longer touching its initial location (2G)	30	
<b>Maximum</b>		<b>50</b>
<b>4. Delivering Supplies</b>		
Food Block has been deposited completely inside its respective zone (3F)	20	
Gas Barrel has been deposited completely inside its respective zone (3G)	30	
For any misplaced objects surrounding the zones	-5 EACH	
<b>Maximum</b>		<b>50</b>
<b>5. Moving the Train</b>		
The 1st, 2nd and 3rd flag are knocked over by the train	10 EACH	30

The 4th and final flag is knocked over by the train	20	
Maximum		50
6. Fixing the track		
The track repair is resting downwards on the track	30	
Maximum		30
7. Starting the generator		
The blue ignitor (wheel) is within the green level	40	
Maximum	40	40
8. Park the Robot		
Robot is completely in home base		30
Total points		400