



## World Robot Olympiad 2020

Regular Category

Elementary

### CLIMATE SQUAD

## Windstorm

Version: January 15th



*WRO International Premium Partners*



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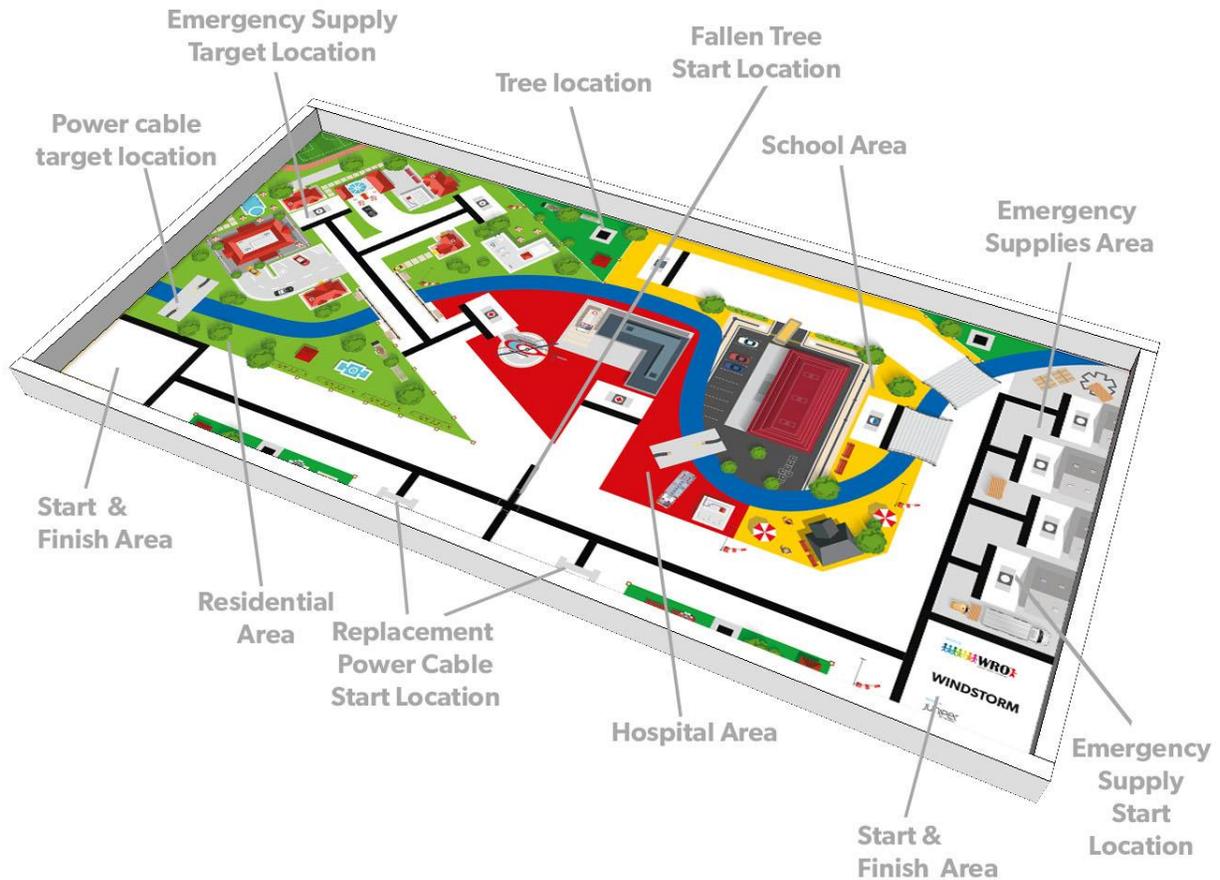
## 1. Introduction

A village has been hit by a severe windstorm. Electrical power is down and the main street is blocked by a fallen tree. Emergency supplies are required in specific areas of the village. Your help is needed!

**This year, it is the Elementary mission to build a robot that helps the village recover from the windstorm by delivering emergency supplies and clearing streets of a fallen tree.**

## 2. Game Field

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



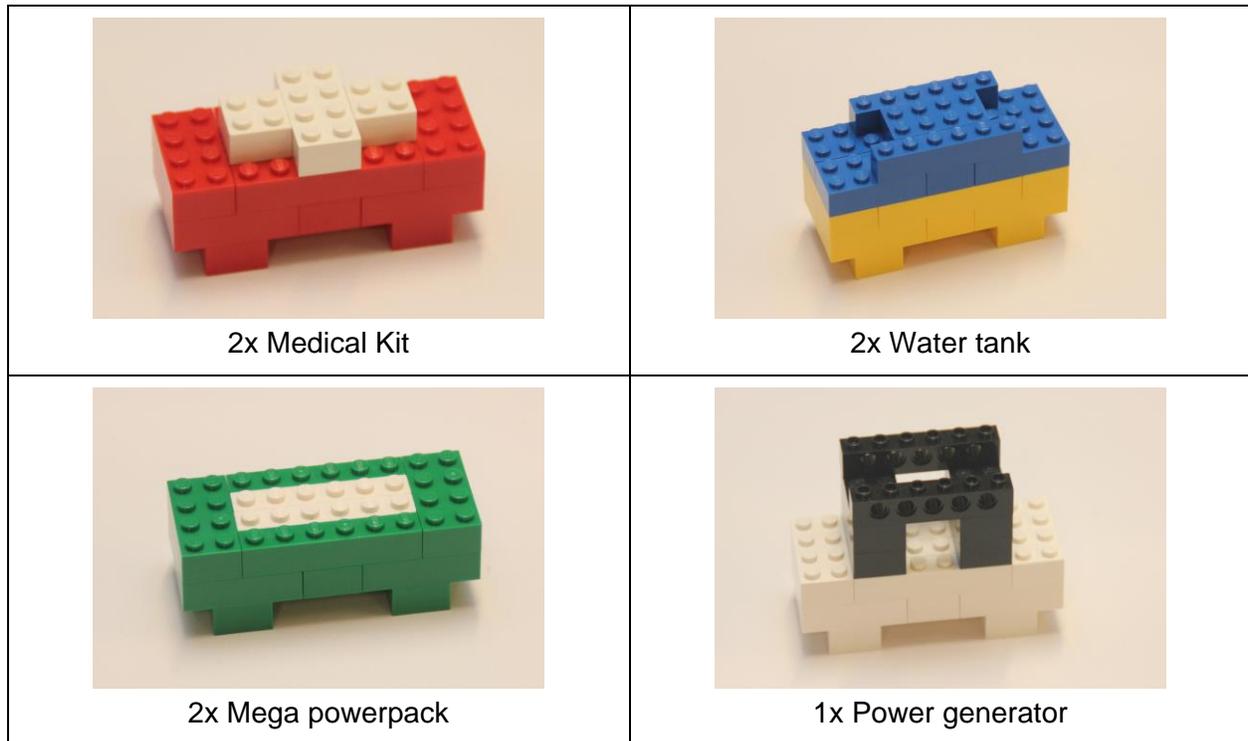
If the table is larger than the game mat, place the mat on the long side with the two start areas on the wall and align them centered between the short walls.

**For more information about the table and game mat specifications, please take a look at WRO Regular Category General Rules Rule 4. The printable file of the mat and a PDF with the exact measurements are available on [www.wro-association.org](http://www.wro-association.org).**

### 3. Game Objects, Positioning, Randomization

#### Emergency supplies

There are 2 medical kits, 2 water tanks, 2 mega powerpacks, and 1 old power generator. Note: Not all emergency supplies are used in every run, please look at the next chapter for randomization.



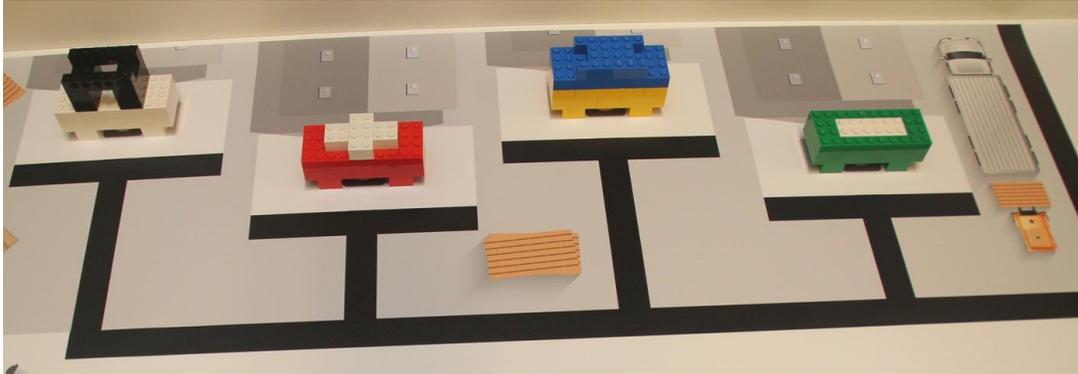
#### Randomization / Positioning of emergency supplies

The positioning of the emergency supplies is done in two steps:

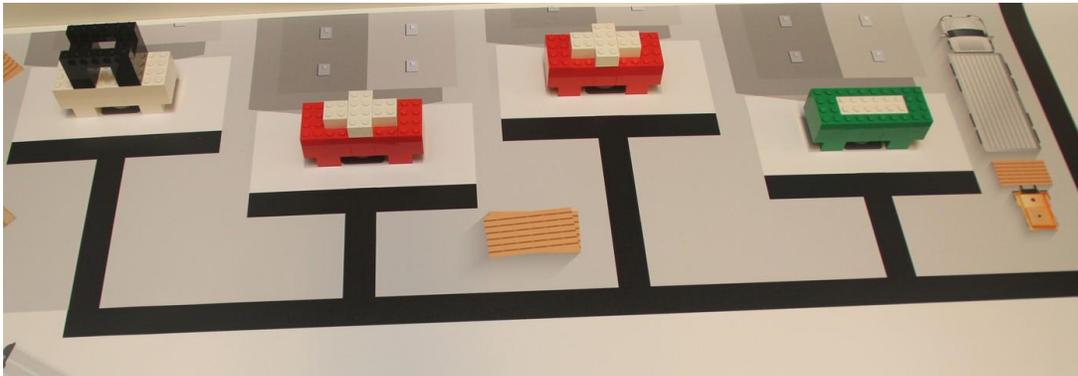
1. **Power Generator:** Install the power generator randomly on one of the 4 locations in the emergency supplies area.
2. **Other supplies:** Install 3 out of 6 emergency supplies randomly in the 3 other locations in the emergency supplies area. It is possible to select 2 supplies of the same type.

Two examples of possible randomizations are shown in the following photos:

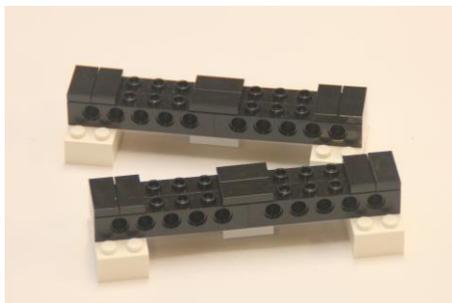
Example of randomization 1:



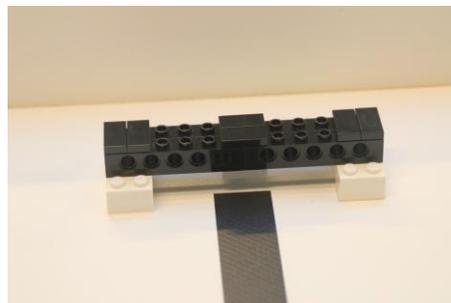
Example of randomization 2:



### Replacement power cables

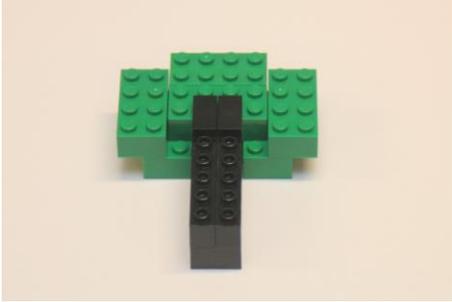
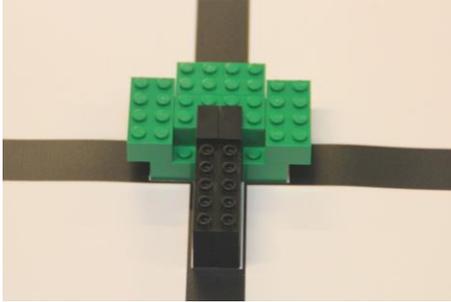
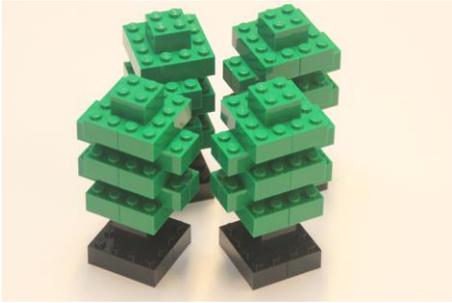


There are two replacement cables on the field.



The cables are placed on the replacement power cables positions.

## Trees

 <p>There is one <b>fallen tree</b> that is broken during the windstorm (to be moved).</p>	 <p>The fallen tree is placed in the middle of the black street.</p>
 <p>There are <b>4 grown trees</b> that have grown along the streets.</p>	 <p>Grown trees are placed on the black square inside the grey area. Trees should not be moved outside the grey area and not be damaged.</p>

## Two start areas on the field

There are two start areas on the field. The start area is randomly chosen on the morning of the competition and will stay the same for the whole competition day. **The teams are only allowed to start in this particular start area for the full day.**

Before the start of the run, the robot must start completely in the start area (defined as mentioned above), the surrounding line is not included in the start area. At the start, the cables count toward the maximum size of the robot, so they need to be included in the start area.

## 4. Robot Missions

For a better understanding, the missions will be explained in multiple sections.

**The team can decide in which order they will do the missions.**

### 4.1 Remove the fallen tree from the main street

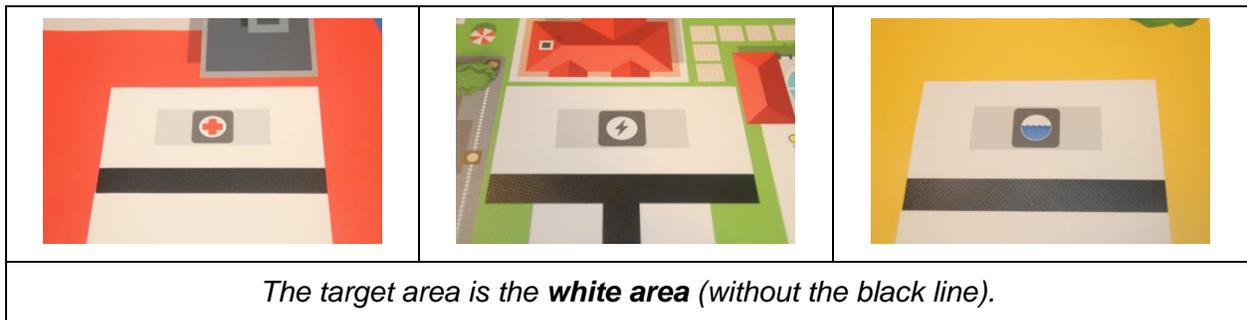
The robot must move the tree from the main street. Full points are awarded if the tree is no longer touching any black lines.

### 4.2 Bring the emergency supplies to their target area

The robot must move each of the supplies to its target area except the old power generator, which will stay in its starting position:

- Medical Kit → Hospital Area
- Water Tank → School Area
- Mega powerpack → Residential Area

To earn maximum points, the robot needs to bring each supply completely into the target area. There are two target locations in the target areas. Only one emergency supply per target location counts, for example: If there are two medical kits on the field and you bring both to one target location, only one counts.



### 4.3 Restore electrical power

To restore the electric power in the village, the robot needs to install two replacement power cables. To be considered fully effective, each **white end** of the repair cable needs to be in contact with the target area (grey area).

#### **4.4 Park the robot**

The mission is complete when the robot returns to either one of the two start areas, stops, and the chassis of the robot is entirely (top-view) within the start area (cables are allowed to be outside of the start area).

#### **4.5 Get bonus points and avoid penalties**

Bonus point will be awarded for not moving the power generator from the starting position. Penalties will be awarded for moving or damaging trees. Penalties will never result in a negative score (see General Rules).

## 5. Scoring

### Definitions for the scoring

- “**Completely**” means that the game object is only touching the corresponding area (not including the black lines). “**Partly**” means that the game object is at least touching the area with one part.
- **Please remember:** Only one supply per target area counts.

Tasks	Each	Total
<b>Remove the fallen tree from the main street</b>		
Fallen tree moved and not touching any black lines	11	11
<b>Bring the emergency supplies to their target areas</b>		
Supply delivered completely in a <b>correct</b> target area	12	36
Supply delivered partly in a <b>correct</b> target area	7	21
Supply delivered completely or partly in a <b>wrong</b> target area	4	12
<b>Restore electrical power</b>		
Each <b>white end</b> of the electric cable touches the target area	14	28
Only one <b>white end</b> of the electric cable is touching a target area	8	16
<b>Park the robot</b>		
Robot completely stops within either one of the Start & Finish Areas <i>(only if other points, not bonus, are assigned)</i>	11	11
<b>Get bonus points and avoid penalties</b>		
Power generator not moved (still touching the starting position) or damaged (at least one piece broken).	14	14
Tree moved (touching outside the light grey square) or damaged (at least one piece broken).	-4	-16
<b>Maximum Score</b>		<b>100</b>

## Scoring Sheet

Team name: \_\_\_\_\_

Round: \_\_\_\_\_

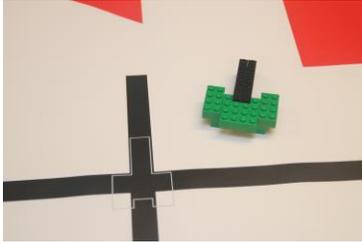
Tasks	Each	Max	#	Total
<b>Remove the fallen tree from the main street</b>				
Fallen tree moved and not touching any black lines	11	11		
<b>Bring the emergency supplies to their target areas</b>				
Supply delivered completely in a <b>correct</b> target area	12	36		
Supply delivered partly in a <b>correct</b> target area	7	21		
Supply delivered completely or partly in a <b>wrong</b> target area	4	12		
<b>Restore electrical power</b>				
Each <b>white end</b> of the electric cable touches the target area	14	28		
Only one <b>white end</b> of the electric cable is touching a target area	8	16		
<b>Park the robot</b>				
Robot completely stops within either one of the Start & Finish Areas <i>(only if points other points, not bonus, are assigned)</i>	11	11		
<b>Get bonus points and avoid penalties</b>				
Power generator not moved (still touching the starting position) or damaged (at least one piece broken).	14	14		
Tree moved (touching outside the light grey square) or damaged (at least one piece broken).	-4	-16		
<b>Sum of Game Score</b>		100		
<b>Surprise Rule</b>				
<b>Total Score in this run</b>				
<b>Time in full seconds</b>				

\_\_\_\_\_  
Signature Team

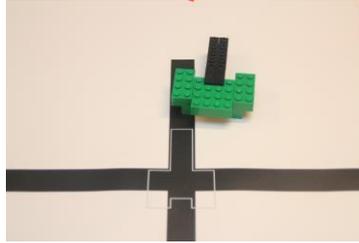
\_\_\_\_\_  
Signature Judge

## Scoring Interpretation

Fallen tree moved and not touching any black lines → 11 points

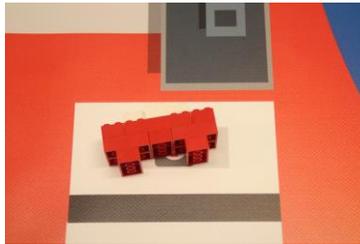
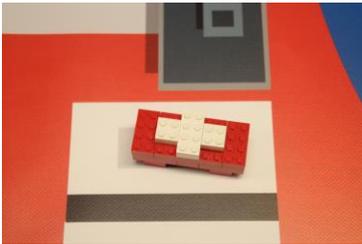


11 points

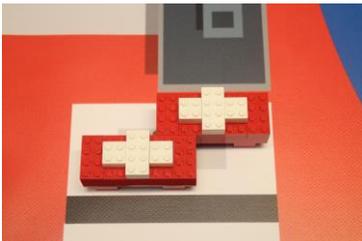


0 points (still touching)

Supply delivered completely in a **correct** target area → 12 points

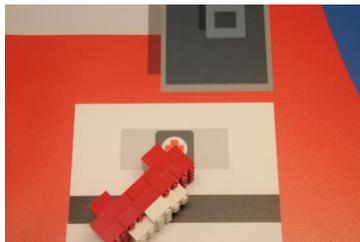
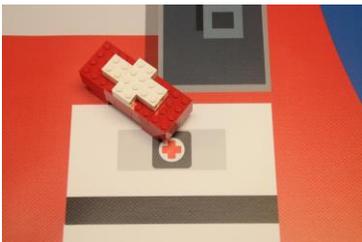


*All situations for full points. It is not important if the object is standing or lying.  
The object should **only touch** the white area.*

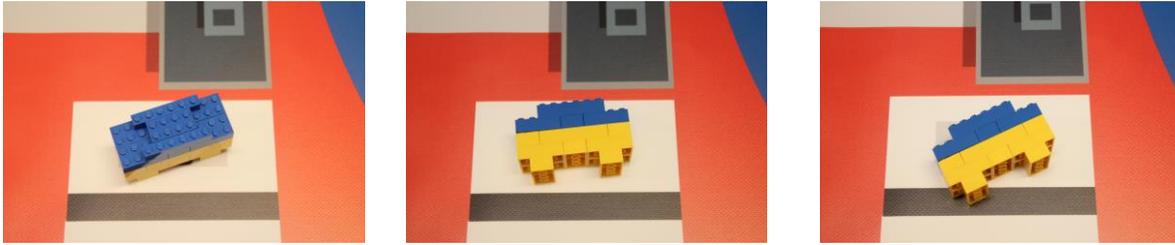


<<< In this case, only **points for one object** are awarded.

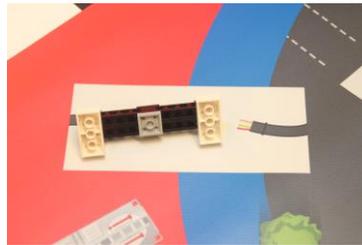
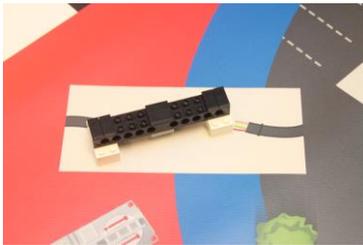
Supply delivered partly in a **correct** target area → 7 points



Supply delivered completely or partly in a **wrong** supply target area → 4 points

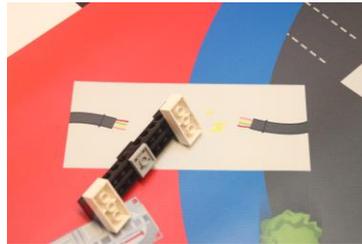
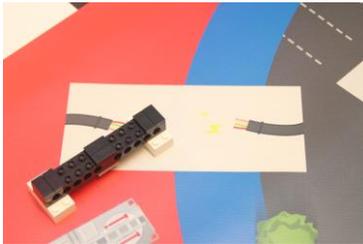


Each **white end** of the electric cable touches the target areas → 14 points

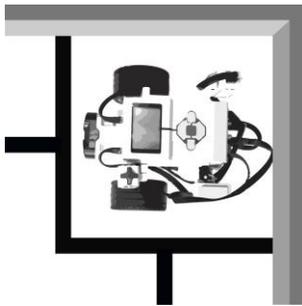


*All situations for full points.  
The object can lie on the site,  
but the two white ends need  
to touch the area.*

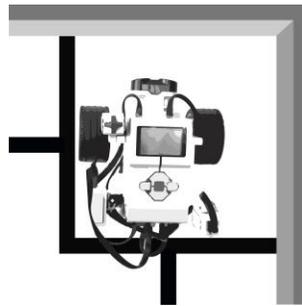
Only one **white end** of the electric cable is touching a target area. → 8 points



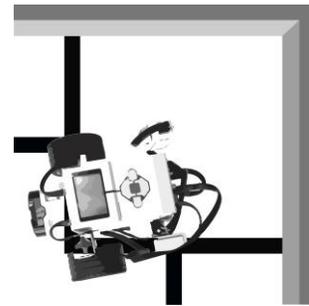
Robot completely stops within either one of the Start & Finish Areas → 11 points



The projection of the robot is completely inside the start/finish area.

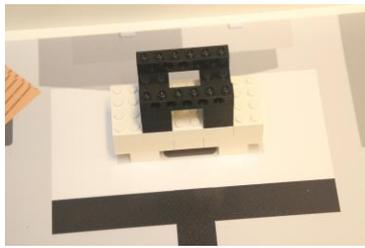


The projection of the robot is completely inside, and cables are out. That is still OK.

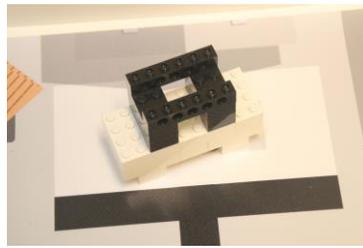


**No points** if the projection of the robot is not in the start/finish area.

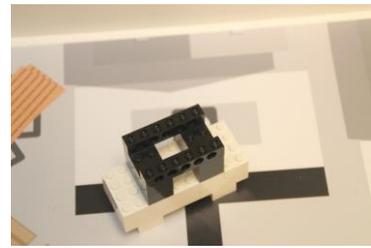
Power generator not moved or damaged → 14 points



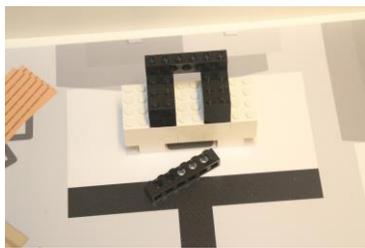
14 points



14 points, a bit moved but still in white area.

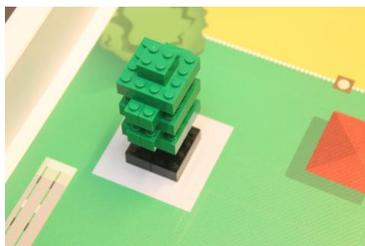


0 points, moved outside of white area



0 points, damaged

Tree moved or damaged → -4 points



OK, not moved.



OK, only moved inside the grey area.



-4 points, moved outside of grey area.



-4 points, damaged.

## 6. Local, regional, and international events

WRO competitions take place in around 80 countries, and we know that teams in each country expect a different level of complexity. The challenge as described in this document will be used for international WRO events.

WRO feels that all participants need to be able to have a good experience in the competition. Teams with less experience should also be able to score points and succeed. This builds confidence in their ability to master technical skills, which is important for their future choices in education.

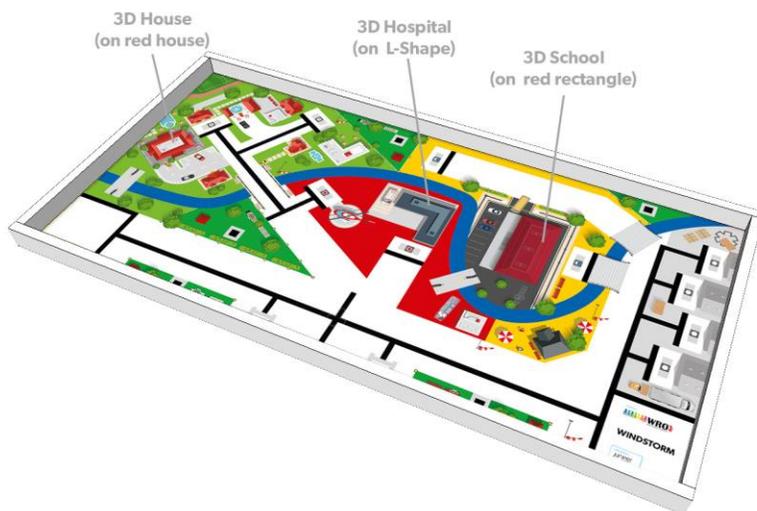
**In every country, our National Organizers can decide to make the challenge easier for local, regional and / or national events. They can make their own choices, that fit their specific situation. Here we provide some ideas to make the challenges easier.**

### Ideas for simplifications:

- Remove two trees.
- Announce a fixed position of the emergency supplies before the competition.
- Make it the team's choice in which start area they want to start.

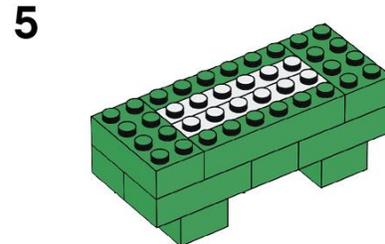
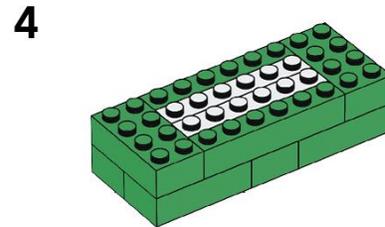
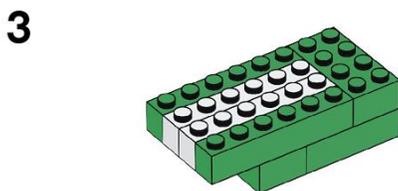
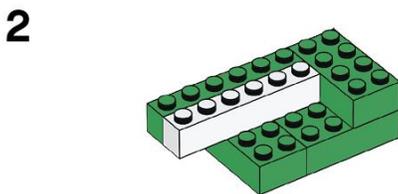
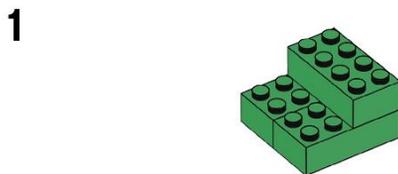
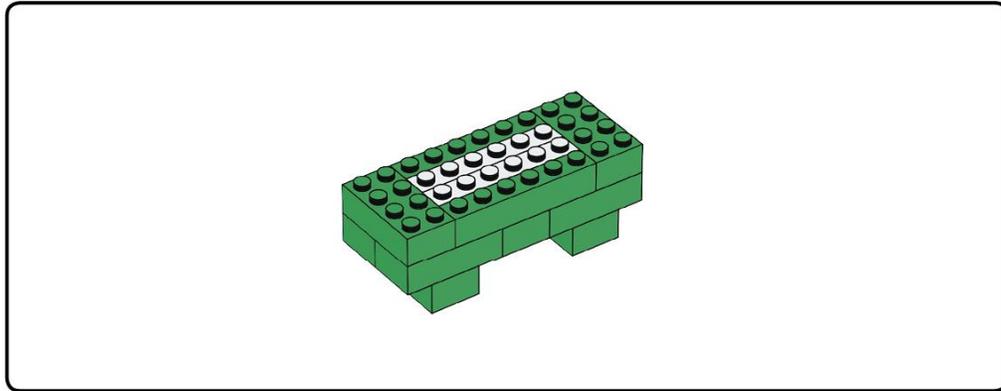
### Special conditions at the International Final

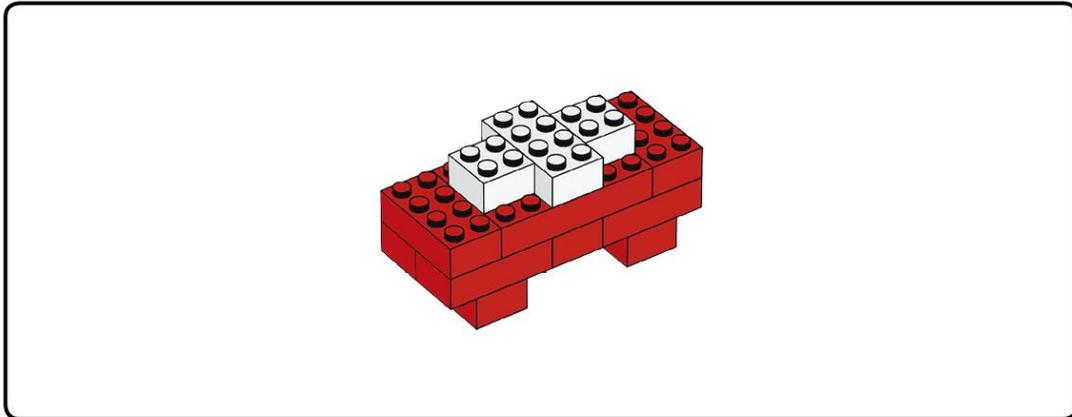
At the International Final, physical constructions might be installed on the following locations: School, Hospital, main residential building. The robot needs to avoid these 3D elements. The 3D elements are installed on the areas you can see in the following graphic.



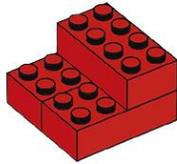
The Host Country will inform about these 3D elements no later than September 1<sup>st</sup>, 2020.

## 7. Assembly of Game Objects

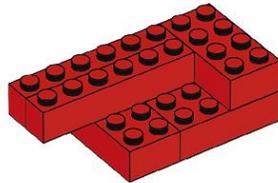




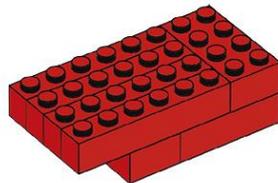
1



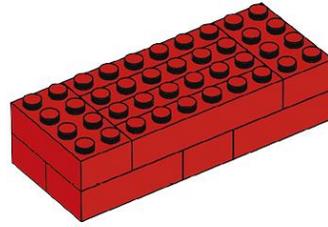
2



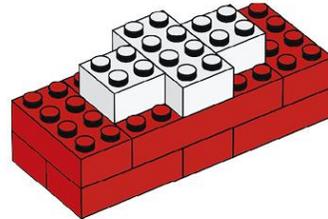
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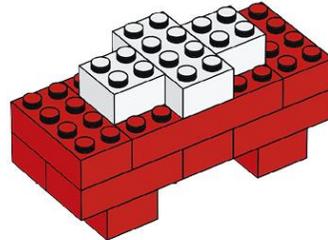
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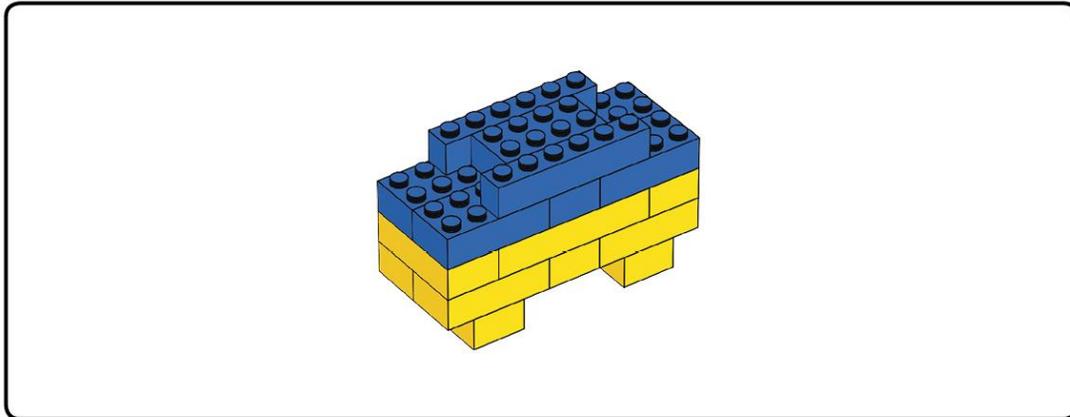


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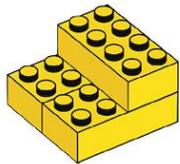


6

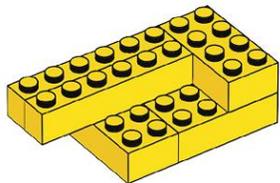




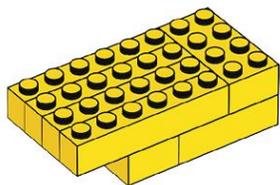
1



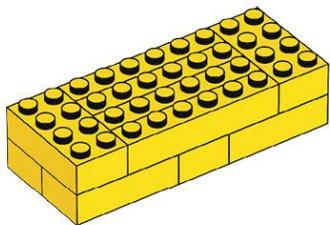
2



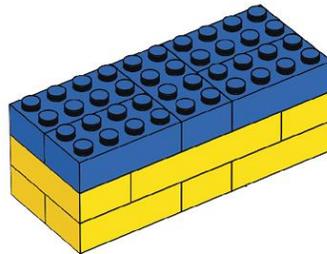
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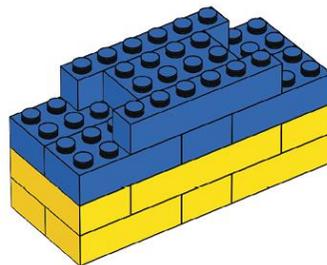
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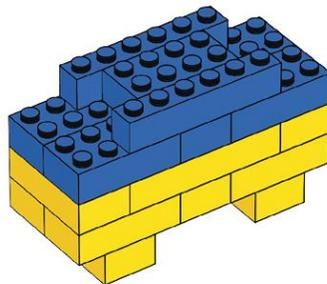
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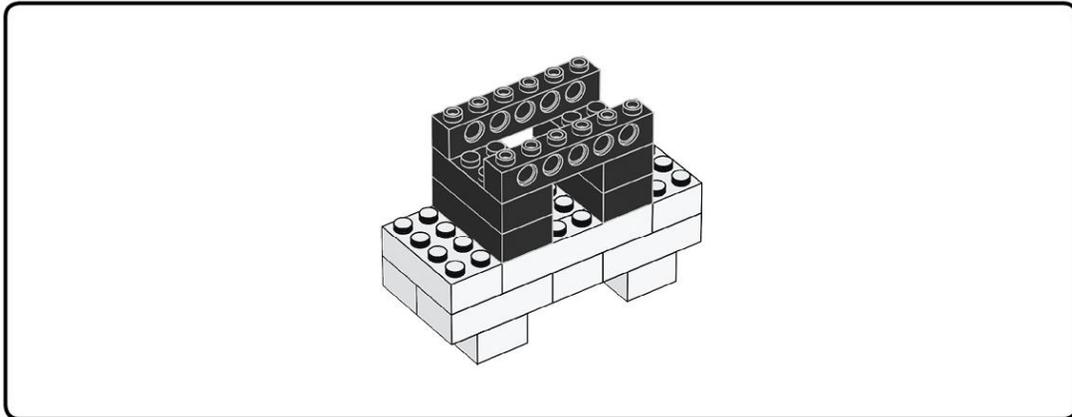


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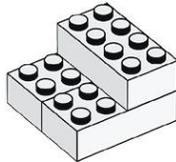


7

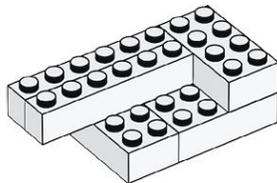




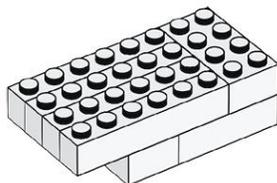
1



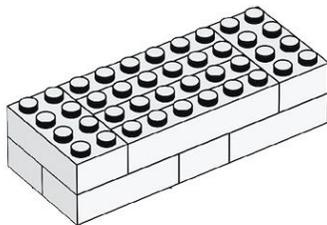
2



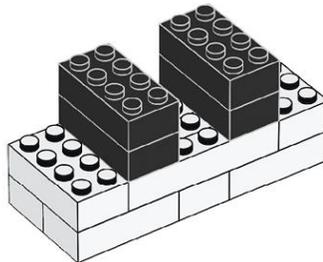
3



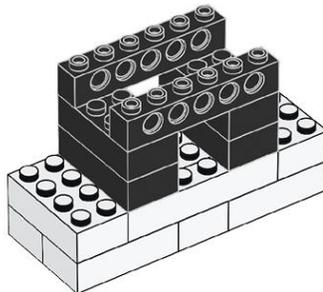
4



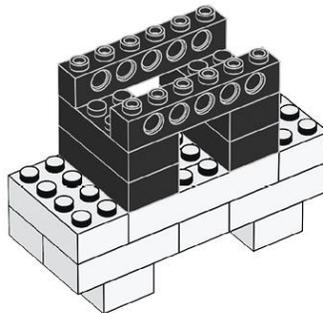
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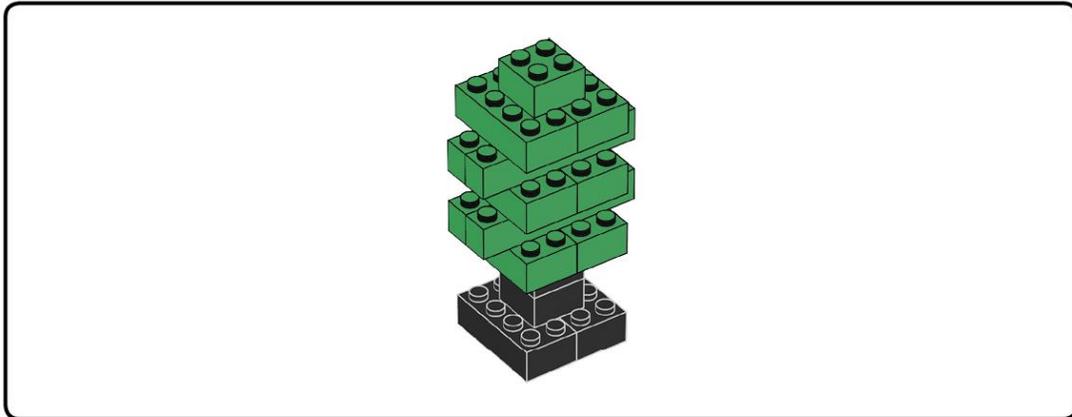


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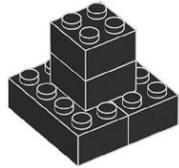


7

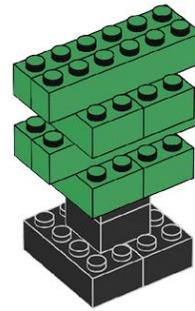




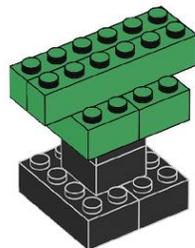
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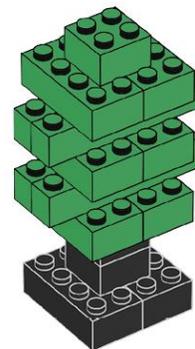
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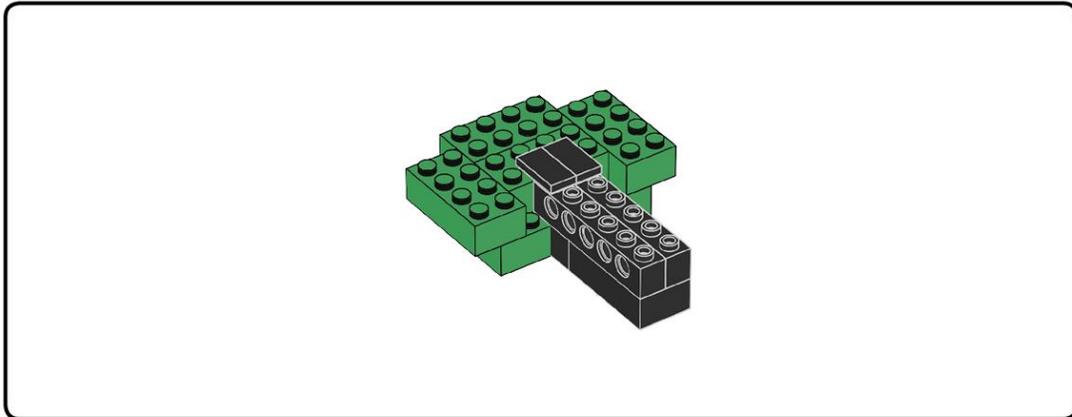


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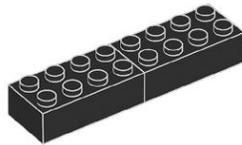


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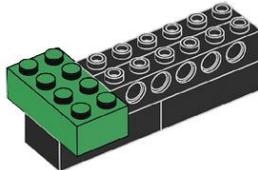




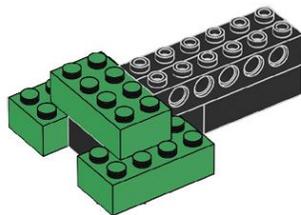
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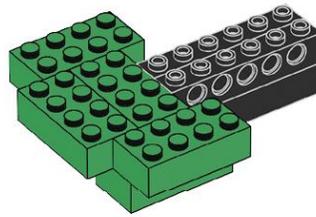
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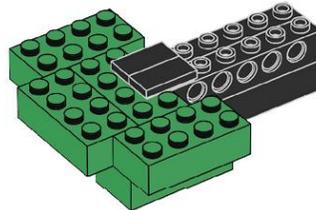
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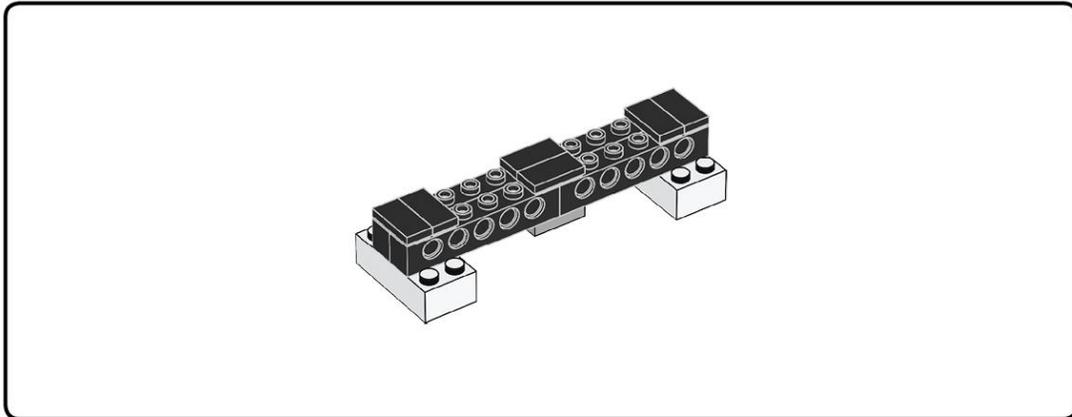


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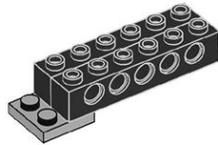


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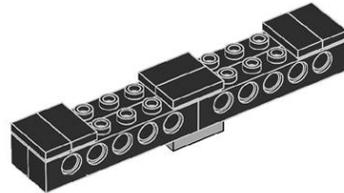




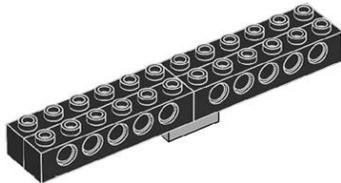
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3



2



4

