

# FLL “HYDRO DYNAMICS<sup>SM</sup>” – RULES & ROBOT GAME

At the FLL Robot Game, the FLL teams compete with robots they have built in advance out of LEGO<sup>®</sup> parts and programmed by themselves. Within 2 ½ minutes they try on the approximately 2 m<sup>2</sup> large playing field, to get as many points. The robot must act autonomously, all movements must be performed independently by the program. Remote controls are not allowed.

At all tournaments of a season, the same playing fields and missions are used worldwide. The way in which the objects are achieved and the order in which they are dissolved, are not prescribed. Accordingly, the robots of the teams look completely different, even though they are all built from LEGO<sup>®</sup>.

## CONTENT

<b>1. RULES</b> .....	<b>3</b>
1.1 Guiding Principles .....	3
GP01 – Gracious Professionalism .....	3
GP02 – Interpretation .....	3
GP03 – Benefit of the Doubt .....	3
GP04 – Variability.....	3
GP05 – Information Superiority .....	3
1.2 Definitions .....	4
D01 – Match.....	4
D02 – Mission .....	4
D03 – Equipment .....	4
D04 – Robot.....	4
D05 – Mission Model.....	4
D06 – Field.....	4
D07 – Base .....	4
D08 – Launch.....	5
D09 – Interruption.....	5
D10 – Transporting.....	5
1.3 Equipment, Software, and People .....	5
R01 – All Equipment.....	5
R02 – Controllers .....	5
R03 – Motors.....	6
R04 – External Sensors .....	6
R05 – Other Electric/Electronic Things.....	7
R06 – Non-electric Elements.....	7
R07 – Software .....	7
R08 – Technicians.....	7
1.4 Robot Game.....	7
R09 – Before the Match Timer Starts.....	7
R10 – Handling During the Match .....	7

R11 – Mission Model Handling.....	8
R12 – Storage.....	8
R13 – Launching.....	8
R14 – Interrupting.....	8
R15 – Stranding.....	9
R16 – Interference.....	9
R17 – Field Damage.....	9
R18 – End of the Match.....	9
R19 – Scoring.....	9
1.5 Questions Regarding Rules, Robot Game & Field Setup.....	10
1.6 Serious Changes for 2017/18.....	10
<b>2. ROBOT GAME 2017/18 – “HYDRO DYNAMICS<sup>SM</sup>”.....</b>	<b>11</b>
2.1 General Field Set up & Placement.....	11
Overview.....	11
Field Mat Placement.....	11
Mission Model Construction.....	13
Dual Lock.....	13
Arrangement of Models and Setup.....	14
Field Maintenance.....	14
2.2 Missions: Field Setup & Placement, Tasks Description, Constraints & Evaluation.....	15
BASE.....	15
M01. PIPE REMOVAL.....	156
M02. FLOW.....	18
M03. PUMP ADDITION.....	19
M04. RAIN.....	20
M05. FILTER.....	21
M06. WATER TREATMENT.....	22
M07. FOUNTAIN.....	24
M08. MANHOLE COVERS.....	25
M09. TRIPOD.....	26
M10. PIPE REPLACEMENT.....	27
M11. PIPE CONSTRUCTION.....	29
M12. SLUDGE.....	30
M13. FLOWER.....	31
M14. WATER WELL.....	32
M15. FIRE.....	33
M16. WATER COLLECTION.....	34
M17. SLINGSHOT.....	36
M18. FAUCET.....	37
PENALTIES.....	38

# 1. RULES

## 1.1 Guiding Principles

### GP01 – Gracious Professionalism

- The FLL Tournament should be driven by fairness.
- You compete hard against problems, while treating all people with respect and kindness.
- If you joined FIRST® LEGO® League with a main goal of “winning a robotics competition,” you’re in the wrong place!

### GP02 – Interpretation

- **If a detail isn’t mentioned, it doesn’t matter.**
- The Robot Game text means exactly and only what it plainly says.
- If a word isn’t given a game definition, use its common conversational meaning.

### GP03 – Benefit of the Doubt

- If the referee feels something is a “very tough call,” and no one can point to strong text in any particular direction, you get the “benefit of the doubt.”
- This good-faith courtesy is not to be used as a strategy.

### GP04 – Variability

- Our partners and volunteers try hard to make all fields correct and identical, but you should always expect little defects and differences.
- Top teams design with these in mind.
- Examples include border wall splinters, lighting changes, and field mat wrinkles.
- Questions about conditions at a particular tournament should be directed to that tournament’s officials, the contact dates you can find at the [FLL Regional Websites](#).

### GP05 – Information Superiority

- If two official facts disagree, or confuse you when read together, here’s the order of their authority (with 1 being the strongest):
  - 1 = [Current Robot Game updates \(FAQ\)](#)
  - 2 = [Missions and Field Setup](#)
  - 3 = [Rules](#)
  - 4 = Local head referees – in unclear situations, local head referees may make good-faith decisions after discussion, with rule GP03 in mind.
- Pictures and videos have no authority, except when talked about in one, two or three.
- Emails and forum comments have no authority.

## 1.2 Definitions

### D01 – Match

- A “match” is when two teams play opposite each other on two fields placed north to north.
- Matches last 2½ minutes, and the timer never pauses.
- Your robot launches one or more times from base and tries as many missions as possible.

### D02 – Mission

- A “mission” is an opportunity for the robot to earn points.
- Missions are written in the form of requirements.
- Most are results that must be visible to the referee at the end of the match.
- Some are actions that must be watched/approved by the referee as they happen.
- If a mission has any “more” requirements, they must all be met, or the whole mission scores zero.

### D03 – Equipment

- “Equipment” is everything you bring to a match for a mission-related activity.

### D04 – Robot

- Your “robot” is your LEGO® MINDSTORMS® controller and all the equipment you’ve combined with it by hand which is not intended to separate from it, except by hand.

### D05 – Mission Model

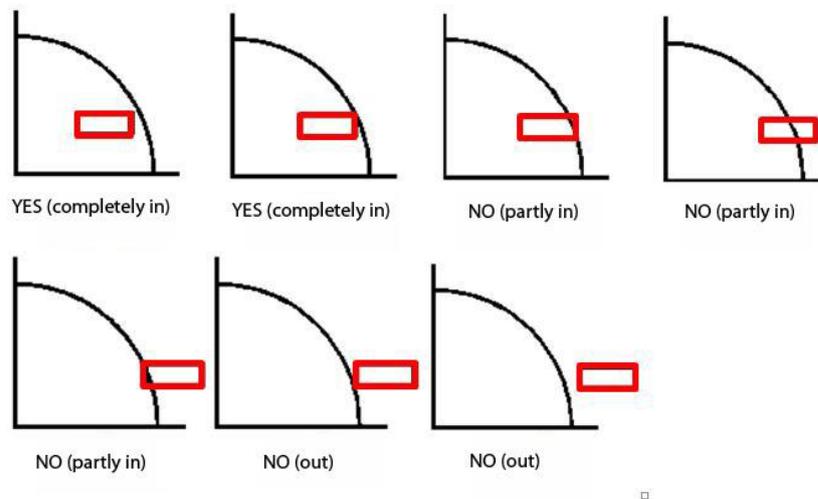
- A “mission model” is any LEGO® element or structure already at the field when you get there.
- Mission models are not the same as “equipment”.

### D06 – Field

- The “field” is the robot’s game environment, consisting of mission models on a mat, surrounded by border walls, all on a table.
- “Base” is part of the field.
- For full details, [see Field Setup](#).

### D07 – Base

- “Base” is the space directly above the field’s larger quarter-circle region, in the southwest corner.
- It extends southwest from the outer curved line to the corner walls (no further), and has no ceiling.
- The diagrams below define “completely in” for base, but apply for any area.



#### D08 – Launch

- Whenever you're done with handling the robot and then you make it go, that's a "launch."

#### D09 – Interruption

- The next time you interact with the robot after launching it, that's an "interruption."

#### D10 – Transporting

When a thing (anything) is purposefully/strategically being...

- taken from its place, and/or
- moved to a new place, and/or
- being released in a new place,

it is being "transported." The process of being transported ends when the thing being transported is no longer in contact with whatever was transporting it.

### 1.3 Equipment, Software, and People

#### R01 – All Equipment

All equipment must be made of LEGO®-made building parts in original factory condition.

- Except: LEGO® string and tubing may be cut shorter.
- Except: Program reminders on paper are okay (off the field).
- Except: Marker may be used in hidden areas for identification.

#### R02 – Controllers

- You are allowed to use only one individual controller in any particular match.
- It must exactly match a type shown below (except color).



EV3



NXT



RCX

- All other controllers must be left in the Pit Area for that match.
- All remote control or data exchange with robots (including bluetooth) in the competition area is illegal.
- This rule limits you to **only one individual robot** in any particular match.

### R03 – Motors

- You are allowed to use up to four individual motors in any particular match.
- Each one must exactly match a type shown below.
- You may include more than one of a type, but again, your grand total may not be greater than FOUR.
- ALL other motors must be left in the Pit Area for that match, **no exceptions**.



EV3 "LARGE"



EV3 "MEDIUM"



NXT



RCX

### R04 – External Sensors

- Use as many external sensors as you like.
- Each one must exactly match a type shown below.
- You may include more than one of each type.



EV3 TOUCH



EV3 COLOR



EV3 ULTRASONIC



EV3 GYRO/ANGLE



NXT TOUCH



NXT LIGHT



NXT COLOR



NXT ULTRASONIC



RCX TOUCH



RCX LIGHT



RCX ROTATION

#### **R05 – Other Electric/Electronic Things**

- No other electric/electronic things are allowed in the competition area for mission-related activity.
- Except: LEGO® wires and converter cables are allowed as needed.
- Except: Allowable power sources are one controller’s power pack or six AA batteries.

#### **R06 – Non-electric Elements**

- Use as many non-electric LEGO® elements as you like, from any set.
- Except: Factory-made wind-up/pull-back “motors” are not allowed.
- Except: Additional/duplicate mission models are not allowed.

#### **R07 – Software**

- The robot may only be programmed using LEGO® MINDSTORMS® RCX, NXT, EV3, or RoboLab software (any release).
- No other software is allowed.
- Patches, add-ons, and new versions of the allowable software from the manufacturers (LEGO® and National Instruments) are allowed, but tool kits, including the LabVIEW tool kit, are not allowed.

#### **R08 – Technicians**

- Only two team members, called “technicians,” are allowed at the competition field at once.
- Except: Others may step in for true emergency repairs during the match, then step away.
- The rest of the team must stand back as directed by tournament officials, with the expectation of fresh technicians being able to switch places with current technicians at any time if desired.

### **1.4 Robot Game**

#### **R09 – Before the Match Timer Starts**

- After getting to the field on time, you have at least one minute to prepare.
- During this special time only, you may also ...
  - ask the referee to be sure a mission model or setup is correct, and/or
  - calibrate light/color sensors anywhere you like.

#### **R10 – Handling During the Match**

- Only the robot is allowed to interact with any part of the field that’s not COMPLETELY in base.

- Except: You may interrupt the robot any time.
- Except: You may pick up equipment that broke off the robot unintentionally, anywhere, any time.
- You are not allowed to cause anything to move or extend over the base line, even partly.
  - Except: Of course, you may **launch** the robot.
  - Except: You may move/handle/**store** things off the field, any time.
  - Except: If something accidentally crosses the base line, just calmly take it back – no problem.
- Anything the robot affects (good or bad!) or puts completely outside base stays as is unless the robot changes it. Nothing is ever repositioned so you can “try again.”

#### **R11 – Mission Model Handling**

- You are not allowed to take mission models apart, even temporarily.
- If you combine a mission model with something (including the robot), the combination must be loose enough that if asked to do so, you could pick the mission model up and nothing else would come with it.

#### **R12 – Storage**

- Anything completely in base may be moved/stored off the field, but must stay in view of the referee, on a stand.
- Everything in off-field storage “counts” as being completely in base.

#### **R13 – Launching**

A proper launch (or re-launch) goes like this:

- Ready situation
  - Your robot and everything in base which is about to move or use is arranged by hand as you like, all fitting completely in base and measuring no taller than 12 inches” (30.5 cm).
  - The referee can see that nothing on the field is moving or being handled.
- Go!
  - Reach down and touch a button or signal a sensor to activate a program.
- First launch of the match – here, accurate fair timing is needed, so the exact time to launch is the beginning of the last word/sound in the countdown, such as “Ready, set, GO!” or BEEEEEP!

#### **R14 – Interrupting**

- If you interrupt the robot, you must stop it immediately, \*then calmly pick it up for a re-launch (\*if you intend one).
- Here’s what happens to the robot and anything it was transporting, depending on where each was at the time:
- Robot
  - Completely in base: re-launch.
  - NOT completely in base: re-launch + penalty.
- Transported thing
  - Completely in base: keep it.

- NOT completely in base: give it to the referee.
- The “penalty” is described with the missions.

#### **R15 – Stranding**

- If the uninterrupted robot loses something it was transporting, that thing must be allowed to come to rest.
- Once it does, here’s what happens to that thing, depending on its rest location...
- Transported thing
  - Completely in base: keep it.
  - Partly in base: give it to the referee.
  - Completely outside base: leave as is.

#### **R16 – Interference**

- You are not allowed to negatively affect the other team except as described in a mission.
- Missions the other team tries but fails to get because of illegal action by you or your robot will count for them.

#### **R17 – Field Damage**

- If the robot separates Dual Lock or breaks a mission model, missions obviously made possible or easier by this damage or the action that caused it do not score.

#### **R18 – End of the Match**

- As the match ends, everything must be preserved exactly as-is.
  - If your robot is moving, stop it as soon as possible and leave it in place. (Changes after the end don’t count.)
  - After that, hands off everything until the referee has given the “okay” to reset the table.

#### **R19 – Scoring**

- Scoresheet/Scoringsoftware: The referee discusses what happened and inspects the field with you, mission by mission.
  - If you agree with everything, you sign the sheet, and the scoresheet is final.
  - If you don’t agree with something, the head referee makes the final decision.
- Impact: Only your best score from regular match counts toward awards/advancement.

## 1.5 Questions Regarding Rules, Robot Game & Field Setup

- Important questions are published at the “[FAQ](#)” section for all teams.
- For official answers to questions send an email to HANDS on TECHNOLOGY e.V. [fill@hands-on-technology.org](mailto:fill@hands-on-technology.org).
- Questions will be answered in due time.

## 1.6 Serious Changes for 2017/18

- The word “objects” has been replaced with the word “things” for parallelism with the term “anything.”
- Definition of “transporting” is opened up for situations not directly involving the robot. (D10)
- Maximum equipment height UPON LAUNCH is now limited. (R13)

## 2. ROBOT GAME 2017/18 – “HYDRO DYNAMICS<sup>SM</sup>”

Have you ever wondered about where the water comes from that we daily use? Everyone needs water – to brush the teeth, to drink, to cook, or just to swim! Does it come from the ground, a river, or a lake? How do you know that the water you drink is clean and what happens with the water when it runs into the drain? In the HYDRO DYNAMICS<sup>SM</sup> Robot Game, you will explore all these and other questions and you will learn which incredible techniques are used to protect our water!

### 2.1 General FLL Field Set up & Placement

#### Overview



The field is where the FLL Robot Game takes place. It consists of a field mat on a table, with mission models arranged on top. The mat and the LEGO<sup>®</sup> pieces for building the mission models are part of your challenge set. The instructions for building the mission models are not part of the challenge set but available online:

[www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html](http://www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html).

The instructions how to build the FLL Tournament Table is online:

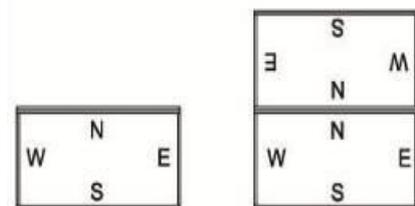
[www.first-lego-league.org/en/general/participation.html#4](http://www.first-lego-league.org/en/general/participation.html#4).

How to arrange the mission models on the playing field is explained in this document.

#### Field Mat Placement

**Step 1:** Remove any obvious splinters, and cover any obvious holes. Vacuum the table top carefully. Even the tiniest particle under the mat can give the robot trouble. After vacuuming, run your hand over the surface and sand or file down any producing imperfections you find. Then vacuum again.

**Step 2:** Place the mat on a smooth surface (for example, the FLL Table) and clearly mark it with a corresponding pitch limit (band), as it is common to FLL Tournaments. On the vacuumed surface

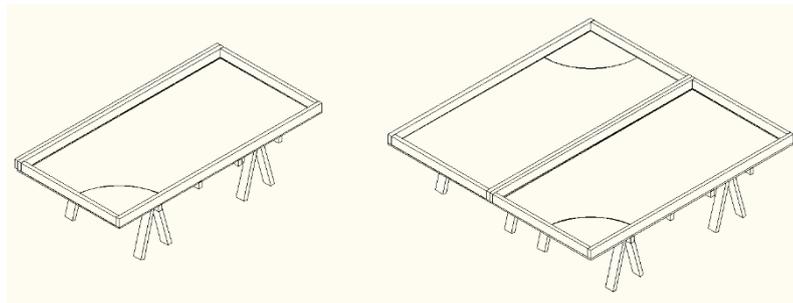


(never unroll the mat in an area where it could pick up particles), unroll the mat so the image is up and its north edge is near the north/double border wall (note the location of the double wall in each table sketch below). Be very careful to not let the mat kink from bending in two directions at once.

**Step 3:** The mat is smaller than the playing surface by design. Slide and align it so that there is no gap between the south edge of the mat and the south border wall. Center the mat in the east-west direction (look for equal gaps at left and right).

**Step 4:** With help from others, pull the mat at opposite ends and massage out any waviness away from the center and re-check the requirement of step three. It is expected that some waviness will persist, but that should relax over time. Some teams use a hair dryer to speed the relaxation of the waviness.

**Step 5 – OPTIONAL:** To hold the mat in place, you may use a thin strip of black tape at the east and west ends. Where the tape sticks to the mat, it may cover the mat's black border only. Where the tape sticks to the table, it may stick to the horizontal surface only, and not the border walls. You can also fix the mat with double faced adhesive tape you stick under the mat to fix it on the table.



**Step 6:** For a competition setup, secure two tables north-to-north. The total span of border between two tables must measure between 76 mm and 100 mm. At a tournament, two tables are placed back to back, but you only operate on one table, so you only need to build one table to practice on.

**Dummy Wall:** Most Robot Games have a “shared” mission for both teams, whose mission model(s) rest partly on your table, and partly on the other team's table, which is connected to your table's north side. You don't need to build a second table, but you do need to build the necessary part of the other team's table, so the shared mission model(s) can be positioned correctly. In the photo you can see, how a dummy wall can look like. In this season, a dummy wall is not mandatory.



## Mission Model Construction

Build the mission models. Use the LEGO® elements from your challenge set, and instructions from this page:

[www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html](http://www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html).

It will take a single person 4–5 hours to do this, so it's best done in a work party. For any team members with little or no experience building with LEGO® elements, mission model construction is a great way to learn. This step is also a nice time for new team members to get to know each other.

The models must be built PERFECTLY. “Almost perfect” is NOT good enough. Many teams make several building errors and practice all season with incorrect models. When these teams later compete on fields with correct models, the robot fails. The team incorrectly blames the robot, the tournament organizers, or bad luck for the failure. Best practice is to have several people check for correctness. PLEASE!

## Dual Lock

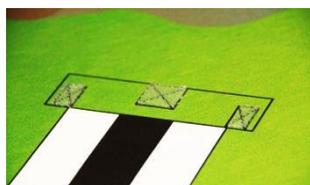
Some models are “secured” to the mat, others are simply “placed” on the mat. Each place on the mat where a model needs to be secured has a white box with an X in it. The connection is made using the re-usable fastening material from 3M called Dual Lock, which comes in the flat clear bag with the LEGO® elements in your challenge set. Dual Lock is designed to stick or “lock” to itself when two faces of it are pressed together, but you can unlock it too, for ease of transport and storage. The application process for the Dual Lock is only needed once. Later, the models can simply be locked onto the mat or unlocked. To apply Dual Lock proceed one model at a time as follows:

**Step 1:** Stick one square, adhesive side DOWN, on each box you see on the mat with an “X” in it.

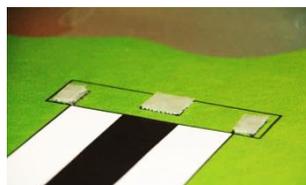
For half-sized boxes, cut the squares in half.

**Step 2:** Press a second square on top of each of those, “locking” them on, adhesive side UP. Instead of using your finger, use a bit of the wax paper the squares came on.

**Step 3:** Align the Model exactly over its mark, and lower/press it onto the squares.



Step 1



Step 2



Step 3

**Hints:** Pay attention. Some models look symmetrical, but do indicate a directional model feature somewhere. Be sure to place each square precisely on its box, and each model precisely over its marks. When pressing a model down, press down on its lowest solid structure instead of crushing the whole model. Pull on that same structure if later you need to separate the model from the mat.

For large and/or flexible models, apply only one or two pairs at a time. There's no need to do it all at once.

## Arrangement of Models and Setup

Marks on mat along with the text and pictures in the Robot Game section give most of the information you need to arrange and set the models (place/set as pictured). Any details not shown in pictures or mentioned in the text are left to chance and officially don't matter.

## Field Maintenance

### **Border Walls**

Remove any obvious splinters, and cover any obvious holes.

### **Field Mat**

Make sure the mat touches the south border wall, and is centered east to west.

Avoid cleaning the mat with anything that will leave a residue. Any residue, sticky or slippery, will affect the robot's performance. Use a vacuum and/or damp cloth for dust and debris (above and below the mat). When moving the mat for transport and storage, be sure not to let it bend into a sharp kink point, which could affect the robot's movement. Do NOT put Dual Lock under the mat, or use it in any other than securing mission models as described.

### **Mission Models**

Keep the mission models in original condition by straightening and tightening solid connections often. Ensure that spinning axles spin freely by checking for end-to-end play.

## 2.2 Missions: Field Setup & Placement, Tasks Description, Constraints & Evaluation

### BASE

The quarter-circle at southwest is base.

Before the start the following objects are completely and loose in base:

- Water well
- Tripod
- The optional loop
- 2 new pipes
- 3 big water
- Slingshot loaded with 1 raindrop and 1 dirty water

You may keep all these models anywhere in base, or in other approved off-table storage.



Base

### FIELD





**BARRIERS:** Secure each one with Dual Lock on the marks on the mat with its smooth side facing west (as you can see it in the photo). There are 6 barriers.



Barrier

**CURBS:** Secure curbs on the mat with wedges facing the circles (as you can see it in the photo). There are 2 curbs.



Curb

## M01. PIPE REMOVAL

### FIELD SETUP & PLACEMENT

**Fig. 1:** Place loose in the pipe repair setup per details below (compare [M10](#)).

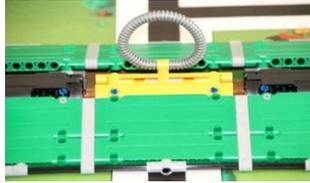


Fig. 1

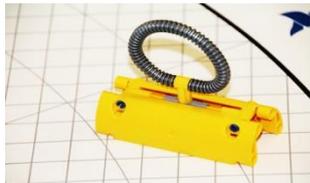
### MISSION

Move the broken pipe so it is completely in base.

### END OF THE MATCH

The broken pipe is completely in base.

**Points: 20**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M02. FLOW

### FIELD SETUP & PLACEMENT

**Fig. 1:** Locate Dual Lock pairs exactly and only in the places shown.

**Fig. 2:** Secure the model to the north border wall within its marks.

**Fig. 3:** Load a big water into the model.



Fig. 1



Fig. 2



Fig. 3

### MISSION

Move a big water (one time maximum) to the other team's field only by turning the pump system's valve(s).

### END OF THE MATCH

A big water is placed on the other team's field.

**Points: 25**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- Only one big water is allowed to be placed on the other team's field.
- Move the big water to the other team's field only by turning the pump system's valve(s).

## M03. PUMP ADDITION

### FIELD SETUP & PLACEMENT

**Fig. 1:** Place loose on the matching marks on the field.

**Fig. 2:** Pump addition target extends to the north wall.



Fig. 1



Fig. 2

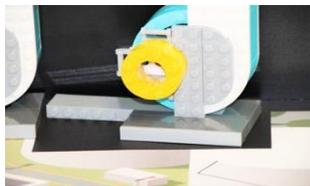
### MISSION

Move the pump addition so it has contact with the mat and that contact is completely in the pump addition target.

### END OF THE MATCH

The pump addition has contact with the mat and that contact is completely in the pump addition target.

**Points: 20**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M04. RAIN

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure on the marks on the mat with cloud part facing east.

**Figs. 2 and 3:** Move yellow bar north while evenly spreading 8 rain into the top. Perfectly even spread is not expected.



Fig. 1



Fig. 2



Fig. 3

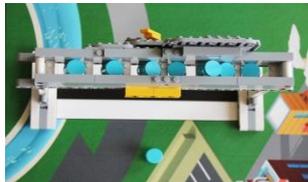
### MISSION

Make at least one rain come out of the rain cloud.

### END OF THE MATCH

At least one rain came out of the rain cloud.

**Points: 20**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M05. FILTER

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure the model on its marks on the mat.

**Fig. 2:** Lift the lock lever (*red arrow* in Fig. 2), and pull the yellow plunger with the white filter south to its mark.

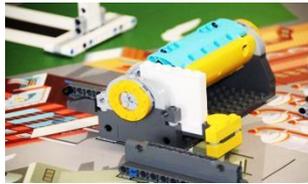


Fig. 1



Fig. 2

### MISSION

Move the filter north until the lock latch drops.

### END OF THE MATCH

The lock latch of the filter has dropped.

**Points: 30**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M06. WATER TREATMENT

### FIELD SETUP & PLACEMENT

**Fig. 1:** Total view.

**Fig. 2:** Secure the toilet on its marks on the mat, with the east axle joined to it.

**Fig. 3:** Place the center axle exactly above its mark and secure both guides of the axis on its marks on the mat.

**Fig. 4:** Secure the two water treatment model's guides with Dual Lock on its marks on the mat. Then remove them.

**Fig. 5:** Join the west axle and water treatment model, and fit the model as accurately as possible but loose onto its mark (Fig. 5 shows it positioned and loaded).

**Fig. 6:** Secure the guides on the Dual Locks. Make sure that the axes are exactly positioned above their marks and check that the joiners are not rubbing against the bearings.

**Fig 7a–c:** Lift the white tank (Fig. 7a) while pushing the gray bar west (Fig. 7b), then load the sludge and a big water to finish the positioning (*red arrows* in Fig. 7c).



Fig. 1



Fig. 2

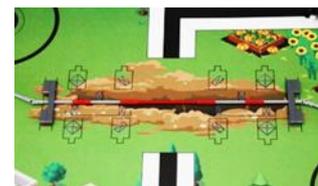


Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7a



Fig. 7b



Fig. 7c

**TESTING:** Push the toilet's yellow lever down and hold it there. The push should take very little force, and should cause the water treatment model to eject the big water and sludge. If there is binding, re-trace each step carefully.

### MISSION

Make the water treatment model eject its big water, only by moving the toilet's lever.

### END OF THE MATCH

The water treatment model ejected a big water.

**Points: 20**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The water treatment model ejects its big water, only by moving the toilet's lever.

## M07. FOUNTAIN

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure the fountain with Dual Lock on the marks on the mat.



Fig. 1

### MISSION

Make the fountain's middle layer rise some obvious height and stay there, due only to a big water in the gray tub.

### END OF THE MATCH

The fountain's middle layer rises some obvious height and stays there.

**Points: 20**



No Points



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The fountain's middle layer rises some obvious height, due only to a big water in the gray tub.

## M08. MANHOLE COVERS

### FIELD SETUP & PLACEMENT

**Figs. 1 and 2:** Place loose on its marks on the mat. Either cover can go on east or west mark, and spin is random.



Fig. 1

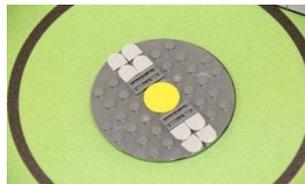


Fig. 2

### MISSION

Flip manhole cover(s) over, obviously past vertical without it/them ever reaching base.

### END OF THE MATCH

Manhole cover(s) flipped over, obviously past vertical.

**Points: 15 each cover**

**BONUS:** Score manhole cover points as described above with both covers completely in its targets (the two big circles, see Fig. 3).

**Points: 30 added**



End



End



Fig. 3



Bonus



No Bonus

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- Manhole cover(s) flipped over, obviously past vertical.
- Manhole cover(s) flipped over without it/them ever reaching base.
- Each manhole cover is scored individually.
- For Bonus both covers must be completely in separate tripod targets.

## M09. TRIPOD

### FIELD SETUP & PLACEMENT

**Fig. 1:** The tripod targets are the two large circles only (*red arrows* in Fig. 1).



Fig. 1

### MISSION

Move the inspection camera tripod.

### END OF THE MATCH

**OPTION 1:** The camera tripod is partly in either tripod target, with all of its feet touching the mat.

**Points: 15**

**OPTION 2:** The camera tripod is completely in either tripod target, with all of its feet touching the mat.

**Points: 20**



End Option 1



End Option 2



No Points

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M10. PIPE REPLACEMENT

Optional: Install first in base the optional loop on a blue pipe.

### FIELD SETUP & PLACEMENT

**Figs. 1 and 2:** Secure both ramps on the marks and push them down.

**Figs. 3 and 4:** Apply the Dual Lock for the black pipes. Place the black pipes on their marks. Make sure the black pipes are not rubbing the axle of M06 (Fig. 4).

**Fig. 5:** Place the broken yellow pipe centered between the ramps and black pipes. Be sure the loop is vertical and parallel to the ramps.

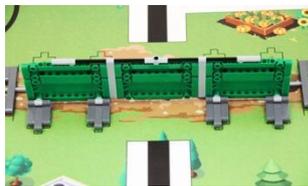


Fig. 1



Fig. 2



Fig. 3

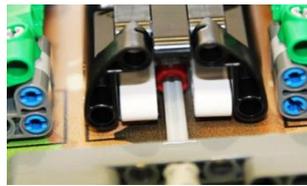


Fig. 4

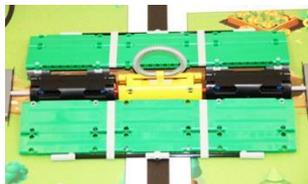


Fig. 5

### MISSION

Replace the broken yellow pipe by a new blue pipe.

### END OF THE MATCH

The new blue pipe lies between both black pipes in full/flat contact (Fig. 6) with the mat.

**Points: 20**

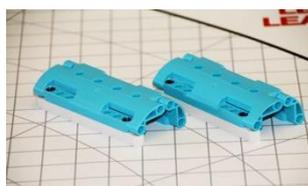


Fig. 6



No Points



End



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M11. PIPE CONSTRUCTION

Optional: Install first in base the optional loop on a blue pipe.

### FIELD SETUP & PLACEMENT

**Fig. 1:** The target extends to the north wall.

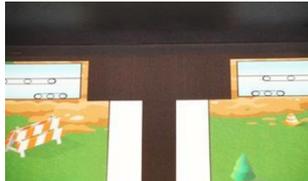


Fig. 1

### MISSION

Move a new pipe.

### END OF THE MATCH

**OPTION 1:** Move a new pipe so it is partly in its target, in full/flat contact (see Fig. 6 in [M10](#)) with the mat.

**Points: 15**

**OPTION 2:** Move a new pipe so it is completely in its target, in full/flat contact with the mat.

**Points: 20**



No Points



Option 1



Option 2

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M12. SLUDGE

### FIELD SETUP & PLACEMENT

**Fig. 1:** Place the sludge loose on the water treatment model (see also [M06](#)).



Fig. 1

### MISSION

Move the sludge so it is touching the visible wood of any of the six garden boxes.

### END OF THE MATCH

The Sludge touches the visible wood of any of the six garden boxes.

**Points: 30**



No Points



End



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M13. FLOWER

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure with Dual Lock on its marks on the mat with bloom part down on the mark.



Fig. 1

### MISSION

Make the Flower rise some obvious height and stay there, due only to a big water in the brown pot.

### END OF THE MATCH

The Flower rises some obvious height and stays there.

**Points: 30**

**BONUS:** Score flower points as described above with at least one rain in the purple part, touching nothing but the flower model.

**Points: 30 added**



End



End



End



Bonus

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The flower rose due only to a big water placed there.

## M14. WATER WELL

### FIELD SETUP & PLACEMENT

**Fig. 1:** Target is this large circle only.

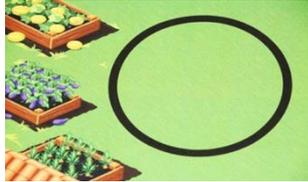


Fig. 1

### MISSION

Move the water well so it has contact with the mat in it's target.

### END OF THE MATCH

**OPTION 1:** The water well is moved so it has contact with the mat and that contact is partly in the water well target.

**Points: 15**

**OPTION 2:** The water well is moved so it has contact with the mat and that contact is completely in the water well target.

**Points: 25**



Option 1



Option 2

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M15. FIRE

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure the house model with Dual Lock on the mark on the mat, then lift the fire up, and push the yellow beam under it towards the house.

**Fig. 2:** Place firetruck loose on the marks.



Fig. 1



Fig. 2

### MISSION

Make the fire drop only by making the firetruck apply direct force to the house's yellow lever.

### END OF THE MATCH

The fire is dropped.

**Points: 25**



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The fire is dropped only by making the firetruck apply direct force to the house's yellow lever.

## M16. WATER COLLECTION

### FIELD SETUP & PLACEMENT

**Fig. 1:** Place target loose on the mark on the mat.

**Fig. 2:** The white off-limits line.



Fig. 1



Fig. 2

### MISSION

Move or catch big water and/or rain water (one rain maximum; no dirty water) so it is touching the mat in the water target. The target may be moved. But the target mustn't ever reach or cross the white off-limits line (the line also passes through under the ramp). Every water may be touching the target, and/or other water, but anything else. Each water model is scored as an individual.

### END OF THE MATCH

**OPTION 1:** At least one rain is in the target and touches the mat.

**Points: 10**

**OPTION 2:** One or several big water(s) lie(s) in the target and touches the mat in it.

**Points: 10 EACH**

**BONUS:** Score at least one big water in its target as described above with one on top, which is touching nothing but other water.

**Points: 30**



No Points



No Points



No Points



Option 1: min. 1 Rain  
= 10 Points



Option 2: 2 x big water  
= 20 Points



Option 2: 2 big water  
= 20 Points



No Bonus



Bonus

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The big water/the rain water should be moved without the target ever getting to the white off-limits line, even barely.
- Water may be touching the target, and/or other water, but not be touching nor guided by anything else.
- Each big water scores individual.
- Maximum one bonus can score.

## M17. SLINGSHOT

### FIELD SETUP & PLACEMENT

**Fig. 1:** Pull the the yellow plunger up and install a rain and the dirty water into the slingshot. Then close its black bar. Both raindrop and dirty water must be flat-side down. Rain or dirty water can be installed in either side randomly.

**Fig. 2:** The target is at the east wall. It does not include the barrier.

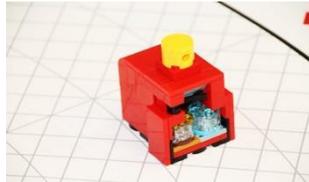


Fig. 1



Fig. 2

### MISSION

Move the slingshot so it is completely in its target.

### END OF THE MATCH

The slingshot it is completely in its target.

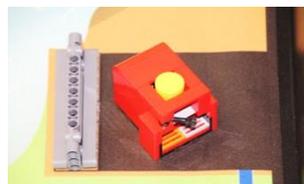
**Points: 20**

**BONUS:** Score slingshot points as described above with the dirty water and a rain completely in the slingshot target.

**Points: 15**



No Points



End



End



Bonus



Bonus

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.

## M18. FAUCET

### FIELD SETUP & PLACEMENT

**Fig. 1:** Secure the faucet with Dual Lock on the mark on the mat. The cup's white part is completely visible. Handle the yellow spin smooth, with a little resistance.



Fig. 1

### MISSION

Make the water level obviously more blue than white as seen from above the cup, only by turning the yellow faucet handle.

### END OF THE MATCH

The water level is obviously more blue than white as seen from above the cup.

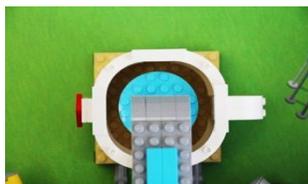
**Points: 25**



No Points



No Points



End



End

### CONSTRAINTS & EVALUATION

- Visible at the end of the match.
- The water level is changed only by turning the yellow faucet handle.

## PENALTIES

Before the match starts, the referee removes the 6 red penalty discs from the field, and holds on to them.

### FIELD SETUP & PLACEMENT

**Fig. 1:** 6 penalty discs are at the referee.

**Fig. 2:** The white triangle is in the southeast of the mat.

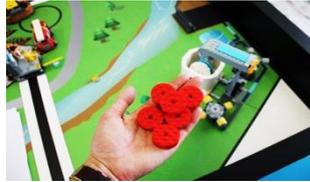


Fig. 1



Fig. 2

### DESCRIPTION

In the event of application of rule R14, the referee places one of the removed samples in the white triangle, in the southeast, as a permanent/untouchable interruption penalty. You can get up to 6 such penalties.

**Penalties: -5 Points each**

### CONSTRAINTS & EVALUATION

- After the match the referee keeps the not given penalties. They aren't part of the game anymore.