



# 2013 FLL Challenge

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# The Project

Prepare | Stay Safe | Rebuild

In the Nature's Fury<sup>SM</sup> Project, your team will:

- Identify a community that could experience a natural disaster
- Identify a problem that happens when a natural disaster occurs
- Create an innovative solution that helps people prepare, stay safe, or rebuild
- Share your problem and solution with others

## Think About It

Little did 10-year-old Tilly Smith know that her geography lesson would save her life. Tilly and her class sat quietly watching a video about a tsunami halfway around the world in Hawaii in the United States of America. They watched the ocean sizzle and froth and thought it looked like a fizzy drink being poured into a glass. They watched a wall of water rise up from the ocean and crash on the shore. They saw the damage left behind. It was interesting, but it seemed very far away from Surry, United Kingdom.

Then, Tilly and her family went to Phuket, Thailand, for winter holidays. On December 26, 2004, as Tilly and her family played on the beach, she noticed something strange. The ocean was bubbling — almost like a fizzy drink being poured into a glass.

Suddenly, Tilly realized where she had seen this strange sight before. She took action. Tilly told her parents that a tsunami was on the way. Tilly's parents had not learned about tsunamis in school, so they did not know what a tsunami was. She explained what she had learned and that everyone needed to get away from the beach fast. Tilly's parents took action, too. They shared what Tilly had learned and warned the hotel staff to get everyone to higher ground — just in case.

That day, the ocean did more than just splash on the beach. Not long after Tilly warned everyone, a huge wall of water washed across beaches, cars, buildings, and everything else near the water. Nobody died on the beach near Tilly's hotel. Thanks to Tilly, everyone got to safety before the huge wave arrived.

Others were not so lucky. The tsunami hit the coasts of 13 countries. The giant wave created by an undersea earthquake injured more than 600,000 people. Not everyone survived. Many, many people lost their homes. In some places, there was very little warning. The wave hit Sumatra just 30 minutes after the earthquake. It hit Tilly's beach less than two hours later.

### **What happens when forces of nature harm people and damage property? A natural disaster.**

Tsunamis are not the only forces of nature that can cause natural disasters. Our planet has been moving and changing for millions of years. When forces of nature damage communities or put many people in danger, it's called a natural disaster. Natural disasters of all kinds happen in every part of the world. Each year almost 250 million people find themselves in or near a natural disaster.



Think about it.

- Rain helps the plants grow and gives us water to drink. But what happens when the rain falls so hard that rivers, streams, and lakes spill onto dry land? A flood.
- When the wind blows, you can fly a kite or paper airplane. But what happens when the wind blows so hard that it knocks down houses or picks up cars? A tornado or a hurricane.
- Did you know that the ground under your feet is moving? Usually, it moves so slowly that only the scientists who study it know it's moving. But what happens when it moves so hard and fast that you feel the ground shake or see lava flow? An earthquake or a volcanic eruption.

Any of these natural events could cause a natural disaster. Your Project challenge this season is to develop an innovative solution that helps people prepare, stay safe, or rebuild.

## Choose a Community

Begin your project by choosing a community where a natural event could cause a natural disaster. Your team's community could be a city, village, town, township, county, or district. You can choose the place where you live. You can choose a place nearby. You can choose a place far away, if your team is interested in a natural disaster that is not likely to happen near you. Choose a community where one of these natural events could happen:

- Avalanche or landslide
- Earthquake
- Flood
- Hurricane
- Storm (wind, sand, blizzard, or rain)
- Tornado or cyclone
- Tsunami
- Volcanic eruption
- Wildfire



Not sure how to choose a community? Consider these suggestions:

**Each Team Member** — You or someone you know may have experienced a natural disaster. Begin by asking your own family and friends. Have they ever been in or near a natural disaster? When? Where? What happened?

Think about places where you have been. Could a natural disaster happen in any of those places?

Check the news. Are there any natural events currently happening around the world that might cause a natural disaster?

Make a list of the places. Be prepared to tell what you learned.

**As a Team** — Next, take a look at each team member's list. Talk about what happened in each place. Talk about how your team can find out more about the forces of nature that can threaten each place. Is the community near you? Can you talk with scientists, engineers, health professionals, volunteers, and emergency management officials who help during natural disasters?

**As a Team** — Choose a community to research and assess for your Project. Choose a community that could be threatened by one of the natural events from the list above. Work together to make the decision.

## Identify a Problem

Next, learn about the natural event that could cause a natural disaster in your chosen community. Then identify a specific problem and find out what is being done to solve it.

**As a Team** — Choose one natural event that threatens the community and learn about it. (Make sure the natural event you choose is on the list in the "Choose a Community" section.) Remember, not every natural event becomes a natural disaster. It only becomes a natural disaster when a force of nature harms people or communities. Think about questions like:

- How could this force of nature cause a natural disaster in your chosen community?
- What problems would it cause? Would it harm people, property, or both?
- Is the community always at risk? At risk only during certain times of the year? Is the risk predictable?

- How do people prepare?
- How are people warned?
- Who provides emergency food, water and shelter ? How?
- Who clears the debris and rebuilds? How long does it take?

**As a Team** — Choose one specific problem that could happen if a force of nature threatens the community you chose. Then learn about current solutions.

What is being done today to prevent or manage the problem? How do people usually prepare, stay safe, or rebuild? Is a scientist, emergency manager, first responder, or engineer helping with research or developing new technology? Is the government, the military, an aid agency, a community activist, or a health care worker developing new programs? Some resources you may use to look for information include: reports, books, magazines, and websites. Use any research tools you have available. Be prepared to share your sources of information.

Professionals who work in and around your chosen community are often great resources to learn more about current solutions.

- Who makes the plans to keep people safe in a natural disaster?
- Who warns people that a natural disaster could happen?
- Who rescues people in danger? How?
- Who cleans up, repairs, and rebuilds after a natural disaster?

Find out about a professional who is working to solve the problem you identified. Can you connect with them in person? Over the phone? Using email or social media? By letter? Can you learn about how they plan for and respond to natural disasters in the community you chose?

## Create an Innovative Solution

Now that your team has decided on a problem, your challenge is to create an innovative solution — **one that makes life better by improving something that already exists, using something that exists in a new way, or inventing something totally new.** Learning about current solutions is just the beginning. How can your solution help keep people and property safe before, during, or after a natural disaster? Could your solution shorten the time it takes to repair and rebuild? Could it prevent a natural event from becoming a disaster? How can your team reduce the impact of natural events on people and the places they live, work, and play?

Think about it. Work together! Brainstorm! Share all your ideas. One team member's "silly idea" just might inspire the perfect innovative solution. What could be done in a new way? What could be done better? A great solution might take all the imagination and ingenuity your team can muster. It might seem so obvious that you wonder why the problem even exists.

**As a Team** — Use the your team's research and design your team's solution.

- What would it cost?
- What technology do you need to make your solution?
- Would it be difficult or easy?
- Can anyone use your solution or only some people?

Think about how someone could make your solution a reality.



## Share with Others

Once your solution is ready, share it! Tell others about the problem you researched and exactly how your solution can help. You choose how to share what you've learned. Give a talk. Create a website. Perform a skit. Make a comic book. Rap. Create a poster. Pass out flyers. Write a poem, song, or story. Your sharing can be simple or elaborate, serious or designed to make people laugh while they learn.

What is the best way to teach your audience about the problem and solution?

Think about who is helped by your solution. How can you let them know? Can you present your research and solution to first responders, lawmakers, scientists, emergency managers, engineers, or groups who already help with your problem? Can you share with the professional who helped you learn about the problem? Or residents of the community you chose? Maybe your team's solution will be the answer to a problem they have been trying to solve.

And remember, the most important thing is to have fun!

## Present Your Solution at a Tournament

Finally, prepare a presentation to share your work with the judges at a tournament. Your presentation can include posters, slide shows, models, multimedia clips, your research materials be creative! Remember, you want to leave a lasting impression.

**To be eligible for Project Awards and advancement your team's presentation must:**

1. Explain the problem your team chose to research (including the natural disaster your team chose).
2. Describe your team's innovative solution.
3. Describe how your team shared your findings with others.
4. Meet the presentation requirements:
  - Give your presentation live; you may use media equipment (if available) but only to enhance the live presentation.
  - Include all team members; each team member must participate in the Project judging session in some way.
  - Set up and complete your presentation in 5 minutes or less with no adult help.

You can learn more about how your team's presentation will be judged by reviewing the Rubrics located at: <http://www.firstlegoleague.org/event/judging>. Among other things, judges expect your team to:

- Clearly explain both the problem and your team's solution
- Use different types of research resources, including professionals in the field
- Consider existing theories and solutions as you develop your own solution
- Be innovative
- Show that you thought about what it will take to make your solution happen in the real world
- Target your sharing toward people who might benefit from your team's work
- Find a way to present your work that is both effective and creative



## More Resources (Optional)

- Check the Project FAQ often: <http://www.firstlegoleague.org/challenge/projectfaq>. Here, FLL staff will clarify common Project questions. Postings contain official information that will be in effect at tournaments.
- View the 2013 Challenge page at <http://www.firstlegoleague.org/challenge/2013naturesfury>. Download the Topic Guide for a glossary of natural disaster words, a list of websites and books to start your research, and tips on how to approach professionals.
- The FIRST LEGO League Coaches' Handbook contains more information about FIRST® LEGO® League, the Challenge, tournaments, and judging. Find it here: <http://www.firstlegoleague.org/challenge/teamresources>.

Still have questions? Send an email message to [flprojects@usfirst.org](mailto:flprojects@usfirst.org) for Project support.

*We cannot stop the forces of nature or prevent all natural disasters. But, by learning about them, you will be prepared to make a difference. Remember Tilly Smith? She saved many people by knowing the signs of a tsunami and knowing what to do. There are organizations and agencies around the world preparing for natural disasters every day, but they cannot be everywhere at once. The next time a natural disaster happens, you could be the one who saves the day. You will be ready for Nature's Fury!*



# Robot Game — Field Setup

The field is where the Robot Game takes place.

- It consists of a field mat, on a table, with mission models arranged on top.
- The field mat and the LEGO® pieces for building the mission models are part of your Field Setup Kit.
- The instructions for building the mission models are [here](#).
- The instructions for how to build the table and how to arrange everything on it are below...

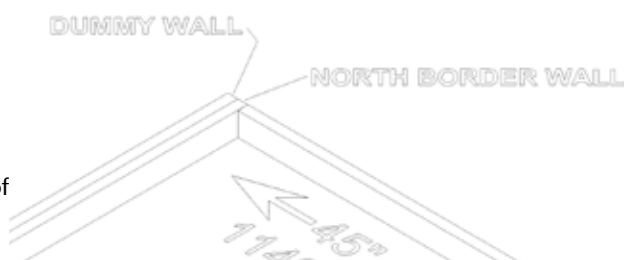
## TABLE CONSTRUCTION

The Robot Game takes place on a specially designed table, so you'll need to build one to practice on if you don't already have access to one. With safety, weight, height, and cost in mind, a simple design is offered here, but as long as your surface is smooth, and your border walls are sized and located properly, how you build the understructure is up to you. The construction is simple, but does require some wood-working skills.

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. We'll call your practice table a "half-table."

Most challenges have a "shared" mission model, which rests partly on your table, and partly on the other team's table. So in addition to building your table, you'll need to build a tiny portion of a second table, so both halves of the shared model are supported. We'll call this added section the "dummy section."

Here are the instructions for building one "half-table," plus a dummy section:



## Materials

Material	Quantity
Field Setup Kit (mission model LEGO elements, mat, CD, Dual Lock™)	1
sanded plywood (or other very smooth board) 96" X 48" X at least 3/8" (2438mm X 1219mm X 10mm)	1
two-by-three, 8' (2438mm) [actual cross-section = 1-1/2" X 2-1/2" (38mm X 64mm)]	6
flat black paint	1 pt. (1/2 L)
coarse drywall screws, 2-1/2" (64mm)	1/2 lb. (1/4 kg)
saw horses, about 24" (610mm) high and 36" (914mm) wide	2

## Parts

Part	Make From	Dimensions	Paint	Quantity
table surface (A)	plywood	96" X 48" (2438mm X 1219mm)	no	1
long border wall (B)	two-by-three	96" (2438mm)	yes	3
short border wall (C)	two-by-three	45" (1143mm)	yes	2
stiffener (D)	two-by-three	48" (1219mm)	no	4
saw horse	purchase	H $\approx$ 24" W $\approx$ 36" (610mm) (914mm)	no	2

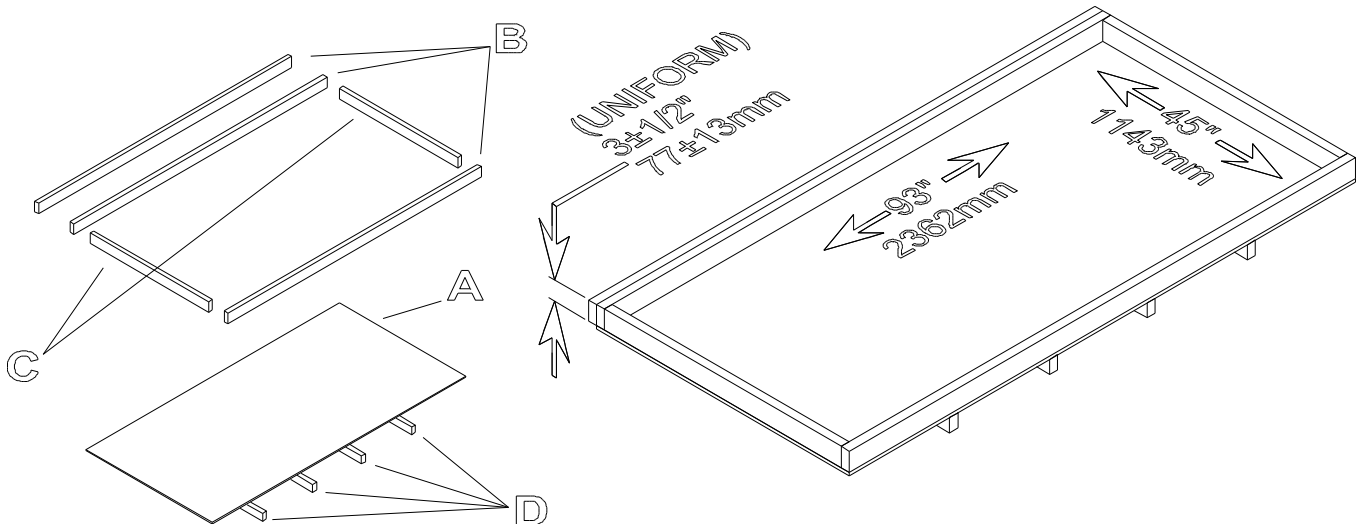
## Assembly

**Step 1** - Determine which face of the plywood (A) is least smooth, and consider that the bottom face. On the bottom face, locate, clamp, and screw on the stiffeners (D) (about every 18" or 457mm). Be sure screw head tops are flush. Sand any splinters.

**Step 2** - On the top face of the plywood, locate, clamp, and screw on the border walls (B,C) around the top perimeter.

- The wall-to-wall dimensions must measure  $93\pm 1/8"$  by  $45\pm 1/8"$  ( $2362\pm 3\text{mm}$  by  $1143\pm 3\text{mm}$ ).
- The height of B and C must measure  $3\pm 1/2"$  ( $77\pm 13\text{mm}$ ). Note the use of the "plus or minus symbol." This means the maximum allowable height is three and a half inches (ninety millimeters) and the minimum height is two and a half inches (sixty-four millimeters).
- All border walls must be the same height as each other on any and all tables at a tournament.
- Border heights at a tournament may be different than those on your practice table.

**Step 3** - With the help of another person, place this table top on short saw horses (or milk crates, or anything else short and solid).



## FIELD MAT PLACEMENT

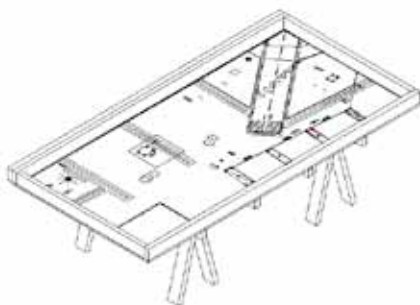
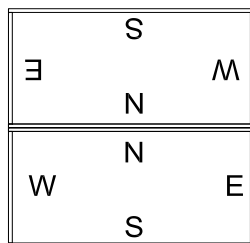
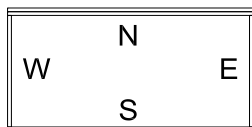
**Step 1** - Vacuum the table top. Even the tiniest particle under the mat can give the robot trouble. After vacuuming, run your hand over the surface and sand or file down any protruding imperfections you find. Then vacuum again.

**Step 2** - 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).

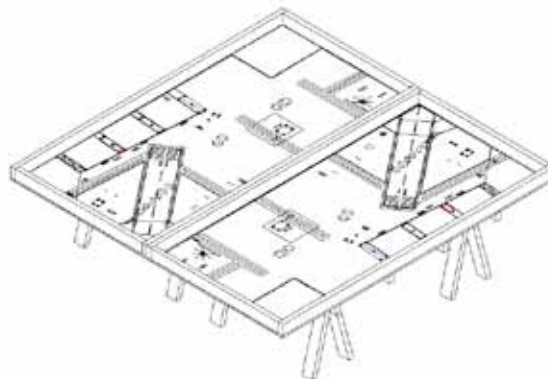
**Step 3** - The mat is smaller than the playing surface by design. Slide and align it so that there is no gap between the south edge of the mat and the south border wall. Center the mat in the east-west direction (look for equal gaps at left and right).

**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 3. 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.





PRACTICE ("HALF TABLE")



TOURNAMENT ("FULL TABLE")

**Step 5** - For a competition setup, the north edge of the two mats must be separated by  $3\text{-}1/2 \pm 1/4$ " ( $90 \pm 6\text{mm}$ ). Note the use of the "plus or minus symbol." After rounding, this means the maximum allowable separation is three and three quarter inches (ninety-five millimeters) and the minimum separation is three and a quarter inches (eighty three millimeters).

## MISSION MODEL CONSTRUCTION

Build the mission models - Use the LEGO elements from your Field Setup Kit, and instructions from this page. It will take a single person four to five 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 acquainted with each other.

## MISSION MODEL ARRANGEMENT AND SETUP

**Dual Lock** - Some models are secured to the mat, others are not. Where a model needs to be secured, 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 Field Setup Kit. 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:

**Step 1** - Stick one square, adhesive side down, on each box you see on the mat with an "X" in it.

**Step 2** - Press a second square on top of each of those, "Locking" them on, adhesive side up. **TIP:** Instead of using your finger, use a bit of the wax paper the squares came on.

**Step 3** - Lower the model onto the squares.

**CAUTION** - Be sure to place each square precisely on its box, and each model precisely over its marks.

**CAUTION** - 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.

**TIP:** For large and/or flexible models, apply only one or two sets at a time.

**Models** - Marks on the mat along with the pictures at the end of this section give you most of the info you need to arrange and set the models (place/set as pictured). Here are the remaining details, not obvious from the text:



**BATTERY, FLASHLIGHT, AND BOTH RADIOS** - Direction doesn't matter.

**MAN AND CHILD** - Face as shown.

**THE FOUR MODELS IN BASE** - These are placed anywhere you like in Base and/or other legal storage areas.

**TSUNAMI** - "Wave" cylinders should be mostly centered. Stud direction doesn't matter.

**TREE** - Removable branch is all the way into its holder and points directly east (no north/south tilt).

**ROOF DEBRIS** - At the beginning of the match, these are "owned" by the referee (ref), who can keep them anywhere, but if kept on the field, they must be placed as pictured, and do not count/score as being on the field.

**TRUCK** - The truck has four models on board: bread, medicine, a loose fuel, and a loose water.

**HOUSE DEBRIS/OBSTACLE** - The tan wall's tilt direction is toward Base.

**TREE DEBRIS/OBSTACLE** - Stud directions (on rollers) don't matter.

**LOOPS** - All must be vertical and symmetrical.

**BASE ISOLATION** - The west building is pushed north to the back of the tray. Window directions don't matter.



EVACUATION SIGN,  
BATTERY



PETS, TREE, FLASH LIGHT,  
ELECTRIC LINES



2-WAY RADIO,  
BOOM BOX



HOUSE, MAN,  
DIRT BIKE



GENERATOR, LADY



GRAIN, CHILD, WATER,  
BUILDING SEGMENTS



TSUNAMI



ROOF DEBRIS  
(PENALTY OBJECTS)



TRUCK, FUEL, WATER, MEDICINE



OBSTACLE



BASE ISOLATION, BUILDING SEGMENTS



BASE ISOLATION



DIRT BIKE



WATER



BARRIER



OBSTACLE



AMBULANCE



OBSTACLE

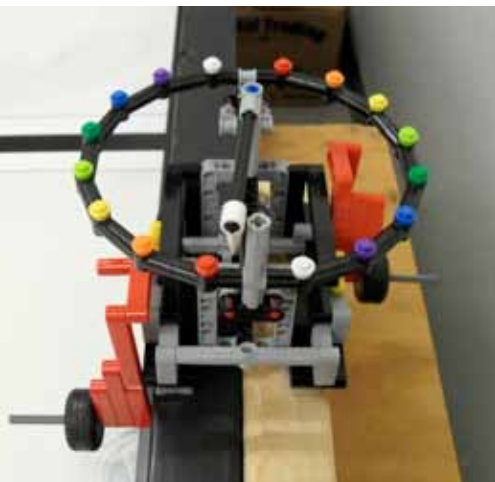
**PROGRESS DIAL** - This model is Dual Locked to the center of a competition setup, which means it sits half on your north border wall, and half on the other team's north border wall. If your practice table doesn't have a "dummy wall" behind your north border wall, build one by fastening a scrap piece of wall to the center back side of your table as shown. (A dummy floor is shown here, but that's not needed for Nature's Fury.)

Since border wall heights can vary within the allowable range depending on where you compete, the height of the progress dial's push lever from the mat can vary between a minimum of 1" (25mm) and a maximum of 2" (51mm).

**KEEP THIS RANGE IN MIND AS YOU DESIGN YOUR ROBOT.**



DUMMY WALL



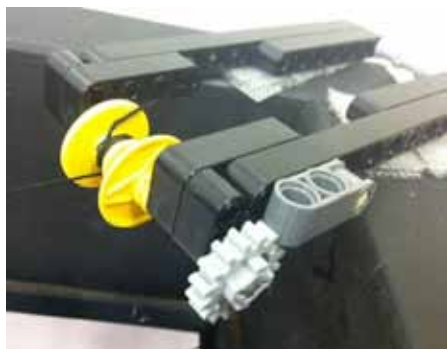
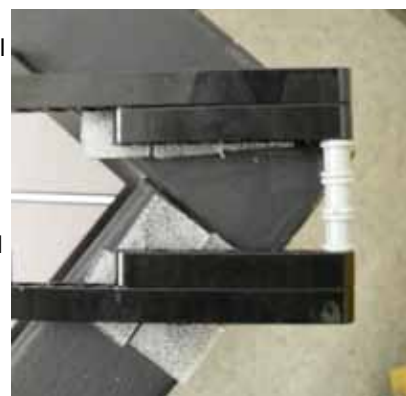
STARTING POSITION

**CARGO PLANE ARRIVAL END** - Place the frame parallel to the runway and use as much Dual Lock as needed to get a solid mount. The string enters the pulley from the bottom, and the pawl (stopper bar) is on top.

The rest of the steps for this model only apply to you if your border wall is shorter than 3" (77mm)...

When you built this model, you built it for a tall border wall, and as such, the reel is flipped downward. But If you have a short wall, the reel needs to be flipped upward. If your border wall is shorter than 3" (77mm), take apart and rebuild the pulley end to match the pictures labeled "SHORT BORDER."

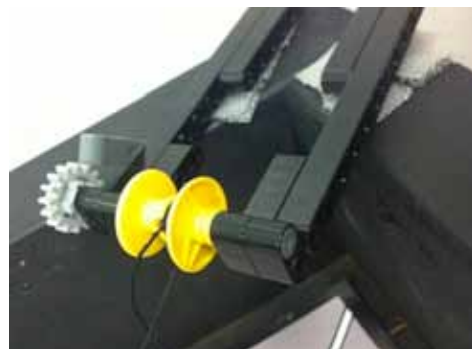
- Take the axle out. The gear, reel, and two spacers will fall off.
- Remove each L-beam with its tiny companion beam still fastened to it.
- Trade these 2-piece units with each other, and reinstall them upside down.
- With the gear at the northwest, reinstall the pulley and spacers, with the axle coming from the northwest.
- Finally, swap the stopper bar to its corresponding hole near the gear. The string still enters the pulley from the bottom.



TALL BORDER



FLIP AND TRADE THESE "L-UNITS"



SHORT BORDER



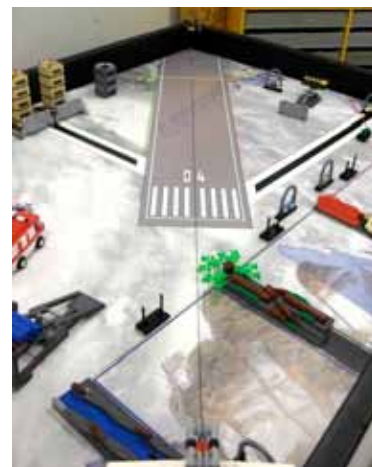
**CARGO PLANE DEPARTURE END** - This model is Dual Locked to the top of the south border wall as shown. Place the east corner of its base 56-1/2" (1435mm) from the inside surface of the east border wall. Apply full coverage of Dual Lock to the inside of the vertical wall under the tower and press it into place against the outside of the south border wall. **Do not put Dual Lock on top of the wall.**



(T = TOWER, SW = SOUTH WALL, EW = EAST WALL)



Put the hook end of the string through the plane's trolley from nose to tail, and hook onto the hitch bar, and latch the plane to the tower. If the string is not parallel to the runway, you can pull the tower's Dual Lock apart, move the tower a little as needed, and then press it on again. Finally, use the thumb-gear at the arrival end to put tension on the string until the cantilever (tire/arm weight) sits mostly level.



The rest of the steps for this model only apply to you if your border wall is shorter than 3" (77mm)...

When you built this model, you built it for a tall border wall, and as such, the tower is in its "short" configuration. But If you have a short wall, the tower needs to be lengthened. If your border wall is shorter than 3" (77mm) pull out the lock pins, extend the tower by two holes, and push the lock pins back in, to match the pictures labeled "SHORT BORDER."

- Pull out the four lock pins for ONE leg. A partial pull-out is all that's needed, so they let go of the inner beams.
- Move the lower two pins up a distance of two holes.
- Reinstall the inner beams two holes higher than they used to be.
- Do the same for the other leg.

In the middle picture, the four pins on one leg have been pulled out, and the far side lower pin has been moved up a distance of two holes.



SHORT TOWER FOR TALL BORDER

(ONE LEG BEING WORKED ON)

TALL TOWER FOR SHORT BORDER

**TOURNAMENT ORGANIZERS SHOULD TAKE EXTRA STEPS TO SECURE THE TOWER TO THE WALL.**



LEFT FIELD



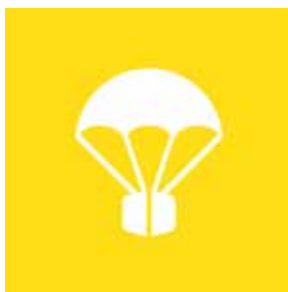
CENTER FIELD



RIGHT FIELD

## 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 compared to a new mat (many tournaments use new mats). Use a vacuum and/or damp cloth for dust and debris (above and below the mat). To get marks off, try a white-plastic pencil eraser. 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. Tournaments using new mats should unroll the mats as far in advance of the tournament day as possible. For control of extreme curl at the east or west edges of the mat, tape is allowed, with a maximum of  $\frac{1}{4}$ " (6 mm) overlap. Foam tape is not allowed. Do NOT put Dual Lock under the mat, or use it in any other than securing models as described.
- **Mission Models** - Keep the models in original condition by straightening and tightening solid connections often. Ensure that spinning axles spin freely by checking for end-to-end play and replacing any that are bent.





# Robot Game — Missions

## BACKGROUND

When Earth is viewed from outer space, the texture of even the highest mountain peaks is surprisingly hard to see. Compared to Earth, and even the atmosphere, and the oceans, humans are unbelievably tiny. So when the giant under our feet cracks, it's always interesting, but sometimes disastrous. And when the fluids around us move, it can be delightful, but too often devastating. It's incredibly challenging to predict, and equally difficult to escape...

### Nature's Fury<sup>SM</sup>!

Is there anything we can do? Yes! As future scientists and engineers currently on **FIRST**® LEGO® League teams, you will craft highly intelligent approaches to preparation, safety, and reconstruction when faced with the incredible destructive energy of natural events. Start the innovative thinking now, as you confront and master the symbolic missions of the robot game below.

## FRIENDLY WARNING

While it's obvious that everyone needs to become an expert on the details of the Missions below, it's also EXTREMELY IMPORTANT for everyone, vets as well as rookies, to read the OTHER THREE CRITICAL ROBOT GAME PAGES: [Field Setup](#) + [Rules](#) + [Updates](#) and go back to them repeatedly. Look at the benefits...

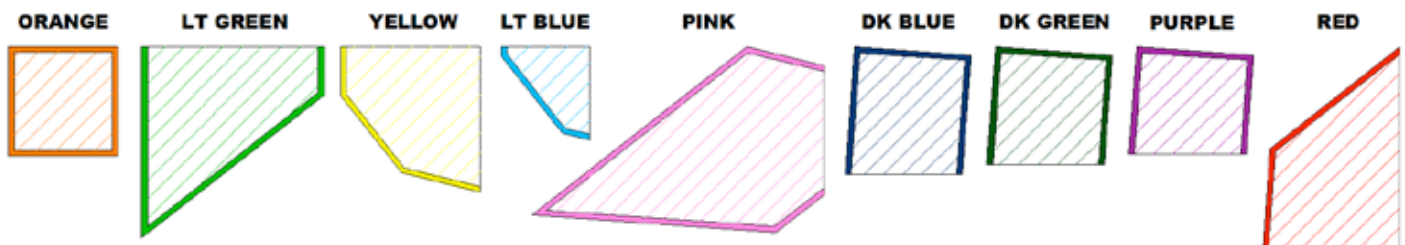
### TEAMS WHO READ EVERYTHING

- have fewer questions
- have less rework
- have fewer surprises at tournaments
- score higher
- have more fun

### TEAMS WHO DON'T

- operate in a fog
- start over and lose time
- learn a lot from... referees
- lose points
- get stressed

## SCORING REGIONS



## MISSIONS

### SUPPLY TRUCK

Condition visible at the end of the match:

— The supply truck is touching the mat in the yellow region.

(Note that the LT blue region is in the yellow region.)

**Value: 20**

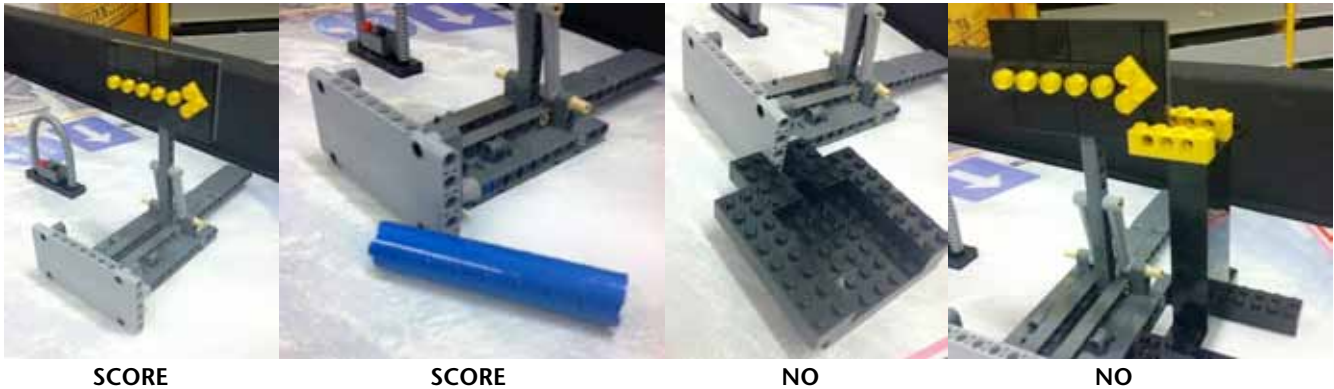
### EVACUATION SIGN

Conditions visible at the end of the match:

— The sign is obviously up (it doesn't need to be vertical), held in place only by the slider's friction with the mat.

— No part of the sign model is being touched by the robot, or any strategic object.

**Value: 30**



### CARGO PLANE

Condition visible at the end of the match:

— The plane is in the yellow region.

(Points are given for yellow and not LT blue, or for LT blue, but not both.)

**Value: YELLOW AND NOT LT BLUE... 20 -OR- LT BLUE... 30**



### TREE BRANCH

Conditions visible at the end of the match:

— The east tree branch is closer to the mat than the electric cables are.

— The tree and the electric cable models are upright, touching the mat.

**Value: 30**

### TSUNAMI

Conditions visible at the end of the match:

— All three waves are touching the mat.

**Value: 20**

### AMBULANCE

Conditions visible at the end of the match:

— The ambulance is in the yellow region.

— All the ambulance's wheels are touching the mat.

**Value: 25**



## RUNWAY

Conditions visible at the end of the match:

— Nothing except wave water and/or the plane is touching the mat anywhere on the runway.

**Value: 30**

## CONSTRUCTION RELOCATION

Conditions visible at the end of the match:

— There are no gray building units anywhere in the LT green region.

**Value: 20**

## BASE ISOLATION TEST

Conditions visible at the end of the match:

— The west tan building is undamaged: Four segments, 90° to mat, and "perfect" alignment.

— The east tan building is obviously damaged.

— \*Nothing is touching either building except the rolling frame.

— \*Nothing ever touched either building except the rolling frame.

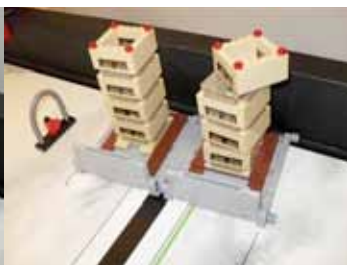
— The damage was caused purely by movement of the rolling frame.

(\*Exception: Fallen segments from the east building may touch the mat and/or the west building by chance.)

**Value: 30**



SCORE



SCORE



NO



SCORE



REALLY?

## CODE CONSTRUCTION

Conditions visible at the end of the match:

— A multi-story building is in the pink region.

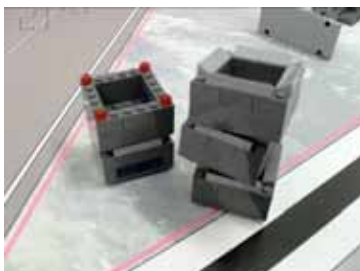
— The building is made of building segments only.

— The finished building does not rely on strategic objects or the robot in any way.

(Perfect nesting and alignment are not needed for this building.)

(If there are multiple buildings, only the highest score-worthy one scores.)

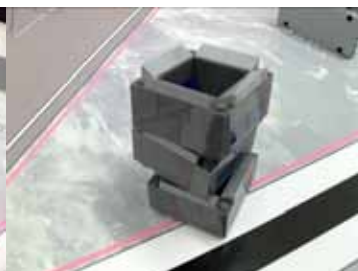
**Value: 5 EACH SEGMENT OF HEIGHT**



H = 3



H = 4



H = 3



NO



## OBSTACLES

\*Condition visible DURING the match:

— The robot has crossed completely over the west line of the noted region, from the west only.

(This mission involves exceptions to the Rules...)

(This mission may be repeated as desired, in hopes of improved results.)

(Points given are permanent unless a better result replaces them later in the same match.)

(Points are given only for the best result achieved.)

(The robot may be rescued from this mission as needed, successful or not, without penalty.)

(Points given are permanent even if the robot later leaves or is rescued from the region.)

**Value:** DK BLUE...**10** -OR- DK GREEN...**16** -OR- PURPLE...**23** -OR- RED...**31**



NO



DK BLUE



DK BLUE

## HOUSE LIFT

Conditions visible at the end of the match:

— The house is locked in its high position.

**Value:** **25**

## PROGRESS

Conditions visible at the end of the match:

— The pointer has reached colors as a result of red lever motion only (moving left in the picture).

(Points for this mission are awarded to both teams, no matter who operates the model.)

(No points are awarded if this model has not been operated.)

**Value:** COLORS REACHED...**2** EACH



LT GREEN



LT GREEN

## FAMILY

Conditions visible at the end of the match:

— At least two people are together in any colored region.

(Points are awarded for 2, or 3, but not both.)

**Value:** 2...**33** -OR- 3...**66**

## WATER

Conditions visible at the end of the match:

— At least one person is together with (bottled) water in the same region.

**Value:** PEOPLE WITH AT LEAST 1 WATER... **15** EACH

## SAFETY

Conditions visible at the end of the match:

— At least one person is in a region colored red or yellow.

(Points for people in red and people in yellow are combined.)

**Value:** PEOPLE IN YELLOW... **12** EACH, PEOPLE IN RED... **18** EACH

## PETS

Conditions visible at the end of the match:

— At least one pet is together with at least one person in any colored region.

**Value:** PETS WITH AT LEAST 1 PERSON... **15** EACH

## SUPPLIES & EQUIPMENT

Conditions visible at the end of the match:

— At least one non-water item is in a region colored red or yellow.

(12 Possible: 2-way radio, battery, generator, 2 fuel, grain, bread, medicine, boom box, flashlight, dirt bike, helmet)

**Value:** ANY IN YELLOW... **3** EACH, ANY IN RED... **4** EACH

## SAFE PLACE

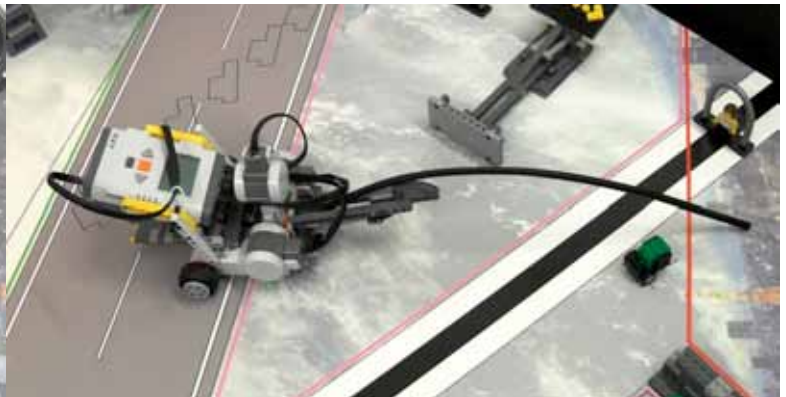
Conditions visible at the end of the match:

— The robot is in the red region at the end of the match.

**Value:** **25**



SCORE



NO

## GAME PENALTY

If a penalty is earned (as described here and in the Rules), the ref places a roof debris model on the west-most possible roof mark which is completely empty. Placement is expected to be closely aligned on the mark, but may not be perfect. For penalties after the 4th, the west-most debris is placed as far as possible into the northeast corner of the LT blue region. The robot may not remove debris from the LT blue region.

**Value:** ANY IN LT BLUE... - **13** EACH, ANY OUTSIDE LT BLUE... - **10** EACH

## COMPANION YouTube VIDEO

[\(Visual aid only – turn sound down – narrator is nuts\)](#)

## UPDATES

[Official Clarifications, Corrections, Changes, Rulings, and Whatever](#)





# Robot Game — Rules

(Including Philosophies, Definitions, and Procedures)

## 1 - GRACIOUS PROFESSIONALISM®

- You are "Gracious Professionals." You are competing hard against PROBLEMS, while treating PEOPLE with respect and kindness - people from your own team, as well people from other teams.
- You build onto other people's ideas instead of resisting or defeating them.

## 2 - PARTICIPATION

- Allowable ages vary by region. Contact your operational partner for specifics if needed.
- At the tournament, only TWO team members at a time are allowed right up at the competition table except during repair emergencies.
- The rest of the team must stay back from the table, but close enough for different members to tag in or out as desired at any time. Exact positioning is decided by the tournament officials.

## 3 - INTERPRETATION

- Robot game text means exactly and only what it says, so it should be taken literally whenever possible.
- Do not interpret text based on your assumption about intent, or on how a situation might be in "real life."
- If a detail isn't mentioned, then it doesn't matter.
- There are no hidden requirements or restrictions. If you've read everything, then you know everything.
- Examples:
  - If a mission is for the robot to "be on the stairs," that doesn't mean the robot needs to climb the steps, and it doesn't mean the robot has to go to the top.
  - If an ocean is drawn on the mat, but never mentioned anywhere, then you don't have to ask if the robot's allowed to drive on it... It is. **"Nothing says it can't"**
  - If a mission is for the cup to "be on the table," upside down is just as good as right side up.
  - If the robot must use a robotic arm to empty the trash, this will be clearly stated. If not, then any method is fine.
  - If the robot must "use a robotic arm to empty the trash," it doesn't matter whether the arm reaches in and grabs the trash, or instead turns the can upside down.
- You're encouraged to think this way - Please learn the requirements and constraints very well, and then realize the many FREEDOMS that are left.

## 4 - EQUIPMENT

- **EVERYTHING** - Everything you use in the competition area directly or indirectly for strategy (mission-related activity) must be made entirely of LEGO-manufactured elements in original factory condition. Stickers are not allowed, except LEGO stickers, applied per LEGO instructions. Paint, tape, glue, oil, zip-ties, etc. are not allowed.
  - Exception 1: You may reference a paper list to keep track of robot programs.
  - Exception 2: LEGO string and tubing may be cut to length.
  - Exception 3: Marker may be used only in hidden areas, for ownership identification.
  - Exception 4: Carts, trays, and boxes may be used for carrying and storing your equipment, off the table only.
- **REGULAR ELEMENTS** - You may use as many non-electric LEGO elements as you like, including pneumatics, rubber bands, and string, and they may be from any source or set (MINDSTORMS®/TECHNIC/DUPLO®/BIONICLE™/STAR WARS™/HARRY POTTER™/etc.). Exception: Factory-made wind-up/pull-back "motors" are not allowed.
- **CONTROLLERS** - You are allowed a maximum of one controller in the competition area in any one match. Choose one of the three LEGO-manufactured types shown here. No other controller is allowed.
- **SENSORS** - You are allowed as many sensors as you like, but the types are limited as follows:
  - They may only be touch, light, color, rotation, ultrasonic, or gyro.
  - They must be LEGO-manufactured MINDSTORMS types as shown below.



WARNING 1: The fact that a sensor was/is being sold by an official LEGO shopping source does not mean that sensor was made by LEGO. Example: "HiTechnic" products are nice products, but they are made "for" LEGO and not "by" LEGO. (HiTechnic products are not allowed.)

WARNING 2: The presence of the LEGO logo on a sensor does NOT mean it was made by LEGO.

- Be SURE any sensor you buy or use looks exactly as shown here.



- **MOTORS** - You are allowed a maximum of four MINDSTORMS motors in the competition area. Choose your favorite combination from among the LEGO-manufactured types shown here. No other motors are allowed.



- Quantity limits don't just apply to what's on your robot "right now." The referee (the "ref") adds up everything you have with you in your boxes, your hands, your trays, and on the table. All of it counts towards your total.
  - Example: If you have three motors permanently built into your robot, but wish to cycle through several motorized attachments during the match, your design needs to allow the last (4th) motor to be traded in and out from one attachment to the next when needed.
  - A fifth motor in the competition area is not allowed, no matter what.
  - Even if you plan to run only four motors at a time, a fifth motor is not allowed.
  - Even as a spare, a weight, or a decoration, a fifth motor is not allowed.



- You may not use more than one robot in any one match, but it's okay to use a different robot in a different match.
- LEGO wires and converter cables are allowed as needed.
- No other electric elements nor devices are allowed for use in any way in the competition area.
- Spare electrical parts are allowed in the PIT area.
- Objects functioning as remote controls are not allowed anywhere, any time.
- **SOFTWARE** - The robot may only be programmed using LEGO MINDSTORMS, RoboLab, NXT-G, or EV3 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. This rule puts a cap on software-related unfairness, and put a cap on what we can reasonably ask tournament judges to become versed in - thanks for your understanding!
- **VIOLATION** - If the robot is in violation of the equipment rule and cannot be corrected, the decision about exactly what to do rests with the tournament officials, but it is possible the team may not be eligible for awards.

## 5 - MISSION

- A [mission](#) is a condition/result the robot produces (sometimes in a specific way), for points.
- You decide the order in which to try the missions, and how many to try with each program on the robot.
- You don't have to try every mission.
- You may re-try missions when that's possible, but the field is not reset for that purpose. Example: If a mission is for the robot to topple a stack eastward, and the robot doesn't reach it, you could try again later, since the stack is undisturbed. But if the autonomous robot topples the stack westward, since the stack doesn't get reset, the mission is impossible to re-try.

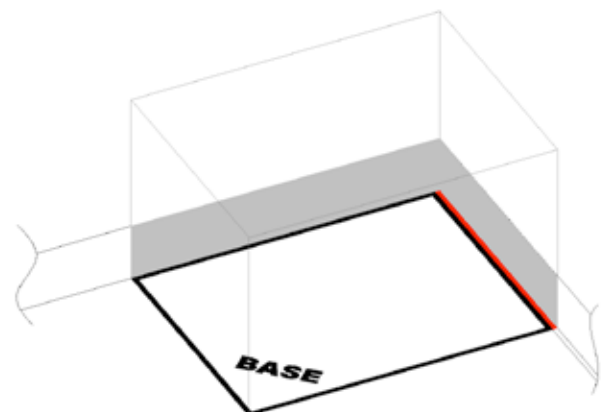
## 6 - MATCH

- At a tournament, two robot game fields are joined back to back, and you are paired opposite another team to compete in a match. There are at least three matches. Here's the process:
- You get to the competition table and have at least one minute to prepare your equipment.
- The match starts and the timer runs for 2-1/2 minutes without stopping
- You start and restart the robot from Base as described below.
- Whenever the robot is in Base, you can prepare/work on it.
- Each match is a fresh chance for you to get your best score.
- No match has anything to do with another, and only your best score counts specifically toward the Robot Performance Award except when breaking ties. "Playoffs" if held, are just for added fun.
- If it is known in advance that you will not have another team opposite you, a volunteer or "house" team substitutes. If not, and you compete against an empty table, you get the points for any missions you tried but could not complete because the other team was missing.
- With few exceptions, your score comes from the condition of the field at the END of the match.

**7 - ROUND** - The process of cycling all teams through one match each is called a round.

## 8 - BASE

- Base is an imaginary box formed by vertical walls that rise from the perimeter of the Base area, including the inside surface of the border walls, and by an invisible ceiling 12" (305mm) high.
- This means Base is not just an area on the mat - it's a VOLUME.



- The lines that define Base are in Base.
- Usually there is a gap between the mat and a side border wall... Base includes this gap (pictured in red).
- Anything even barely in Base counts as being in Base unless the robot moves it completely out.
- Anything in the team's possession is understood to count as being in Base, and is okay to store or handle.

## 9 - FIELD

- The field is where the robot game takes place. It consists of mission models on a field mat on a table.
- The field mat and the LEGO elements for building the mission models are part of your Field Setup Kit.
- The instructions for building the [mission models](#) are posted on the web.
- All details about how to set up the mission models after they've been built are on the [Field Setup](#) page.

**10 - ROBOT** - The robot is the controller and anything joined with it by hand (any method, any configuration) which is designed not to separate from it except by hand.

**11 - ATTACHMENTS** - These are features which qualify as part of the robot while installed, but are not installed for the entire match.

## 12 - STRATEGIC OBJECTS

- These are team-supplied objects which serve a mission-related purpose, but never qualify as part of the robot.
  - Example 1: You may use a LEGO frame/"jig" to help aim your robot in Base.
  - Example 2: The robot may carry a LEGO ramp out to help itself cross a barrier.
- Strategic objects powered by stored energy are allowed, but the ROBOT must activate them.
- A strategic object outside Base stays there unless the robot brings it to Base (per Rule 33).
- JUNK PENALTY - At the end of the match, each strategic object outside Base is considered a throwaway and causes a game penalty. Objects smaller and/or lighter than the robot cost **5 points** each, and those obviously larger and/or heavier than the robot cost **13 points** each. In unclear situations, you pay the smaller penalty.

**13 - CARGO** - Cargo is anything the robot has with it for transport or release.

## 14 - MISSION MODELS

- Mission models are the objects that are already on the field when you walk up to it.
- You may not bring duplicate mission models to the table if they could confuse scoring.
- You may not take mission models apart, even temporarily.
- You may never assemble anything to a mission model by hand. This includes loose elements, strategic objects, other mission models, and the robot.
- You may never entangle or entrap a mission model in anything by hand.
- To be sure you have not assembled, entangled, or entrapped, a model illegally, take the "gravity test."

## 15 - GRAVITY TEST

- Any time you join a mission model with anything by hand, gravity alone should be able to separate them if the heavier were picked up and/or turned over.
- In the case of identical models, it doesn't matter which is picked up.
- The team performs this "gravity test," only if asked by the ref, and only when failure looks probable.
- The ref does not allow a start unless all mission models in Base could pass the gravity test.

- Only if there is no hand-help at all, the ROBOT is allowed to cause models to fail the gravity test.

**16 - Strategic/Precision Stop** - If your eyes are doing the work of a sensor... If the window of execution for a touch of the robot grab is conveniently precise (3, 2, 1, GRAB NOW!)... If a new scoring condition is produced or preserved by the precision of the grab... and these things are obvious to the ref, missions benefitting are marked scoreless.

Example: If the robot needs to push a lever somewhere between Position 3 and Position 4, and you touch your "healthy" robot while the lever is STILL MOVING between those positions... No score.

## **17 - AUTONOMOUS <> DEAD ROBOT**

- After each start, the robot is considered "autonomous" and remains so until the next time you touch/influence it.
- At the moment of that touch, the robot becomes "dead" and is immediately picked up, brought to Base/storage, and hand-prepared for restart from Base.
- The robot may pass in/out/through Base, and if you don't touch/influence it, you don't have to restart it.

**18 - CALIBRATION** - During your pre-match setup time only, you may calibrate light & color sensors outside Base.

**19 - QUALITY CONTROL** - During your pre-match setup time only, you may ask the ref to double-check that a particular setup is correct/within spec, but you may not request any custom setup, in or out of the specified setup range.

## **20 - SENDING/HANDLING OBJECTS OUTSIDE BASE**

- Your hands may not directly or indirectly strategically place, poke, roll, topple, drop, throw, eject, slide, shoot, or otherwise send or extend things out of Base except by properly starting the robot.
- Your hands may not directly or indirectly strategically change the shape, position, motion, quantity, or other status of things outside Base except when storing things, or by properly starting the robot.
- If you break this rule, by accident or not, see Rules 34 & 35.

**21 - STORED OBJECTS** - You may at any time, in Base, or other storage areas, handle stored objects the robot is not currently touching or using. Stored objects are not allowed to make contact with anything outside Base except other stored objects.

**22 - DEAD ROBOT HANDLING** - During setup, and whenever else the robot is dead, you may repair it, aim it, switch attachments, charge pneumatics, select programs, reset features, and load/unload cargo in Base, or other storage areas.

**23 - AIMING** - You may use a frame/"jig" to aim the robot, but its use must be completely in Base at all times, and you must let go of it prior to starting/restarting.

**24 - STAGING** - You may at any time place objects completely in Base for the autonomous robot to move or use.

**25 - CHAIN REACTIONS** - If the (hand) movement of the dead robot will unavoidably allow/cause the movement of any non-cargo object outside Base, such as something being "held up" or "held back," the movement of that restrained object (the chain reaction) must be kept to an absolute minimum. Allow the stored energy to dissipate slowly over as little distance as possible. Missions obviously benefitting from hand-help are marked scoreless.

## **26 - TOUCHING THE AUTONOMOUS ROBOT**

- If you touch the autonomous robot or anything it is moving or using... At the time of the touch...
- No matter what, you must bring the robot back to Base (if it wasn't already there), for restart.
- If the robot and any cargo were in Base... No problem.
- If either the ROBOT or any CARGO was OUTSIDE Base... See Rule 31.



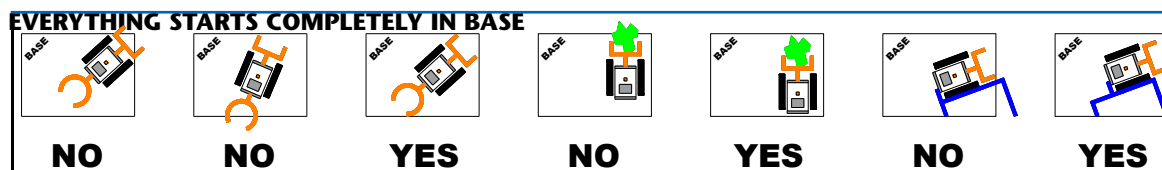
**27 - BROKEN ROBOT** - You may at any time recover pieces of an obviously broken robot.

## 28 - STORAGE AND WORKSPACE

- Once the ref inspects your equipment, you may store things as needed in Base, or in a box, or by hand, or possibly on a stand, if stands are allowed at your event (decided by your tournament's officials - check with them in advance).
- If you feel crowded in Base, storage and handling of the robot and other objects may extend over/outside Base lines, as long as there is absolutely nothing strategic or disruptive about the placement.
- Mission models and objects worth points in Base must always stay in view of the ref.

## 29 - START/RESTART POSITION

- For the match start and all restarts, EVERY BIT of the robot, including its installed attachments & wires, everything touching it, and any objects it is about to move or use, must ALL fit COMPLETELY in Base.
- YOU may NOT be touching the robot or any objects the robot is touching.
- YOU may NOT be touching objects the robot is about to move or use.
- The ROBOT MAY be touching objects it is about to move or use.
- The robot's program may or may not already be running, but everything must be motionless.
- All mission models in Base must be able to pass the gravity test.

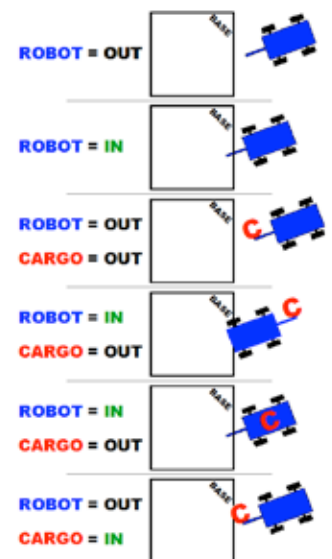


## 30 - STARTING PROCEDURE

- For the match start, the ref checks that things are in proper starting position, then signals your readiness to the announcer.
  - As the countdown starts, you reach in with one hand, ready to either touch a button or signal a sensor to prompt the robot's program.
  - During the countdown: Except for the button/signal prompt, you may not handle the robot or anything it's touching, or about to move or use.
  - The exact time to start is at the beginning of the last word in the countdown, such as "Ready, set, GO!"
  - If a non-word signal is used, like a beep or buzzer, the start is at the beginning of that signal.
  - At the exact starting time, you either touch a button or signal a sensor to start or prompt the robot's program. The robot is now considered to be started and autonomous.
- For all other starts (called restarts), there's no countdown. The ref watches to be sure things are in proper starting position, and you activate the robot whenever you like.
- If the robot enters and leaves Base with no interruption or influence from you, this is not considered a restart, so starting procedure doesn't apply.
- Once autonomous, the robot can go and/or extend in any direction until the next touch and restart.

## 31 - TOUCH PENALTY (This rule is about hand-touching the robot while it's autonomous.)

- If you touch the autonomous robot or anything it's touching while the ROBOT is completely outside Base, there is a penalty," as described on the Missions page.
- If you touch the autonomous robot or anything it's touching while its CARGO is outside Base...
  - If the robot had the cargo the most recent time the robot was in Base, the cargo goes back to Base.
  - If not, the ref keeps the cargo.



SO: Avoid touching a robot entering Base until its **cargo has also reached Base!**

- Exception 1: If the only part of the robot in Base at the time of the touch is a cord, hose, wire, tube, chain, string, or other feature obviously used purely for reaching Base from a distance and avoiding a touch penalty, you get a game penalty anyway.
- Exception 2: If the robot is outside Base, straining its motors, and no longer traveling, you may non-strategically shut it off and leave it in place with no penalty.

**32 - SPRAWL PENALTY** - If the robot is obviously twice the width of Base, either when it is touched, or when the match ends, there's a game penalty, even if the robot was in Base.

**33 - LOSS AND CHAOS** (This rule doesn't involve a hand-touch.)

- Anything your AUTONOMOUS ROBOT does to your field outside Base (good or bad) stays that way, unless the ROBOT changes it. "Accidents," "mistakes," and "failures" are the same thing in engineering!
- Cargo the robot loses contact with is left wherever it comes to rest. If it goes off the table, the ref keeps it.
- This means the robot can ruin its own opportunity to accomplish tasks, and it can even spoil previous results.
- Exception: Robot parts which separate due to obviously accidental DAMAGE may be recovered by YOU, by hand, at any time, even if they have cargo (gift: you keep any cargo in question).

**34 - MODEL DAMAGE**

- This is when a model outside Base is made defective and/or its Dual Lock is separated by an autonomous robot.
- Model damage is not repaired during the match.
- If a model is manipulated into a scoring condition, but gets damaged
  - during the process, the condition is marked scoreless.
  - during an obviously unrelated action later (even seconds later), as long as the scoring condition is visible it can still score.
- Any scoring success which obviously depended on model damage is marked scoreless.
- This means the robot can ruin its own opportunity to accomplish tasks, and it can even spoil previous results.
- Any model damage obviously due to poor setup or lack of maintenance is scored with benefit of the doubt.

**35 - REVERSIBLE ACTION**

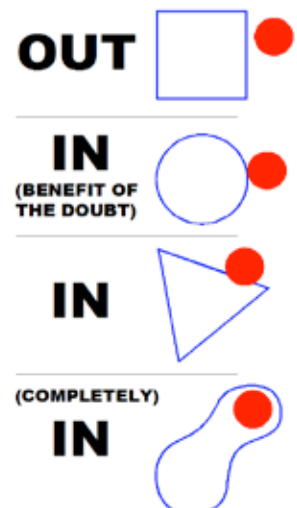
- When things such as a sleeve, table-bump, renegade DEAD ROBOT, or illegal action disturb the field in a non-trivial way, the ref physically reverses the change if he or she feels that's easy. If the change is too hard to undo...
  - if the accident was the team's fault, negative scoring effects stand, and positive scoring effects do not.
  - If the accident is not the team's fault, the team gets benefit of the doubt on all related scoring questions.

**36 - INTERFERENCE**

- Your robot may not have any effect on the other team's robot, field, or strategy, unless it's allowed in a mission.
- Any points you or your robot potentially cost the other team are given to them automatically.
- If two robots become entangled, they are both allowed to restart without penalty. Any cargo involved is given to the team in Base, whether or not it has ever been there before.
- As a matter of luck, the other team might out-perform you in a competitive interactive mission, or might fail to help you in a cooperative interactive mission. The net effect is the same, and this is not considered interference.

**37 - IN**

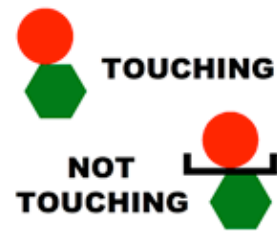
- **Red** is "in," "into," or has "reached" **Blue** if any bit of **Red** is directly over or under **Blue**.
- To be "in" an area is to penetrate the volume over that area.



- Barely "in" is considered "in" unless "completely "in" is required.
- **Red** can be "in" **Blue** without touching **Blue**.
- Objects are ruled on independent of each other, and independent of their transports/containers.
- "Outside" is the opposite of "in" and means completely out.

### 38 - TOUCHING

- **Red** is "touching" **Green** only if **Red** is making direct contact with **Green**.
- Any amount of direct contact counts as touching.



### 39 - MATCH-END SCORING

- Unless a specific method for producing a scoring condition is required, your score comes from **the conditions at the exact time the match ends only**.
- Points are not given for results the robot produces during the match but then trashes before the end.
- Points are not given nor taken away for results produced after the match end signal ends.
- When a mission is required to be achieved through a specific method, but is achieved by some other method, it is marked scoreless.
- When the match ends, PLEASE DON'T TOUCH ANYTHING! The ref first needs time to record the condition of the field on a score sheet and come to agreement with you (kids only) about what points were scored or missed and why.
- If you agree with the score, you sign the sheet, and the score is final.
- If you don't agree, DO (nicely) let the ref know. Referees can be wrong, and when they are, they want to know.
- After a short discussion, if the ref is not sure about the score, the head ref must make the final decision.
- Please don't try to show video to the refs.
- The scores are tallied by computer.
- Ties are broken using 2nd, then 3rd highest scores.
- In the rare occasion of a tie across all three matches, tournament officials decide what to do. Options include simply awarding multiple same-place awards.
- Don't walk away with mission models from the competition area. Bring them back if you do. Thanks.

### 40 - BENEFIT OF THE DOUBT

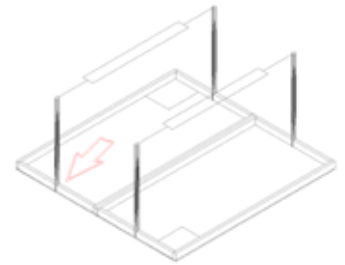
- You get the benefit of the doubt when:
  - incorrect/poor model setup or maintenance is the probable cause.
  - a split-second or the thickness of a (thin) line is a factor.
  - a situation could "go either way" due to confusing, conflicting, or missing information.
  - a ref is tempted to rule based on the "intent" of a requirement or constraint.
  - no one's really sure WHAT just happened!
- Speak up! If you (kids, not coach) disagree with the ref and can respectfully raise sufficient doubt in his/her mind during your post-match chat, you are given the points in question.
- This rule is not an order for the refs to be lenient, but for them to rule in your favor when they've done all they can to rule correctly, yet the answer's still unclear.

### 41 - DOWNLOADING

- Downloading programs to robots may take place in the pits only - never in the competition area.
- Always download by cable. Bluetooth must be switched off at all times.

## 42 - VARIABILITY

- As you build and program, keep in mind that our suppliers, donors, and volunteers make every effort to ensure that all fields are correct and identical, but you should always expect some variability, such as:
  - flaws in the border walls.
  - variety in lighting conditions, from hour to hour, and/or table to table.
  - texture/bumps under the mat.
  - presence or absence of tape at the East and West edges of the mat.
  - waviness in the mat itself. At many tournaments, it is impossible for the mats to be rolled out in time to lose their waviness. Location and severity of waviness varies. You are being warned here. Consider this while designing.
- Two important building techniques you can use to limit the effects of variability are:
  - Avoid steering systems that involve something sliding on the mat or border walls.
  - Cover your light sensors from surrounding light.
- Expect and design around interference where poles for lights and cameras might be mounted to walls.
- Questions about conditions at a particular tournament should only be directed to that tournament's officials.



## 43 - PRECEDENCE/AUTHORITY

- You get information about the robot game from more than one place. Once in a while, information from different places conflicts. So here is the order of precedence for the sources:  
1 = CURRENT [Robot Game Updates](#), 2 = [Missions](#) and [Field Setup](#), 3 = [Rules](#), and 4 = [Video](#).
- If something on a page conflicts with something else on the same page, the most sensible interpretation is assumed. If two interpretations seem equal, the interpretation most favorable for the team is assumed.
- On all pages, videos and pictures are for guidance and example only. Often they can not express complete information, and are therefore misleading. When there is conflict between pictures/videos and text, the text takes precedence!
- The head ref at a tournament is required to base decisions on the information above, in the order shown above. No other source of information has standing (E-mails from official Robot Game Support are only for guidance.)

## 44 - ROBOT GAME SUPPORT

- The best first place to go for Robot Game support is the [Robot Game Updates](#).
- If that doesn't help, expert support is available directly from the designer/author (Scott - Hil!) at [fillrobotgame@usfirst.org](mailto:fillrobotgame@usfirst.org) (usual response in 1-2 business days).
- When e-mailing, please state your role in FLL (member, coach, parent, mentor, referee, Partner).
- No question is a bad question, but some are much better than others!
- If it's obvious you're not at least a little familiar with the text of the various important pages, you'll be referred to it.
- If you're not sure how to interpret or apply a particular bit of text, you'll be told how a good referee likely would.
- If you expose missing or problematic text so common or severe as to potentially cause problems at events, an addition, correction, or ruling will be posted on the Updates page.
- Questions organized into short simple parts get the fastest and most useful answers.
- The ref is not obligated to read individual response e-mails.
- No new Robot Game Updates are posted after 3PM (eastern U.S.) on Fridays.
- You won't get help/advice about building or programming (that's your challenge).
- Questions about LEGO product in general get redirected: Instead call (U.S.) 1-866-349-LEGO.
- Questions posted in the discussion forum are not seen nor responded to by Robot Game Support.

WARNING: The forum is great for sharing ideas and getting tips from other teams, but it is not an official source of answers about anything.

## 45 - COACHES' MEETING

- If a question does come up right before the tournament, your last chance to ask it is at the "Coaches' Meeting" (if there is one) the morning of the tournament.
- The head ref and coaches meet to identify and settle any differences BEFORE the first match.
- For the rest of the day, the ref's calls are final when you leave the table.

## SIGNIFICANT CHANGES FOR 2013

- Rule 4 - MINDSTORMS EV3 is allowed. It has obvious improvements over NXT, but not enough to amount to a meaningful advantage, or to warrant scaling of scores, especially since there are many sources and seven years' worth of training and support for NXT.
- Rule 4 - A 4th motor is allowed, since the EV3 set has one.
- Rule 4 - The EV3 "Angle Sensor" is allowed, but is not considered an advantage. While it's useful, its usefulness in a competition setting is unknown.
- Rule 4e - A camera (any type) is allowed onboard the robot. Today's technology is small and light, it won't cause an advantage, and it's flat-out fun.
- Rule 8 - The ceiling of Base is lower...
- Rule 12 - The "Junk Penalty" is introduced...
- Rule 32 - The "Sprawl Penalty" is introduced...

These are to renew emphasis on the engineering concepts of navigation and efficient use of parts.

## UPDATES (CLARIFICATIONS, CHANGES, RULINGS, AND WHATEVER)

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<http://www.firstlegoleague.org/challenge/robotgameupdates>





