Mission Instructions for Minnesota HSR

The mission models and mat should be set up following the FLL directions and then the separate Minnesota HSR field set up instructions.

The significant change for HSR is the relocation of the base. For HSR, the defined research area in the south EAST corner of the mat is the starting base for all robot operations. The southwest corner will no longer have any significance for the one robot division. **(See enclosed picture.)** Any instruction for HSR that states "base" will be referring to the research area base (which does include the ice model.) All base rules apply, no extensions outside the edge of the base, height restriction, … For the 2 robot division both southern corners will be used as bases. - Please note there are changes this year to the FLL standard rules with regards to starting and robot motion in base, these also apply to HSR.

Missions (changes appear in bold)

Bury Carbon Dioxide (Carbon Sequestration):

Mission: Move carbon dioxide (the gray balls) to the underground reservoir. For each carbon dioxide to score, it must be touching the reservoir model and/or the mat within the model, but it must not be touching the mat outside the model. Scoring carbon dioxide (balls) are worth **15** points each **in the one robot division. They will be worth 30 points in the two robot division. The initial placement of the carbon dioxide will be random (into 4 of the 5 existing locations). The carbon dioxide may not be brought to base or it will be removed from play.**

Construct Levees:

Mission: Move levee blocks to low-lying shores while being careful not to damage the ones that are already in scoring position. For each block to score, it must be upright and touching low-lying shores on the mat. Scoring blocks are worth 5 points touching red and 4 points touching green. Blocks touching both red and green shores are scored as touching red only.

NOTE: Levee blocks are this year's touch penalty objects. When an active robot is touched while it's completely out of Base, the referee will take one levee block off the field, out of play, starting with those that are in Base. If there are none in Base, the one currently farthest west in the field will be taken. If the only levee blocks available are being moved by the robot at the time of the touch, one of those will be taken after the robot is carried back to Base. If all 8 levee blocks have been taken already, there is no loss.

Test Levees:

Mission: See how levees survive when a storm approaches (activate the wheel-roller). The wheel must be allowed to roll freely until it either hits or misses the levees. The activation is worth 15 points whether the levees are hit or missed, but worth no points if the wheel is strategically blocked by anything other than released levees near or past the green shore.

Raise The Flood Barrier:

Mission: The barrier in the up position (red lever down) is worth 15 points.

Elevate The House:

Mission: The house in the up position (red lever east) is worth 25 points.

Turn Off The Lights:

Mission: The window showing black is worth 20 points.

Open A Window:

Mission: The window all the way open is worth 25 points.

Get People Together:

Mission: Three ~~**or more**~~ red/white citizens touching the pink grid area is worth 10 points. Three ~~**or more**~~ blue/gray leaders touching the tall, green mountain and/or city is worth 10 points. Three ~~**or more**~~ black/white scientists ~~**touching the research area**~~ **in the north east ice area where the drilling rig is located (outside of and to the north of the base)** is worth 10 points. **NOTE: There is only one person of each color combination in base, rather than two.**

Find Agreement (Align The Arrows):

Mission: Before the match starts, the referee sets the yellow arrows in random disagreement. Alignment of both yellow arrows is worth 40 points for both teams, no matter which direction the alignment faces and no matter if one or both robots helped.

Fund Research Or Corrective Action:

Mission: Move money (the yellow ball) to the research area **(base)**. ~~**or to the underground reservoir. For the ball to score, it must be touching the underground reservoir or research area (ice sheet) models and/or the mat within those models, but it must not be touching the mat outside those models.**~~ The scoring money is worth **40 points in the one robot division and 50 points in the two robot division. The money (yellow ball) will be randomly placed into 1 of the 5 existing locations.**

Deliver An Ice Core Drilling Machine:

Mission: Move the core drilling machine to the research area **(base)**. ~~**For the machine to score, it must be making direct contact with the research area model and/or the mat within that model, but it must not be touching the mat outside that model.**~~ The scoring machine is worth **30** points. ~~**The drill assembly raised completely vertical is worth an additional 10 points.**~~

Extract An Ice Core Sample:

~~**Mission:** The ice core pulled completely from its hole is worth 20 points. The ice core in Base is worth an additional 10 points.~~

Deliver An Ice Buoy:

Mission: Move the ice buoy to the research area **(base)**. ~~**For the buoy to score, it must be upright and making direct contact with the research area model and/or the mat within that model, but it must not be touching the mat outside that model.**~~ The scoring buoy is worth 25 points **for the one robot division and 40 points for the two robot division.**

Insulate A House:

~~**Mission:** Move the insulation to the green grid area. Both insulation touching the green grid area is worth 10 points.~~

Ride A Bicycle:

Mission: Move the bicycle to the **yellow** grid area. The bicycle touching the **yellow** grid area is worth 10 points.

Telecommute And Research:

Mission: Move the computer to the **yellow** grid area. The computer touching the **yellow** grid area is worth 10 points.

Study Wildlife:

Mission: Move the polar bear and/or the snowmobile to the research area **(base)**. ~~**To score, they must be making direct contact with the research area model and/or the mat within that model, but they must not be touching the mat outside that model.**~~ The scoring bear is worth **20** points ~~**upright, or 10 points "sleeping" (on its side),**~~ and the scoring snowmobile is worth **20** points. **In the one robot division, the bear and snowmobile will start standing upright on the LEGO logo in the southwest corner. In the two robot division, they will start in the southwest corner base.**

Beat the Clock:

Mission: At the end of the match, if the robot is ~~**making direct contact with the research area model and/or the mat within that model, but it's not touching the mat outside that model, that's worth 15 points. At the end of the match, the robot**~~ touching only the yellow grid area it is worth **15** points. **For the two robot division this applies to the research area robot only.**

Rescue the Home Owners:

New Mission: Rescue the two people sitting on the roof of the house and bring them back to the research area base. Each person is worth 30 points when back in base.

Additional HSR Rules and Definitions

Research Challenge

This year for the HSR competition, there will not be a research challenge.

However you may be asked at any time by any one what the difference is between climate and weather and how they interrelate and you will be expected to answer with a full and complete description.

Also, thematic based skits, songs and chants may be optionally performed by any team for the referees and will be considered for an appropriate award.

Bonus Points - Head to Head placements

- **1st Place –** 50 points added to best score in Head to Head
- **2nd Place –** 30 points added to best score in Head to Head
- **3rd Place –** 20 points added to best score in Head to Head
- **4th Place –** 10 points added to best score in Head to Head

Rules

Please see the FLL robot rules (at www.firstlegoleague.org). All rules apply to the HSR competition with the following exceptions:

Participation
In the 2 robot division, four team members are allowed at a time at the competition table.

Robot
A robot in the HSR competition may have 1 or 2 bricks (any combination of RCX and NXT.)

Materials
With the exceptions noted in the table below, EVERYTHING the team brings with it to the COMPETITION AREA of a tournament must be made entirely of LEGO elements in original factory condition. Electrical parts (which includes sensors) are limited in type and quantity to 2 "bricks" (any combination of RCX and NXT). Wind-up/pull-back "motors" are not allowed, as per FLL rules this year. Remote controls of any form are not allowed anywhere.

In the Two Robot division, the team must have two independent robots. Each Robot may have 1 or 2 "bricks" (any combination of RCX and NXT).

There are no restrictions on the quantity or source of non-electric LEGO pieces.

Additional sensors allowed:

• Any of the following sensors from Hi Technic: (http://www.hitechnic.com/).
o NXT Gyro
o NXT IRSeeker
o NXT Compass
o NXT Color sensor
o NXT Acceleration Tilt sensor

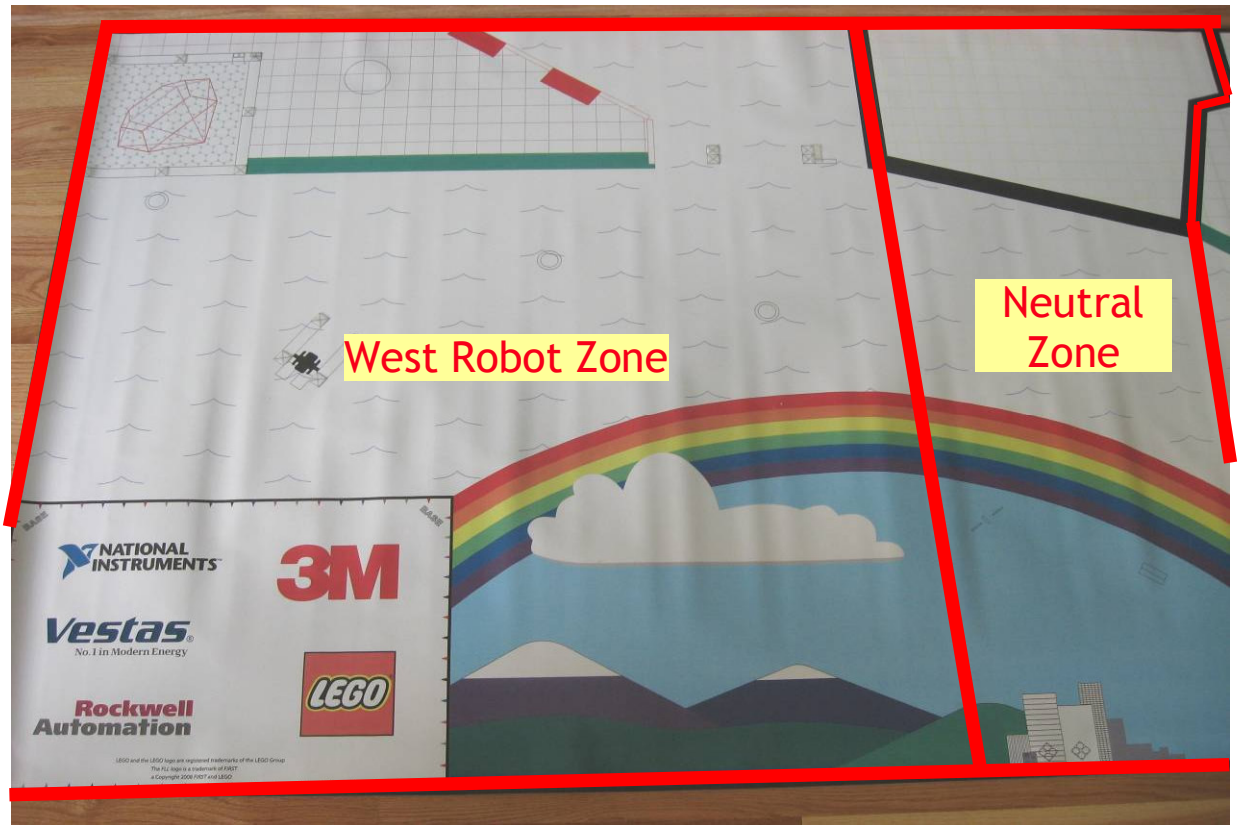
• Any of the following sensors from MindSensors (http://www.mindsensors.com/)
o Real time clock
o NXT to RCX communication
o Acceleration sensor (all 3 versions)
o Dual infrared obstacle detector
o Motor multiplexor
o Compass sensor
o Pneumatic pressure sensor
o High precision (long, medium, and short) range IR sensors

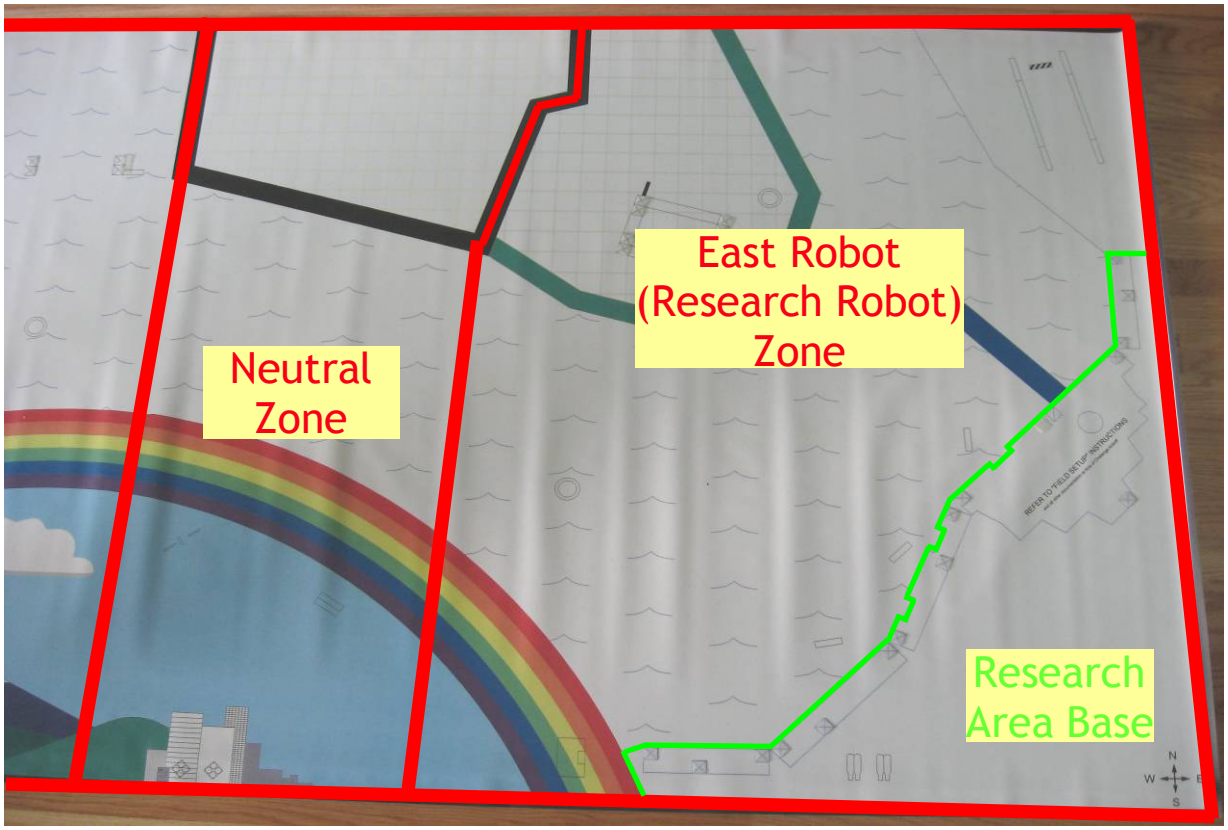
There are no limits to the quantities of these sensors.

SOFTWARE There are no limits on the software to be used to program the robot. Any package or language is legal.

Defined Zones for Two Robot Division:

In the two robot division, one robot is restricted to the west (and neutral) zones of the mat, and uses the original FLL base in the southwest corner of the mat. The other robot (research robot) is restricted to the east (and neutral) zones of the mat and uses the research area in the south east corner of the mat for a base. All rules about base, starting and retrieval penalties apply to both robots. The robots may not extend beyond their zones. The neutral zone, which either robot may use, is defined by a due north/south extension of the west edge of the yellow grid area and a due north/south line from the corner of the yellow and green grid areas. See photos below for zone and new base boundaries.


West Robot Zone
Neutral Zone
NATIONAL INSTRUMENTS
3M
Vestas
No. 1 in Modern Energy
LEGO
Rockwell Automation


Neutral Zone
East Robot (Research Robot) Zone
Research Area Base