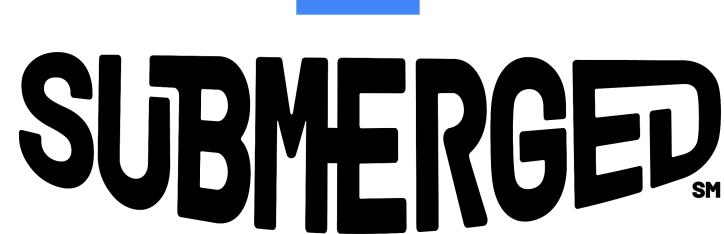


Building Mission Models

for *FIRST* LEGO League Challenge



Getting Organized

Sort Your Bags by Number

For the SUBMERGED season,
you should find the following
items in your Challenge set box

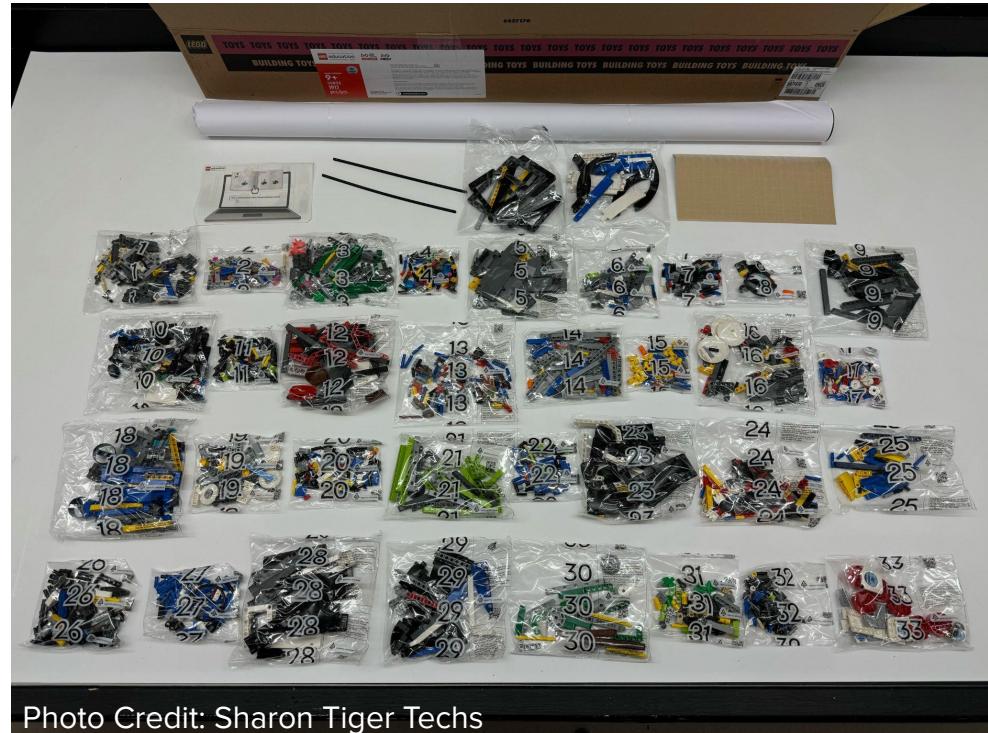
33 numbered bags

2 unnumbered bags

2 loose black axles

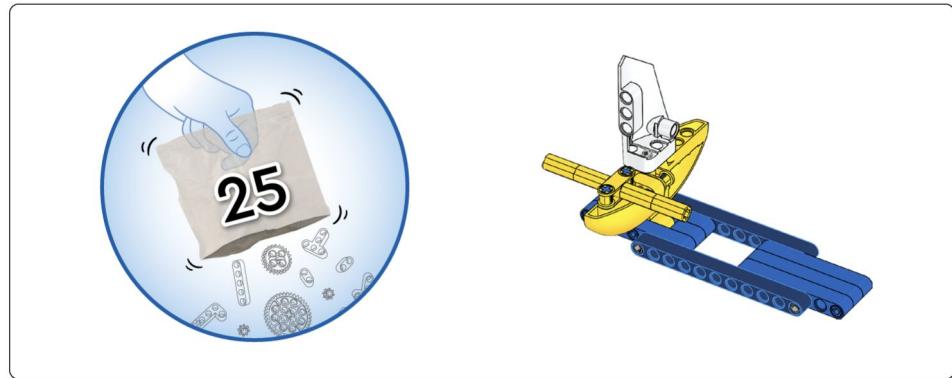
1 sheet of 3M Dual Lock

1 rolled up Challenge Mat



Open and Sort by Number

- Only open the bags that are needed for each model (instruction) in the order identified
- Do not open all bags at once as it will make it much harder to find the correct element



Example: This model only requires elements from Bag 25.

Sorting Can Save You Time

- Sort the parts for each Model into general part types so that they are easier to find (axles, liftarms, frames, pins, etc.)
- You can use LEGO sorting trays, paper plates, small bowls, box lids, trays, etc.
- This step will help find the part you need as you build



Photo Credit:
Sharon Tiger
Techs

**Building
Efficiently and
Reliably**

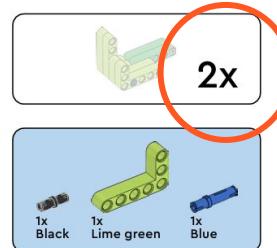
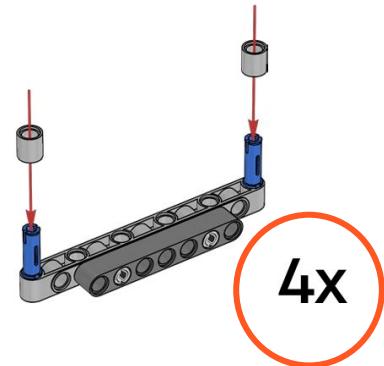
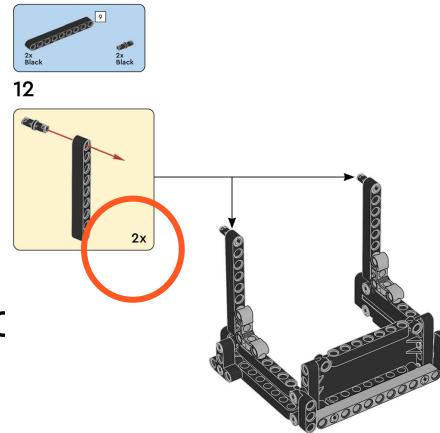
Build in Pairs

- Building in pairs or small groups works well.
- One person finds the parts for the step, one person puts the pieces together, and one person checks to make sure the step was done correctly.
- Change roles every few steps.



Multiplier Symbols

- Be sure to pay attention to the multiplier symbols (e.g. 2x, 4x) symbols at the start of a subset of instructions.
- You can save time by constructing them simultaneously.
- Sometimes the multiplier symbol only shows up after you have built one copy.



13

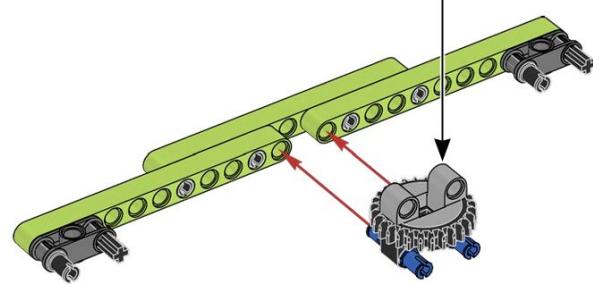
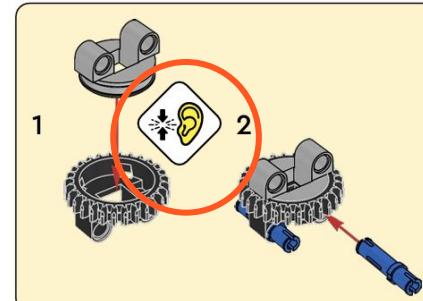


Ear Symbol

- The icon with an ear means you need to listen for something
- In this example, you need to hear a clicking sound to make sure that you have inserted the gear correctly to form a functioning turntable



7



Follow the Instructions

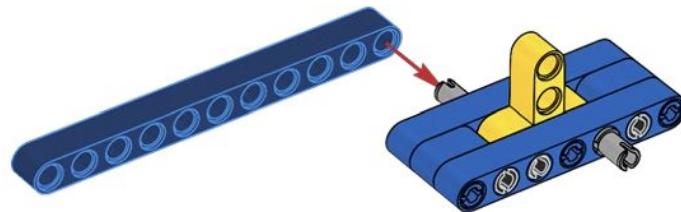
- Take your time and always build exactly what the instructions tell you.
- Do not improvise or “improve” the model.
- Your model must look like and behave exactly the same way as the ones at the competition.



Check Your Work

- Have your coach or adult check the build or compare with another team's set if needed.
- Be careful and use the right part in the right step
- Common mistakes include:
 - Using the wrong length liftarm in a step (e.g. 13M instead of a 11M liftarm)
 - Using the wrong pin (friction vs. frictionless)

TIP: LEGO Technic is measured in “Modules” (M). This step requires a 11M liftarm (count the holes).

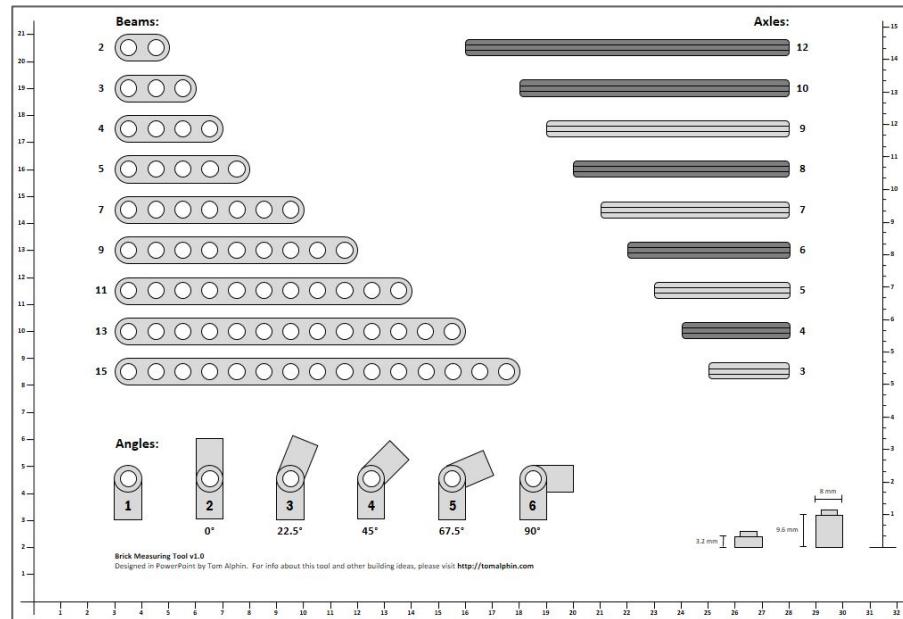


TIP: Pay attention to the color of the pins. This step uses a light grey frictionless pin. Substituting with a black pin will make the model behave differently.

Tip for Using the Right Length/Angle

If your team members have trouble identifying the right lengths, consider printing out this free LEGO ruler:

<http://tomalphin.com/2014/02/lego-ruler-and-sorting-tool.html>



Some Models Take Longer to Build

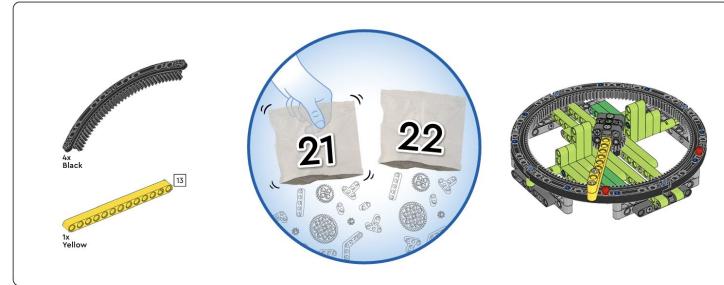
- When splitting up the work, note that some models and bag numbers take a lot longer to complete than others.
- Check ahead and see how many step numbers are in each build instruction
- Approx. times for one person to build are included on the right

Build No.	Time (Mins)	Build No	Time (Mins)
Model 1	19	Model 8	22
Model 2	15	Model 9	25
Model 3	17	Model 10	15
Model 4	2	Model 11	21
Model 5	35	Model 12	6
Model 6	18	Model 13	33
Model 7	14	Model 14	21

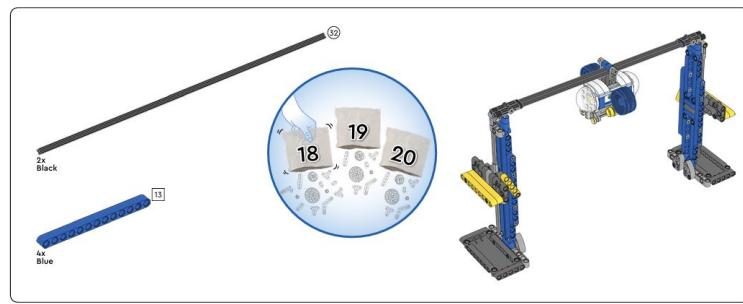
Unnumbered Bags

- Larger elements such as hoses, long axles, large frames, and 13M/15M beams are just loose in the box or in unnumbered bags. (M = LEGO Modules)
- Check the top of the instructions page for parts needed before you begin.

TIP: If you are trying to presort by mission model so that a student can take elements home and build, be sure you look for all required items in the unnumbered bags or loose items at the bottom of the box for each model..



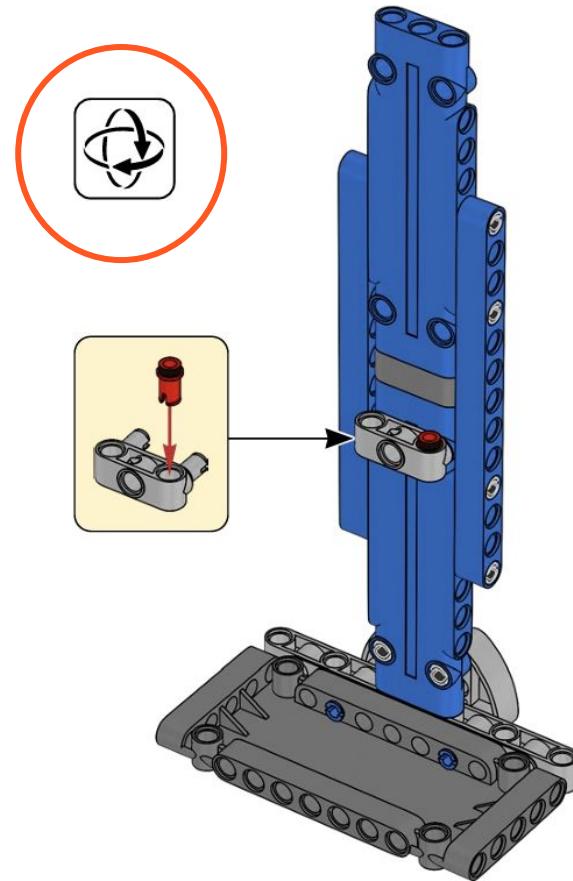
**Everything from bags 21 + 22
+ black gear racks and yellow liftarms
from unnumbered bags.**



**Everything from bags 18, 19, and 20
+ black axles (loose in the box) + blue
liftarms (unnumbered bags)**

Flip Symbol

- The model sometimes requires flipping/turning the model before the next element is added.
- Check before you add the pins/next element
- Compare the model in your hand with the image on the page



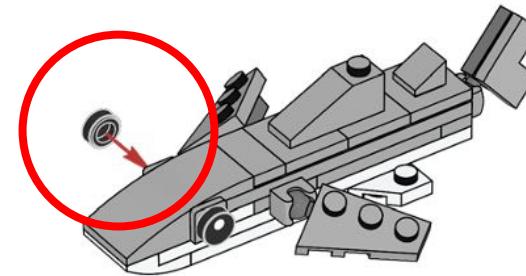
Arrows

- Sometimes instructions have arrows or show where one element is added.
- However, pay attention to how many items are in the blue box and look for them in the image.
- Pay attention to which pins/holes you need to use. It is easy to put a peg in the wrong hole.
- Sometimes there is no arrow indicator, but if you look closely, elements were already added in the image.



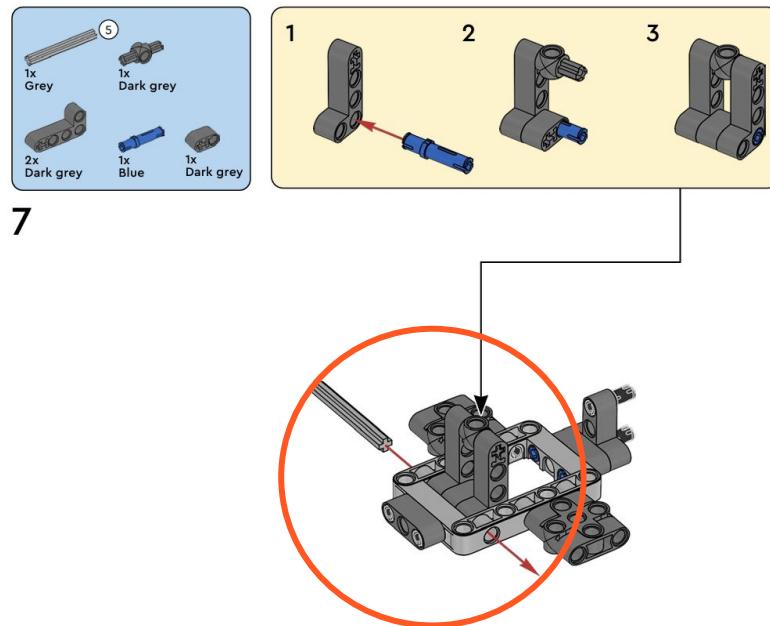
65

In Step 65 you can see an arrow to where one of the eyes should be placed. However, the callout box on the top left indicates 2 elements are added. One has already been inserted in the shark.



Submodels

- Sometimes you will build a submodel first and insert all of it into the correct location.
- Pay attention to when and how the submodel is inserted (black arrow)
- In the example on the right, you hold the submodel in the right location and then insert axle to keep it in place.



Setting Up the Mat

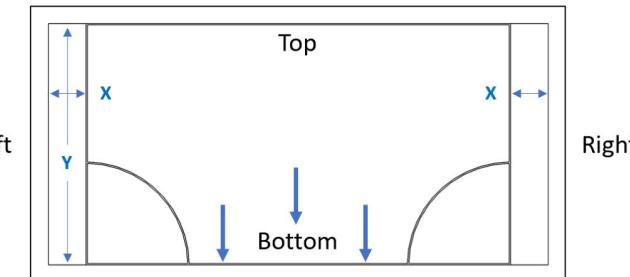
Setting up the Challenge Mat

- Placement of the challenge mat is a very important step before placing the models on it.
- The *Robot Game Table Building Instructions* document tells you how to place the mat relative to the table.
- Please note #4. Tables at your contest may/may not use tape.

FIELD MAT PLACEMENT

Make sure to follow the following steps when setting up your mat:

1. Check the table surface for bumps. Sand or file them away and then vacuum well.
2. On the vacuumed table only, unroll and place the mat as shown below. Never fold the mat, and never crush or bend a rolled mat.
3. Slide the mat against the bottom border wall and align it centrally. There should be no gaps except for one at the top wall of about 0.35 in. (9 mm). When table size and mat placement are correct, the areas to the left and right of the mat each measure about X = 7.15 in. by Y = 45 in. (181 mm by 1,143 mm).
4. Optional: To hold the mat in place, you can use thin strips of black tape, covering only the mat's left and right borders.



SLIDE MAT DOWNWARD

Setting up the Models

- Place finished models loosely on the challenge mat.
- Be sure to follow the rules carefully. The *Field Setup Video* provided by FIRST will help you with this task.
- Use the markings on the challenge mat itself as alignment points. If it doesn't align, it is probably an indication of something wrong with the build itself.



Pressing Models into Place

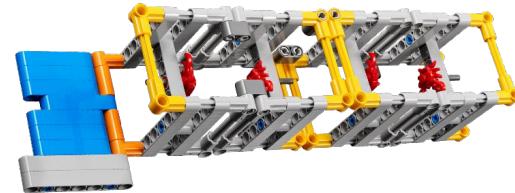
STEP 1: Locate the square outlines with an X through them. Place one dual-lock square sticky side down on each square.



STEP 2: Place another dual-lock square directly on top of it with the sticky side up.



Step 3: Place the Mission model on top, making sure to align with markings on the mat. Press the models down in place as close to the dual lock/mat as possible.



Not all Models Need Dual-Lock

For some models, you simply need to find the marking on the mat and place the model there without dual-lock



Sometimes what direction the model faces matters. This year, the krill orientation will be randomly selected by the referee.



Packing Away Models

- You can pack up and put away your challenge set if you need to. The models are generally very durable
- Remove models from as close to the dual lock as possible.
- One side of the dual lock should come off with the model. The other side stays on the mat.
- Place all smaller items such as minifigures in ziplock bags so that you do not lose the accessories

Common Questions and Issues

Should I glue or lubricate the models?

- Do not glue (permanently or temporarily) any models even if they tend to “fall apart”
- Do not lubricate any models that seem hard to activate
- You should not make models behave differently than the ones at your competition
- If models are not acting as intended, press elements together and/or rebuild the model.
- Until FIRST issues an official update, do not deviate from official build instructions.



Is my model operating correctly?

- You can compare your model with another local team's models.
- If it does not look and behave in the same way, rebuild your model.



Leftovers

- There are always some small leftover elements
- The image on the right shows all the leftover elements from every Model No once you have finished building
- There should be no large elements leftover

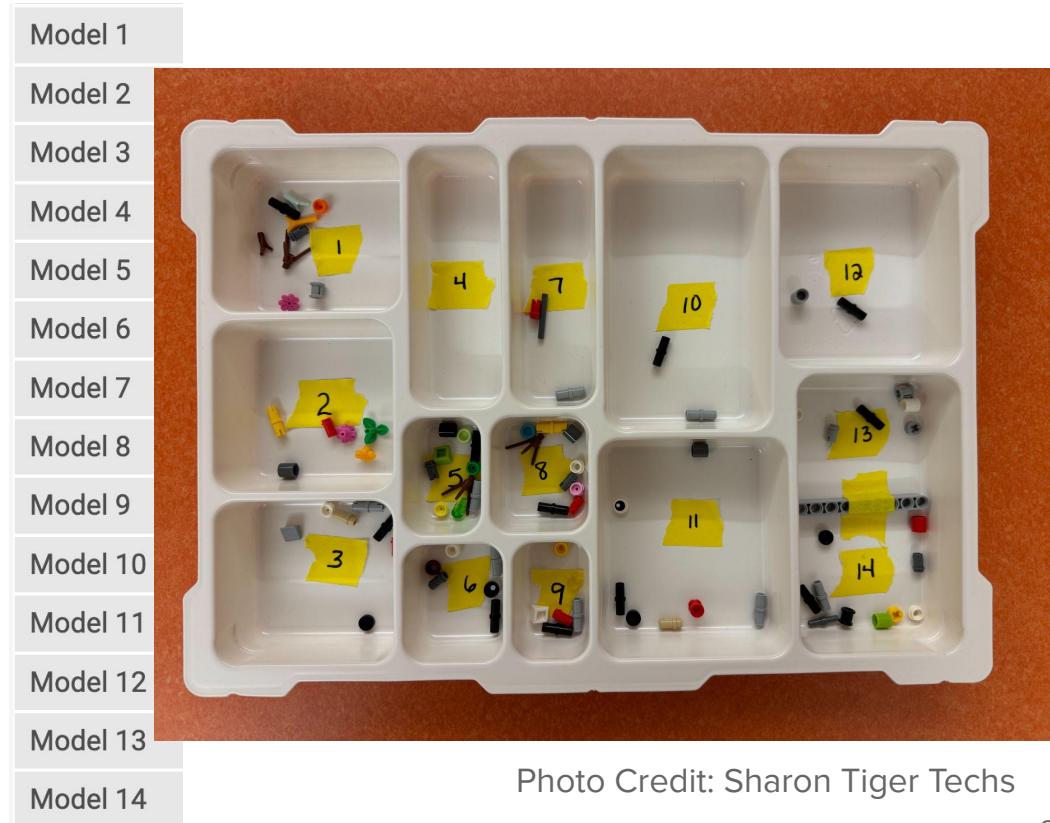
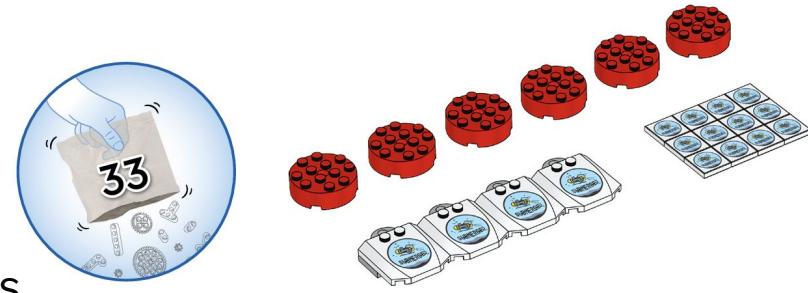


Photo Credit: Sharon Tiger Techs

No Build Instructions

- No build instructions for a bag number simply means the bricks are used in some other way
- Bag 33 contains team souvenirs (coach pins and tiles) as well and 6 precision tokens which are used by the referee (see Robot Game Rulebook).
- See the next page for building instructions for the coach pins.

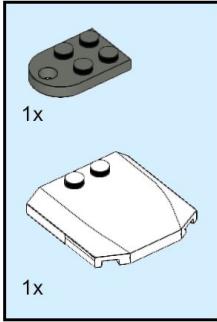


Tokens, season tiles and coach pins

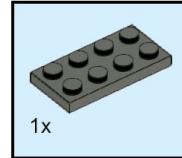


Build Instructions for Coach Pins

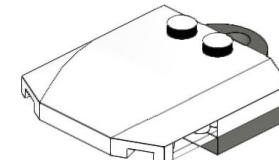
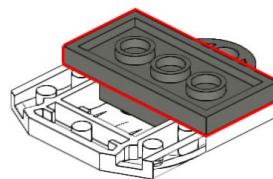
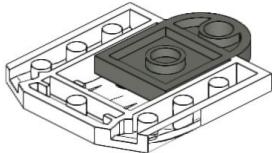
1



2



3



Missing Items

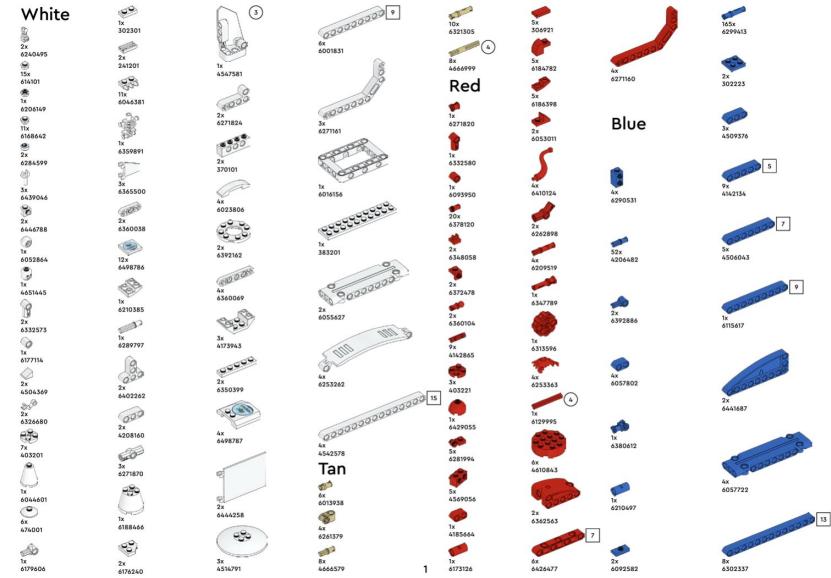
- It is very uncommon to be missing a LEGO element or a whole bag.
- Can't find a small part?
 - Check the bags, check the ground, and check to see that the element was not used earlier in another step by mistake.
- Can't find the dual-lock?
 - Check the box again - it tends to blend in with the cardboard
- Can't find a larger item?
 - Check the unnumbered bags or bottom of the box.

Tip: To prevent losing elements, make sure that you empty the bags of LEGO on to a tray or container of some kind rather than on the floor or table.

Missing Items



- If you really can't find an item, call LEGO for help: 1-844-903-5346 (US/CAN) or 00800 5346 5555 (International). You can also visit the missing parts/customer service page of the LEGO website
 - You will need to know the set number (**45826**) and the part you need. The Element Overview document in the Building Instructions section will tell you the part number.



Issues and Tips Specific to SUBMERGED

Building Instructions

- This year, the instructions are by Mission Model.
- Therefore, if you click on a Bag No. you will notice that the instructions use multiple Bags of LEGO
- **Updated on 8/15 from Bag No. to Model No.**
- **Note that Model No. does not match the actual Mission numbers**

Bag Number
Element Overview
Prepack Overview
Bag 1
Bag 2
Bag 3
Bag 4
Bag 5
Bag 6
Bag 7
Bag 8
Bag 9
Bag 10
Bag 11
Bag 12
Bag 13
Bag 14

Model No	Mission
Model 1	Coral Nursery
Model 2	Coral Reef
Model 3	Shark
Model 4	Scuba Diver
Model 5	Angler Fish
Model 6	Raise the Mast/Kraken's Treasure
Model 7	Artificial Habitat
Model 8	Unexpected Encounter
Model 9	Send Over the Submersible
Model 10	Sonar Discovery
Model 11	Feeding the Whale
Model 12	Changing Shipping Lanes
Model 13	Research Vessel
Model 14	Sample Collection

M01 Dual-Lock Position

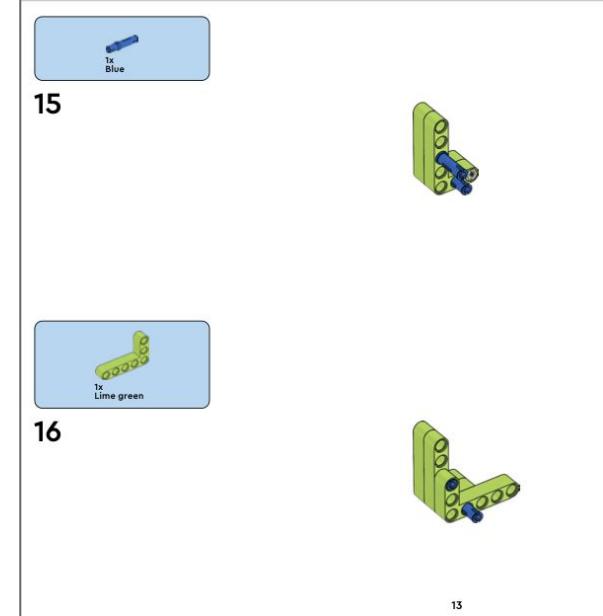
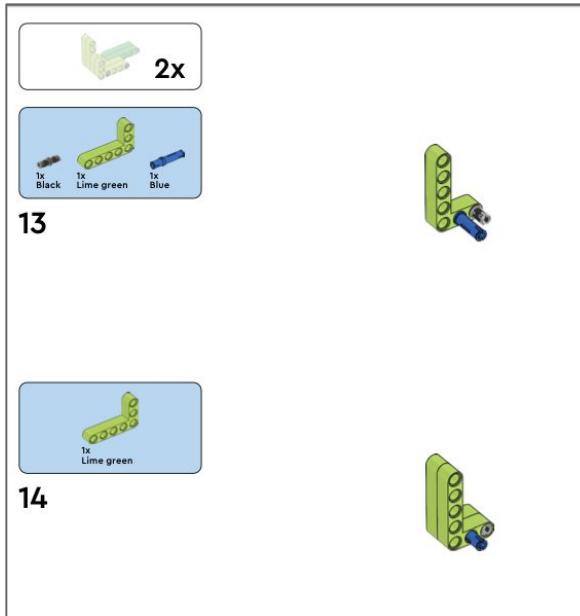
UPDATE 01 – MISSION 01: CORAL NURSERY SETUP – To avoid interfering with the intended movement of the coral tree's holder in Mission 01: Coral Nursery, move the 3M™ Dual Lock™ Reclosable Fastener as shown in the image:



M11 Building Instruction Error (FIXED)

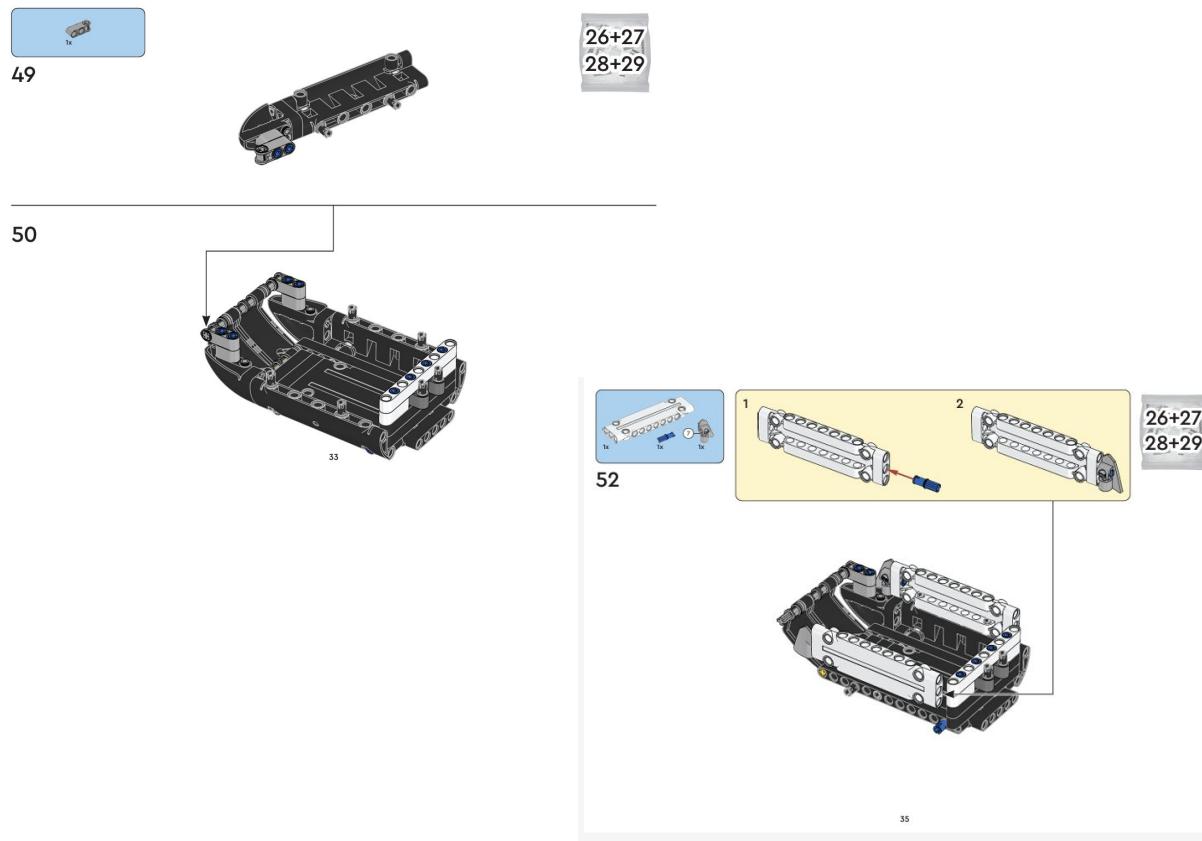
If you follow the instructions for the blue pins in these steps, they do not end up in the same place as the final image on Step 16.

Instructions were updated 8/15 to fix this error.



M15 Research Vessel Instruction Error

The section inserted in Step 50 disappears for the next few steps. As a result, the image on Step 52 has a floating element that is missing the parts below it.



Field Setup Tips Guide

See Field Setup Tips document on FLLTutorials for additional tips on how to set up the missions.

Some Models Take Longer to Build

- When splitting up the work, note that some models and bag numbers take a lot longer to complete than others.
- Check ahead and see how many step numbers are in each build instruction

Mission/No.	Steps	Mission/No.	Steps
Coral Nursery (1)	52	Unexpected Encounter (9)	56
Shark (2)	66	Send Over the Submersible (10)	54
Coral Reef (3)	37	Sonar Discovery (11)	31
Scuba Diver (4)	4	Feeding the Whale (12)	45
Angler Fish (5)	85	Changing Shipping Lanes (13)	16
Raise the Mast/Kraken's Treasure (6, 7)	63	Sample Collection (14)	68
Artificial Habitat (8)	42	Research Vessel (15)	96