

FIRST® LEGO® League Challenge SUBMERGEDSM Building Instructions

Build 11: Feed the Whale

This build is 154 pieces, and 45 building steps.

Welcome to text-based instructions from Bricks for the Blind. Before you start building, here are some terms we'll be using:

- In Front of/Front: towards you.
- Behind/Back: away from you.
- Up: towards the ceiling.
- Down: towards the floor.
- Stud: the bump on a LEGO brick. Example: A 2x1 brick has two studs on it.
- Vertically: going from front to behind.
- Horizontally: going from left to right.
- Upright: pointing up towards the ceiling.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- Symmetrically: a mirror image. Example: If you place a 2x1 brick with technic connector on the front wall at the right, connector to the front, and then place another such piece symmetrically on the back wall, at the right, the technic connector of the second piece should point to the back, since it will be placed symmetrically.
- Centered-vertically: even amount of space in front of and behind the piece
- Centered-horizontally: even amount of space left and right of the piece.
- Row: studs lined up horizontally (left to right/side to side).
- Column: studs lined up upright or vertically (top to bottom/back to front).
- Standing upright: the piece is perpendicular to the ground, like a wall.
- Lying flat: the piece is parallel to the ground, like a piece of toast which fell off the table.
- Anti-stud: the portion of a piece which accepts studs, like the bottom of a plate.
- Jumper plate: a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.

A note on LEGO Technic™ part names. These parts are somewhat different from regular LEGO bricks. Here are some definitions in case the builder or helper is not familiar with LEGO Technic™.

Axles - An axle is a connector which has an X shaped cross-section. Because their cross section is not round, anything connected to an axle using an axle-hole will rotate with that axle. Axles are longer than they are wide, and the length of an axle corresponds with how many bricks long it is. Aka a 3L axle is three bricks long. Axles come in a variety of lengths, with a 2L axle being the shortest available. They may be combined with pins, or have circular stops on them. A stop prevents the axle from sliding through an axle-hole at a specific point on the axle.

Pins - A pin is a connector which has a circular cross section and a flanged notch out of one or both ends. This flanged notch allows them to click into bricks with a pin-hole. Pins come with and without friction ridges, which are small bumps on the pin which prevent them from rotating freely. For standard pins, black is a high friction pin, and gray is a low friction pin. A standard length pin is two brick lengths long, with a stop in the middle. This prevents a brick from being pushed from one side of the pin to the other. A 1L pin is one brick long and still retains the stop, however it also includes a hollow stud at the other end. A 3L pin is three bricks long, and only contains a stop at one side, allowing two bricks to be pushed onto the other side of the pin. Pins may also have one side which is an axle.

Lift-arms - A lift-arm is a basic structural element, similar to a brick or a plate, but usually without any studs. It is a beam with rounded ends and with holes in it, with the same spacing as the studs on a LEGO brick. lift-arms come in a variety of lengths, including a 1x1 lift-arm which looks like a cylinder. Thick lift-arms are as wide as a LEGO brick, and thin lift-arms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a lift-arm arm may accept axles or pins. They also come in a variety of shapes, including tees, ells and triangles.

Gears - A gear is a functional element. They are typically discs with teeth on the outside, there are also worm gears which look like a spiraling cylinder! Gears connected by axles transmit or even transform rotational motion!

Axle and Pin Connectors - These elements are typically smaller than lift-arms and are used to connect some combination of pins or axles. They might have pins or axles, as well as axle or pin-holes. They have a lot of different angle combinations! The simplest just connects two axles or pins together in a straight line.

Bushes/Bushings - LEGO Technic™ uses bushes largely as spacers, but they also can reduce friction between rotating parts, or can form useful elements such as handles. Bushes are typically light gray, generally cylindrical, and have an axle-hole running through the middle. They have a flange at the front and back to make them easier to pull on and off.

Technic™ Bricks and Plates – There are also regular bricks and plates that are adapted for use with Technic™ elements. Technic™ bricks have holes for either pins or axles on the sides and are only one brick wide. One of the most common of these is a 1x2 brick with a single pin hole. Most often, these bricks have pin holes, not axle holes. Technic™ plates have holes on the flat surface between the studs and are a minimum of two bricks wide. The holes in these plates can accept pins, or can allow an axle to pass through and still spin.

For builders with low vision, or a sighted building partner who may want to follow along with the printed visual instructions that come with each set. As low vision users may benefit from viewing the instructions on a personal device where they can zoom in on content and use assistive technologies to enhance the visuals.

Sorting the pieces:

This LEGO set comes in the bags labeled 23-24. Additional pieces are in the unlabeled bag. Sort the pieces into groups as described below. Note that where there are multiple colors of the same brick in a step, the colors will be split across two groups to make telling the difference easier for the builder! LEGO includes a few spare parts in case you lose something. Set these into their own group away from the rest, in case you need them later.

Build 11 (9 groups of bricks)

Group A contains all of the black 2L pins from this bag. These pins have friction ridges.

Group B contains all of the blue 3L pins from this bag. These pins have friction ridges.

Group C contains all of the blue 2L axle/pin combos from this bag. These pins have friction ridges.

Group 1 contains the pieces for steps 1-8. This includes the black #17 panel fairing from step 9.

Group 2 contains the pieces for steps 9-10.

Group 3 contains the pieces for steps 11-23. This includes two white 3x13 curved panels from the unlabeled bag.

Group 4 contains the pieces for steps 24-35.

Group 5 contains the pieces for steps 36-43. This includes the black #6 panel fairing from step 44.

Group 6 contains the pieces for steps 44-45.

Building Instructions:

Main build.

Open groups A, B, C and 1. You will use the pins from groups A, B and C throughout the build.

1.1. We'll start by building the back of the whale's throat. Place a yellow 5L liftarm in front of you, vertically with the holes facing left and right.

1.2. Push two blue 3L pins from group B, with the stop rings on the right, from the left into the second holes from the front and back of the previous piece. Push them all the way in so they extend 2L to the left.

2. Push a yellow 5L liftarm, vertically with the holes facing left and right, from the left onto the pins from the previous step. Push it all the way to the right so the pins extend 1L to the left of the first liftarm. Repeat this with another yellow 5L liftarm so the pins are completely covered.

3.1. Find a black 5x7 hollow frame. This looks like two 7L liftarms connected by two 5L liftarms, forming an open rectangle. Place this, with the 7L liftarm sides on the left and right and the 5L liftarms at the front and back over the three 5L liftarms. It should fit perfectly over them.

3.2. Push two blue 3L pins from group B, with the stop rings on the left, from the left into the front and back holes on the left side of the previous piece. There should be one free hole between them. Push them all the way in so they connect to the 5L liftarms and extend 1L to the left.

4.1. Find a black 5x11 panel. This piece has five pin holes on each short end, seven pin holes on each long side, and four pin holes on the top and bottom. One side is flat, and one side has a gap between the two long rows of pin holes. Place this piece in front of you, horizontally with the flat side at the bottom.

4.2. Rotate the back of the whale's throat so the pins point down and are in a column. Push the pins down into the right two top facing holes on the previous piece.

4.3. Push two black 2L pins from group A, from the front into the left and right holes on the front side of the 5x11 panel. Repeat this symmetrically on the back side.

4.4. Push two black 2L pins from group A, from the left into the front and back holes on the left side of the 5x11 panel.

5.1. Find a black 11x3 curved panel. This piece is curved. It has one smooth side and one hollow side. It is also a little bit narrower. It has one long side with five holes, two short sides with two holes each, and the side opposite the five holes has two pairs of three holes. Push this piece, horizontally with the smooth side at the back and the five-hole side at the top, from the back onto the two pins on the back of the 5x11 panel. Its sides should be even with the 5x11 panel.

5.2. Push a black 2L pin from group A, from the left into the bottom hole on the left side of the previous piece.

6. Repeat steps 5.1 and 5.2 symmetrically on the front side of the assembly. There should be two pairs of pins extending on the left side of the assembly, with three free holes between them.

7. Push a black 7L liftarm, vertically with the holes facing left and right, from the left onto the four pins on the left side of the assembly.

8. Push two black 2L pins from group A, from the top into the second holes from the right on the front and back rows of the assembly.

9.1. Find a black panel fairing #17, large, smooth, Side A. This piece has one smooth, curved side and one hollow side. This has a 2x5 L-shaped pattern of holes on one side and no holes on the opposite side. It has three holes on one long side, and one perpendicular through hole on the opposite side. If you stand it up on the L-shaped hole pattern, with the smooth side at the back, the left side is taller than the right. Rotate this piece so the smooth side is at the back and the L-shaped hole pattern at the right. Find the three holes on the bottom. Push the middle hole onto the back pin from the previous step. The right side of this piece should be even with the right side of the assembly.

Open group 2.

9.2. Find a black panel fairing #18, large, smooth, Side B. This piece is the mirror of the one from the previous step. Attach it symmetrically to the previous piece on the front side of the assembly.

10.1. Keeping the 5x11 panel flat on the table, rotate the whale's head 90 degrees clockwise so the hollow frame is at the front. Place a black 2x4 L-shaped liftarm in front of you, with the long leg upright on the left and the short leg horizontally on the bottom, pointing to the right.

10.2. Push a blue 2L axle/pin combo from group C, with the axle at the front, from the back into the top hole of the previous piece.

10.3. Push two black 2L pins from group A, one from the back into the hole below the previous piece, and one into the bottom right hole on the L-shaped liftarm.

10.4. There is a row at the bottom of the front side of the whale's head. Push the bottom pin on the L-shaped liftarm into the leftmost hole of this row. The other two pins should go into the two leftmost holes on the front of the whale's head.

10.5. Place a black 2x4 L-shaped liftarm in front of you, with the long leg upright on the right and the short leg horizontally on the bottom, pointing to the left.

10.6. Push a blue 2L axle/pin combo from group C, with the axle at the front, from the back into the top hole of the previous piece.

10.7. Push two black 2L pins from group A, one from the back into the hole below the previous piece, and one into the bottom left hole on the L-shaped liftarm.

10.8. Place this L-shaped liftarm on the right side of the whale's head, symmetrically to the first.

Open group 3.

11.1. Now we'll start on the whale's lower jaw. Find a white 1x11.5 bent liftarm. This looks like a 7L liftarm and a perpendicular 3L liftarm connected by a 45 degree angled liftarm. Place this in front of you so the holes are facing the top, the 7L part is horizontally on the left, and the 3L part is vertically at the front.

11.2. Push two black 2L pins from group A, from the top, one into the second hole from the left and one into the second hole from the front on the previous piece. There should be one free axle hole to the left of the left one, and in front of the right one.

12. Push a white 1x11.5 bent liftarm, in the same orientation as the first, from the top onto the two pins from the previous step so it is even with the first bent liftarm.

13. Push a blue 2L axle/pin combo from group C, with the axle side at the bottom, from the top into the front axle hole of the previous piece. Repeat this symmetrically on the bottom side. These should extend 1L above and below the front hole of the lower jaw.

14. Push two black 2L pins from group A, from the top into the two corner holes of the lower jaw. There should be one wide hole between these two pieces. Repeat this symmetrically on the bottom side.
15. Rotate the long portion of the assembly away from you so it stands upright on the left side and so the short portion lies flat and points to the right. The pins should now point front and back. Push the leftmost hole of a white 9L liftarm, horizontally with the holes facing forward, from the back onto the rightmost pin on the lower jaw.
16. Push two black 2L pins from group A, from the front into the second and fourth holes from the right on the previous piece. There should be one hole between these two pins.
17. Push a white 9L liftarm, horizontally with the holes facing forward, from the front onto the two pins from the previous step. Offset it so it extends two holes to the right past the liftarm behind it.
18. Push two black 2L pins from group A, from the front into the second holes from the left and right sides of the previous piece. There should be five holes between these two pins.
19. Push a white 9L liftarm, horizontally with the holes facing forward, from the front onto the two pins from the previous step. It should be even with the liftarm behind it.
20. Push two black 2L pins from group A, from the front into the fourth holes from the left and right sides of the previous piece. There should be one hole between these two pins.
21. Push a 9L liftarm, horizontally with the holes facing forward, from the front onto the rightmost three pins on the front side of the lower jaw. The two liftarms behind it should extend two holes to the right of it.
22. Push two tan 1L pins with a short pin on one side, with the short pin at the front, from the front into the rightmost and second from the left holes on the previous piece. There should be six holes between these pins. Repeat this symmetrically with the 9L liftarm on the back side of the lower jaw.
23. Whale jaws are not perfectly straight, so we're going to add a curve to it! Find a white 3x13 curved panel. This is a flat piece, which has a pin hole at each end. Rotate this so it is horizontal and curving up like a bowl. Locate the second pin from the left on the front side of the lower jaw. This is at the bottom of the two bent liftarms. Push the left hole of the curved panel onto this pin. The panel should be below the lower jaw. Rotate it all the way counterclockwise so it touches the lower jaw. Repeat this symmetrically on the back side.

Open group 4.

- 24.1. Place a white 5L thin liftarm in front of you, horizontally with the holes facing forward.
- 24.2. Push a light gray 5L axle, from the front into the rightmost axle hole of the previous piece. Push it in until the back of the axle is even with the back of the liftarm.
- 24.3. Locate the rightmost hole on the lower jaw. The holes of the two 3x13 curved panels should be in line with the two liftarms here. Push the axle, from the back through this hole. Locate the right short pin on the back side of the jaw. Push the liftarm forward until it attaches to this pin.
- 24.4. Repeat steps 24.1-24.2 to create another liftarm and axle.
- 24.5. Locate the left short pin on the back side of the jaw. The thin liftarm should be horizontal with the holes facing the front, and the axle should be on the right pointing forward. Push the axle through the hole to the right of this pin. Push the liftarm forward until it attaches to the left short pin.

25. Push two white 5L thin liftarms, horizontally with the holes facing forward, from the front onto the two sets of axles and short pins on the front side of the jaw. These should be symmetrical to the liftarms on the back side of the jaw.

26. Locate the top hole on the left side of the lower jaw. This is an axle hole facing front and back. Push a yellow 3L axle, from the front through this hole. Push it through the hole until it extends evenly to the front and back of the jaw.

27.1. Place a white 3L thin liftarm in front of you, horizontally with the holes facing forward.

27.2. Push a yellow 3L axle, from the front into the leftmost axle hole of the previous piece. Push it in until the back of the axle is even with the back of the liftarm.

28.1. Assemble a wheel by pushing a black rubber tire onto a black wheel rim. Notice that the rim has two sides, one which has five spokes flush with the edge of the tire, and another which is recessed inside of the tire. This will be the counterweight that helps keep the whale's mouth open.

28.2. Push the wheel, with the recessed side at the front, from the front onto the axle. Push the wheel all the way back until it touches the thin liftarm.

29. Push a red bushing, from the front onto the axle. Push it all the way back until it touches the wheel. Its front edge should be flush with the front of the wheel.

30. Rotate the wheel and liftarm assembly so the liftarm is upright at the back. Push the bottom axle hole of the liftarm, from the back onto the axle extending to the back of the top left hole on the lower jaw.

31. Push a white 3L thin liftarm, standing upright with the holes facing forward, from the front onto the two axles at the top of the lower jaw.

32.1. Place a yellow 4x2 L-shaped liftarm in front of you, with the short leg upright on the right and the long leg horizontally on the bottom pointing to the left.

32.2. Push a black 4L axle, from the front into the leftmost axle hole of the previous piece. Push it in until the back of the axle is even with the back of the liftarm.

32.3. Push a black 2L pin from group A, from the front into the second from the right hole on the bottom row of the L-shaped liftarm. There should be one free hole between this pin and the 3L axle.

32.4. Push a yellow 3L liftarm, horizontally with the holes facing forward, from the front onto the pin and axle. Push it all the way to the back so the axle extends 2L to the front.

32.5. Locate the pin on the back side of the lower jaw. This should be on the upright portion below the wheel/counterweight. Push the bottom right corner of the L-shaped liftarm, with the long leg horizontally pointing to the left, from the back onto this pin.

33.1. Place a yellow 4x2 L-shaped liftarm in front of you, with the short leg upright on the left and the long leg horizontally on the bottom pointing to the right.

33.2. Push a black 2L pin from group A, from the front into the third hole from the right on the L-shaped liftarm.

33.3. Push the left hole of a yellow 3L liftarm, horizontally with the holes facing forward, from the front onto the pin from the previous step. Its right side should be even with the right side of the liftarm behind it.

33.4. Rotate this assembly 180 degrees so the L-shaped liftarm is at the front, with the short leg upright at the right and the long leg horizontally pointing to the left. Push this assembly, from the front onto the pin on the front of the jaw, and the axle from the other L-shaped liftarm assembly. It should be symmetrical to the other L-shaped liftarm.

34.1. Now we'll attach the lower jaw to the rest of the whale's head. Place the top part of the head in front of you, with the 5x11 panel lying flat at the bottom, and the two L-shaped liftarms on the right side. There should be upright walls on the front, back, and right sides. Find the one hole on the front side, near the top right corner. There's another one on the back side. We'll use these to attach the lower jaw.

34.2. Rotate the lower jaw so the wheel/counterweight is on the right side and the curved side is on top on the left. If you put it on the table in this orientation, it should look kind of like an arch. Find the holes which are just to the right of the widest part of the two flat panels. Place the jaw between the front and back sides of the head and line this hole up with the holes we found in the previous step. You will have to lift the head slightly to get these to line up.

34.3. Push a light gray 1L pin with a 3L bar on one side, with the bar at the back, from the front through the hole on the top of the head, pushing it all the way back so it attaches the lower jaw to the top of the head. Repeat this symmetrically on the back. This can be tricky. It helps to push the bar in through one of the holes on the top part of the head, then move the jaw until the bar can go into the jaw. Once it's in, you can push it all the way through.

35. Place two white 1x1 round tiles with an eye pattern on the studs of the pieces from the previous step.

Open group 5.

36. Now we'll make a base for the whale's head, which also holds the fins. Set the completed head aside for now. Place a black 5x7 hollow frame in front of you, with the 7L liftarm sides on the left and right and the 5L liftarms at the front and back.

37. Push two black 2L pins from group A, from the left into the front and back holes on the left side of the previous piece. There should be one hole between these two pieces. Repeat this symmetrically on the right side.

38.1. Place a black 3L liftarm in front of you, horizontally with the holes facing forward.

38.2. Push two black 2L pins from group A, from the back into the left and right holes of the previous piece.

38.3. Push this assembly, from the front into the back row of the hollow frame. You'll need to place this piece inside the frame and push it back to accomplish this.

38.4. Repeat steps 38.1-38.2 and place this symmetrically at the front.

39. Push the bottom two holes of a black 5x7 hollow frame, with the 5L liftarms vertically at the top and bottom, and the 7L liftarms standing upright, from the left onto the two pins on the left side of the first hollow frame. Repeat this symmetrically on the right side.

40. Push two black 2L pins from group A, from the left into the top two holes on the left side of the front 7L liftarm on the left 5x7 hollow frame from the previous step. Repeat this symmetrically on the right piece from the previous step.

41. Push a black 4x2 L-shaped liftarm, with the long leg upright at the back and the short leg vertically on top pointing forward, from the left onto the left pins from the previous step. The top of this piece should be even with the top of the hollow frame it attaches to, and the short leg should extend 1L to the front. Repeat this symmetrically on the right hollow frame.

42.1. Find a black 1L pin with a perpendicular pin hole on one side. This looks like a 1L pin which has a hollow cylinder on one side which is perpendicular to the pin. The hollow cylinder is a pin hole. Place this in front of you, with the pin pointing up and the hole facing left and right.

42.2. Push a light gray 2L pin, from the right into the hole of the previous piece. This pin does not have friction ridges so it will spin easily.

42.3. Push the previous piece, from the right into the frontmost left facing hole on the right 4x2 L-shaped liftarm. Because the pin does not have friction ridges, the 1L pin with a perpendicular hole will hang down.

42.4. Repeat steps 42.1-42.2 and place this symmetrically on the left 4x2 L-shaped liftarm.

43.1. Place the whale's head in front of you, with the 5x11 panel at the bottom and the wheel/counterweight at the right. Locate the top right-facing holes on the front and back upright columns on the whale's head. We'll attach the frame to these.

43.2. Rotate the frame 90 degrees away from you so the two parallel 5x7 hollow frames are on the left and right, and the other 5x7 hollow frame is at the front. The two L-shaped liftarms should be on top at the back. Rotate the frame 90 degrees counterclockwise so the parallel hollow frames are at the front and back with the other frame at the right. Rotate the two black 1L pins with perpendicular pin holes so they point left and attach them to the holes we identified in the previous step. This is tricky because these pins don't like to stay put! One way to do it is to push one pin in just a little bit, then do the same on the back side, and then push them both all the way in.

44.1. Now we'll make the first fin. Find a black panel fairing #6, long, smooth, Side B. This looks like a slimmer version of the #18 fairing, and it only has a 2x3 L-shaped hole pattern. Place this in front of you so it is horizontal, with the L-shaped hole pattern at the left and the smooth side down.

44.2. Push two black 2L pins from group A, from the left into the backmost and corner holes of the L-shaped hole pattern. This will be the whale's left fin.

44.3. Rotate the fin so the L-shaped hole pattern is at the bottom, with the smooth side of the fin at the back. There should be a 3L column of holes on the right side. Push the two pins on the bottom of the fin, from the top into the leftmost two holes on top of the back row of the frame.

Open group 6.

44.4. Now we'll make the other fin. Find a black panel fairing #5, long, smooth, Side A. This is the mirror of the previous piece. Place this in front of you so it is horizontal, with the L-shaped hole pattern at the right and the smooth side down.

44.5. Push two black 2L pins from group A, from the right into the backmost and corner holes of the L-shaped hole pattern. This will be the whale's right fin.

44.6. Rotate the fin so the L-shaped hole pattern is at the bottom, with the smooth side of the fin at the front. There should be a 3L row of holes on the right side. Push the two pins on the bottom of the fin, from the top into the leftmost two holes on top of the front row of the frame. Now the whale's head is complete! Rotate it so the frame is at the bottom with the two fins pointing to the right. The wheel/counterweight should be on your left. If you lift the wheel, the whale's lower jaw should open! It will close if you let go of the wheel.

45.1. Now, let's make the whale a snack! This is a baleen whale, and baleen whales love krill! Krill are kind of like little shrimp. Set the whale's head aside. Place a red 1x2 brick with two studs on each long side horizontally in front of you.

45.2. Find a red 2x1 curved slope with a recessed stud. This looks like a 1x1 plate attached to a 1x1 brick with a rounded corner. The rounded corner extends one plate thickness above the 1x1 plate. Place the plate of this piece, with the curved slope at the left, on the left stud of the previous piece.

45.3. Find a red 1x1 plate with a ring on one side. This looks like a 1x1 plate which has a hollow cylinder on one side. This hollow cylinder has studs on each side. Place this piece, with the ring on the right, to the right of the previous piece.

45.4. Place a red 1x2 tile, horizontally, on the two previous pieces.

45.5. Place a red 1x2 inverted curved slope tile, horizontally on the left two anti-studs on the bottom of the krill.

45.6. Place a white 1x2 plate with three little triangles on one side, sideways with the triangles on the bottom, on the front two side studs. Repeat this symmetrically on the back.

45.7. Place a black 1x1 round tile, sideways, on the front stud on the ring at the right side of the krill. Repeat this on the back side.

45.8. Repeat steps 45.1-45.7 four more times.

45.9. Now, open the whale's mouth and feed it some delicious krill!

Congratulations! Now this build is complete!

Thank you so much for building this set!

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