

# FIRST® LEGO® League Challenge SUBMERGED<sup>SM</sup> Building Instructions

## Build 9: Send Over the Submersible

This build is 206 pieces, and 54 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 18-20. 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.

Note that since we'll build two identical supports, groups 4, 5, and 6 are identical to groups 1, 2, and 3.

Build 9 (14 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 1-11. This includes two blue 13L liftarms from the unlabeled bag.

Group 2 contains the pieces for steps 12-20.

Group 3 contains the pieces for steps 21-26.

Group 4 contains the pieces for steps 1-11. This includes two blue 13L liftarms from unlabeled bag.

Group 5 contains the pieces for steps 12-20.

Group 6 contains the pieces for steps 21-26.

Group 7 contains the pieces for steps 27-32. This includes two black 32L axles from unlabeled bag.

Group 8 contains the pieces for steps 33-39.

Group 9 contains the pieces for steps 40-41.  
Group 10 contains the pieces for steps 42-47.  
Group 11 contains the pieces for steps 48-54.

#### Building Instructions:

##### Main build.

Note: This build contains a submersible, which rides on a line between two identical towers. You can raise the towers to make the submarine move from one side to the other. We'll start by building the two towers, which are identical. Note that since we'll build two identical supports, groups 4, 5, and 6 are identical to groups 1, 2, and 3.

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

1.1. Time to build one of the towers! Find a light gray 11L liftarm with perpendicular holes. This looks like a normal 11L liftarm, except that every hole is perpendicular to its neighbors. Place this piece in front of you, horizontally with the smooth side at the front. The left and rightmost holes should be facing up.

1.2. Push two black 2L pins from group A, from the top into the middle two holes on the top of the previous piece. There should be two free holes to the left and right of these pieces on top of the 11L liftarm.

2. Push two blue 3L pins from group B, with the stop ring at the back, from the front into the second holes from the left and right on the front side of the 11L liftarm. There should be one free hole between these two pins. Push these all the way to the back so they extend 1L to the front and back of the 11L liftarm.

3. Find a dark gray 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 near each corner. One side is flat, and one side has a gap between the two long rows of pin holes. Push this piece, horizontally with the flat side at the bottom, from the back onto the back side of the pins from the previous step. Its left and right sides should be even with the left and right sides of the 11L liftarm.

4. Find a blue 3x11 panel. This piece looks like the 5x11 panel, except that it has three holes on the short sides instead of five. Push this, standing upright with the flat side at the back, from the top onto the two pins on top of the 11L liftarm. The sides with seven pin holes should be on the left and right.

5.1. Push two black 2L pins from group A, from the right into the top and fourth from the top holes on the right side of the previous piece. There should be two free holes between these pins. Repeat this symmetrically on the left side.

5.2. Push two black 2L pins from group A, from the front into the bottom two front facing holes on the 3x11 panel.

6. Find two light gray 2x3 quarter ellipse liftarms. These look like a 2x3 L-shaped liftarm which has a smooth curve opposite the corner. It has a 2x3 L-shaped hole pattern. Find the four pins on the front of the base assembly. Push one quarter ellipse liftarm, with the three holes standing upright on the left and the two holes horizontally pointing right, from the front onto the right two pins. The curved side of this piece should be on the right. Repeat this symmetrically on the left two pins. There will be a 1L gap between these pieces.

7.1. Push two blue 3L pins from group B, with the stop rings at the bottom, from the top into the left and right holes on the 3x11 panel. Push them all the way in so they extend 2L to the top.

7.2. Push a dark gray 3L liftarm, horizontally with the holes facing up, down onto the pins from the previous step. Push this all the way down so the pins extend 1L to the top.

8.1. Push a 3x11 panel, standing upright with the flat side at the back, from the top onto these two pins. The sides with seven pin holes should be on the left and right.

8.2. Push two black 2L pins from group A, from the right into the bottom and fourth from the bottom holes on the right side of the previous piece. There should be two free holes between these pins. Repeat this symmetrically on the left side.

9. Find the four pins on the left and right side of the two 3x11 panels. Push a blue 13L liftarm, standing upright with the holes facing left and right, from the right onto the right set of pins. It should connect all four pins. Repeat this symmetrically on the left side.

10.1. Keeping the bottom flat on the floor, rotate the base 180 degrees so the two 3x11 panels are at the back. Find the three pairs of front-facing free holes on the two 3x11 panels. Find a light gray 3L pin connector with two pins. This looks like a 3L liftarm where the middle pin hole is perpendicular to the end holes. There are also two pins extending parallel to the middle pin hole on side of the piece. When viewed from the front, it looks like a letter C. Push this, horizontally with the pins pointing to the back, from the front into the bottom pair of front-facing holes.

10.2. Push a red 1L pin with a hollow stud on one side, with the hollow stud on top, from the top into the right hole of the previous piece.

11. Push a light gray 2L pin, from the right into the middle hole of the upright 13L liftarm on the right side of the base. There should be 6 holes above and below this pin. This pin does not have friction ridges so it should spin easily.

Open group 2.

12.1. Now we'll build one of the levers used to move the submersible across the track. Set the base aside for now. Place a dark gray 3L liftarm in front of you, horizontally with the holes facing forward.

12.2. Push a blue 3L pin from group B, with the stop at the back, from the front into the middle hole of the previous piece. Push it all the way so it extends 2L to the front.

12.3. Push a blue 3L pin from group B, with the stop ring at the back, from the back into the right hole of the 3L liftarm. Push it all the way so it extends 1L to the front and back.

13.1. Push a light gray 3L liftarm with perpendicular axle connector, horizontally with the axle hole on top facing left and right, from the front onto the two pins on the front of the assembly. The left and right sides should be even with the 3L liftarm behind it.

13.2. Push a blue 3L pin from group B, with the stop at the back, from the front into the left hole of the previous piece. Push it all the way to the front so it extends 2L to the front.

14. Push a dark gray 3L liftarm, horizontally with the holes facing forward, from the front onto the two pins on the front of the assembly. The left and right sides should be even with the pieces behind it.

15. Push a black 2L pin from group A, from the front into the right hole of the previous piece. Push another, from the back into the back left hole of the assembly.

16. Find a dark gray 3x3x1 square liftarm. This piece is shaped like a square with five holes forming a cross on the flat sides. Two sides are rounded, and the other two sides have two holes each. Push this piece, laying flat with the rounded sides on the left and right, from the front onto the two pins on the front of the assembly. Repeat this symmetrically on the back side.

17.1. Find a light gray 2L axle connector. This looks like a cylinder which has four shallow grooves cut out of the sides so it has a vaguely X-shaped cross section, kind of like a thick axle. Place this piece horizontally in front of you.

17.2. Push a yellow 3L axle, horizontally from the left into the previous piece.

17.3. Find the axle hole on top of the lever assembly. Push the previous piece, with the 2L axle connector on the right, from the right into the axle hole. Push it all the way to the left.

17.4. Push a light gray 2L axle connector, from the left onto the left side of the 3L axle.

18. Push two black 2L pins from group A, from the top into the back two holes on the center column of the front 3x3 square liftarm. Repeat these two pins symmetrically on the back 3x3 square liftarm.

19. Push the front two holes of a dark gray 3x3 T-shaped liftarm, with the flat part horizontally at the back and the stem vertically pointing to the front, onto the front two pins from the previous step. Repeat this symmetrically on the back side.

20. Push a light gray 9L axle, horizontally from the left into the left axle connector on the lever assembly.

Open group 3.

21.1. Place a yellow 9L liftarm, horizontally with the holes facing forward, in front of you.

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

21.3. Push a yellow 9L liftarm, horizontally with the holes facing forward, from the front on the pins from the previous step. Push it all the way to the back so the pins extend 1L in front of it.

21.4. Keeping the axle at the left, rotate the lever assembly 180 degrees so the axle and T-shaped liftarms are at the bottom. Find the left holes on the cross-shaped hole patterns on the two 3x3 square liftarms. Rotate the two 9L liftarms we just assembled so that they are vertical, with the two pins pointing down. Push these pins into the two holes we just identified.

22. Place the tower base back in front of you, with the two 3x11 panels at the back. Find the light gray 3L pin connector with two pins on the front of the lower 3x11 panel. This piece has two holes facing up, the right one has a hollow stud in it. We're going to put the next piece into the left hole of this piece. Rotate the lever assembly so the axle points down, and so the stack of two 9L liftarms is horizontal, with the holes facing forward. Slide the axle through the left hole of the triple pin and perpendicular axle connector. The two T-shaped liftarms on the lever should be touching the tower.

23. Push the bottom hole of a yellow 5L liftarm, standing upright with the holes facing left and right, from the right onto the pin on the right side of the upright portion of the base. This liftarm is connected to a pin without friction ridges so it should swing freely.

24. Push a light gray 3L pin connector with two pins, horizontally with the pins pointing to the back, from the front into the pair of front-facing holes near the top of the upright portion of the base.

25.1. Push two black 2L pins from group A, from the top into the left and right top facing holes on top of the upright portion of the base.

25.2. Push a blue 3L liftarm, horizontally with the holes facing up, from the top onto the pins from the previous step.

26.1. Place a light gray 9L axle horizontally in front of you.

26.2. Find a light gray axle and pin connector #1. This piece has a 1L axle connector on one side, and a perpendicular pin hole on the other. Push this piece, with the pin hole on the right with the hole facing forward, from the right onto the previous piece.

26.3. Push a tan 2L axle/pin combo, with the axle portion at the front, from the front into the pin hole of the previous piece. This pin does not have friction ridges so it should spin easily.

26.4. Find a black double pin and perpendicular axle connector. This piece looks like a 2L liftarm with an axle hole on one side. The sides are not smooth, like a normal liftarm, but are bumpy. The axle hole is parallel to the long axis of the liftarm. It looks like a liftarm with a bushing on one side. Push the axle hole of this piece, horizontally with the axle hole on the left facing forward, from the front onto the axle side of the previous piece. Because there are no friction ridges on the pin, this piece will move freely.

26.5. Rotate this axle assembly so the axle points down and the previous piece is on the right side. Find the axle connector on the top of the lever assembly. Slide the axle down through the left hole of the top light gray 3L pin connector with two pins on the front of the upright assembly, and push it into the axle connector on the lever.

26.6. Now, remember that we need two towers! If you've only got one, repeat steps 1.1-26.6 to build the second tower. Instead of groups 1, 2, and 3, you will open groups 4, 5, and 6. If you already have two towers, you can move on to the next step!

Open group 7.

27.1. Now we will build the rail that the submersible rides on. Set the two bases aside for now. Place a black 2L thin liftarm with two axle holes in front of you, vertically with the holes facing left and right.

27.2. Push a 32L axle, horizontally, from the left into the front hole of the previous piece. Push it all the way through so it extends about 1L to the right of the previous piece. Repeat this in the back hole of the 2L thin liftarm so you have two parallel 32L axles.

28.1. Find a black axle and pin connector #2. This piece has two 1L axle connectors on opposite sides, and a perpendicular pin hole between them. Place this piece in front of you, with the axle connectors at the left and right and the pin hole facing forwards.

28.2. Push a black 2L pin from group A, from the front into the pin hole of the previous piece.

28.3. Push a black axle and pin connector #2, in the same orientation as the first, from the front onto the pin from the previous step. The two axle and pin connectors should be parallel.

28.4. Push the two axle and pin connectors, from the right, onto the right side of the two 32L axles. Push them all the way to the left until they stop. If the 2L thin liftarm is not touching them, push it to the right until it does.

29. Push a black 2L thin liftarm with two axle holes, vertically with the holes facing left and right, from the left onto the two axles. Push it to the right so the two axles extend about 1L to the left of it.

30.1. Place a black axle and pin connector #2 in front of you, with the axle connectors at the left and right and the pin hole facing forwards.

30.2. Push a black 2L pin from group A, from the front into the pin hole of the previous piece.

30.3. Push a black axle and pin connector #2, in the same orientation as the first, from the front onto the pin from the previous step. The two axle and pin connectors should be parallel.

30.4. Push the two axle and pin connectors, from the right, onto the left side of the two axles. Push them all the way to the left until they stop. If the 2L thin liftarm is not touching them, push it to the left until it does. Check to make sure the two 32L axles are straight and parallel. If they are not, you may need to push the axles further into the axle and pin connectors or move the two thin liftarms a little bit.

31. Push two blue 2L axle pin connectors from group C, with the axle portion at the right, from the left into the two axle and pin connectors on the left side of the rail assembly. Repeat this symmetrically on the right side.

32.1. Now we will attach the rail to the towers. Place one of the tower bases in front of you, with the upright on the right side. Find the black double pin and perpendicular axle connector, which is on top of the axle connected to the lever. If you're having trouble finding it, you can raise the lever slightly. It will be the piece on top of the axle which spins freely. Set the lever back down and rotate this piece so the holes face left and right. Rotate the rails so it is horizontal. Put one finger behind the double pin and perpendicular axle connector so it doesn't spin, push the left pair of pins on the rail into these two holes. When it's pushed in, the rail will also be free to spin. Let it droop down to the right.

32.2. Place the other base in front of you, with the upright on the left side. Repeat the previous step symmetrically for this base. Note that the entire assembly is very wobbly. You can raise and lower the levers to tilt the rail. I suggest you hold down the base when you do this. Also note that the 5L liftarm that dangles off of each base does not really do anything.

Open group 8.

33.1. Now we will build the submersible. Set the rest of the build aside for now. We'll start by building the bottom of the submersible. Find a light gray 2x2 inverted tile. This looks like a 2x2 plate where the bottom is completely flat like a tile. Place this piece in front of you.

33.2. Place a light gray 2x2 plate with two studs on one side, with the side studs facing to the right, on the previous piece.

34. Find a light gray 2x4 plate with pin holes. This looks like a regular 2x4 plate, except there is a pin hole on the bottom of each long side. If you look at the bottom of the plate, there is a half-cylinder across the middle. Place the right column of this piece, horizontally, on the left column of the previous piece so it overhangs three columns to the left.

35.1. Place the right column of a light gray 2x2 plate with two studs on one side, with the side studs facing to the left, on the left anti-stud column of the previous piece so it overhangs one column to the left. The studs of this piece and the previous piece should be level.

35.2. Place a light gray 2x2 inverted tile on the anti-stud of the previous piece. The bottom of the submersible should be mirrored left and right.

36. Find three white 4x2 double inverted slopes. These pieces look like a 2x2 plate with an inverted slope on each end. If you look at it from the front it kind of looks like a letter U. Place one, vertically, on the left two columns of the assembly. The slopes should overhang to the front and back. Place two more, in the same orientation, to the right of the first so they go all the way across the submersible bottom.

37. Place a blue 1x2 jumper plate, vertically and centered vertically, on the left column of the submersible bottom. Repeat this symmetrically on the right side.

38. Place two yellow 1x1 round plates, one on each of the previous two pieces.

39. Place a light blue 1x4 plate with only two studs, horizontally and centered horizontally, on the front row of the submarine bottom. The front and back rows of the submarine are the raised ones, not the recessed, middle portion. Repeat this symmetrically at the back.

Open group 9.

40. Place two dark blue 1x4 plates with only two studs, horizontally and centered horizontally, on each of the two previous pieces.

41.1. Now we'll make a tiny submersible crew member! Find a white 1x1 half circle brick with a stud on one side. This piece has one side which is a half-circle, and one side which is flat with a side stud. It is only two studs tall, instead of three like a normal brick. Place this in front of you, with the side stud at the right.

41.2. Place a white 1x1 slope tile, with the thick side on top, on the side stud of the previous piece.

41.3. Place a yellow 1x1 plate with a vertical clip on one side, with the clip on the left, to the left of the previous piece on the top stud of the white 1x1 half circle brick with a stud on one side. The clip is the crew member's arms

41.4. Place a red 1x1 tile with a clip-on top, so the clip looks like a U if you look at it from the front, on the previous piece.

41.5. Place this piece on the 1x1 round plate which is centered vertically on the left column of the submersible.

41.6. Repeat steps 41.1-41.4 to make a second crew member. Place this one symmetrically on the right side.

Open group 10.

42.1. Now we will make the mount for the roller the submersible uses to go across the rail. Set the rest of the submersible aside for now. Place a white 1x4 Technic brick horizontally in front of you.

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

42.3. Push a dark gray 3x3 T-shaped liftarm, with the flat part horizontally at the bottom and the stem upright pointing upwards, onto the two pins from the previous step. It should extend 2L above the Technic brick.

42.4. Push two black 2L pins from group A, from the front into the bottom two pins on the middle of the previous piece.

42.5. Push a dark gray 3x3 T-shaped liftarm, in the same orientation as the last one, from the front onto the two pins from the previous step.

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

42.7. Push a white 1x4 Technic brick, horizontally, from the front onto the two pins from the previous step.

42.8. Place the submersible in front of you, with the crew members at the left and right. Place the roller mount, centered horizontally with the Technic bricks horizontally at the front and back, on the submersible assembly. The Technic bricks should attach to the two 1x4 plates with only two studs.



43. Place two blue 1x2x2 tall bricks with two studs on one side, with the side studs at the left, on the front and back studs on the left column of the submersible. Repeat this symmetrically on the right side.

44. Place two pale blue 1x6 plates, horizontally, one on the front and back rows of the submersible.

45. Place two white 1x2 grille tiles, horizontally and centered horizontally, one on each of the two previous pieces.

46.1. Now we will make a pair of small thrusters. Find a light gray pin with dual wheel holders. This piece has a pin on one side. The other side has an angled extension with two small pegs pointing in opposite directions. These pegs are perpendicular to the pin and are used for attaching wheels. Place this in front of you, with the pin at the back and the pegs facing left and right. The direction of the angle is not important right now.

46.2. Find two small yellow wheel hubs. These are cylinders, about 2L long with a groove in the center. There is a hole on only one end, but it is small and might be hard to feel. Push these onto the two pegs on the previous piece. Push until they click. If the peg won't go in, you might need to turn the wheel hub around.

46.3. Rotate the assembly so the pin is facing the back, the wheel hubs are at the left and right, and the angle portion points up. Push the pin, from the front into the bottom hole on the front of the submersible.

46.4. Repeat steps 46.1-46.2 to make another small thruster assembly and place it symmetrically on the back side of the submersible.

47.1. The bottom of the ocean can be very dark, so now we'll build lights for the front and back of the submersible. Find a light gray 1x4 offset plate. This looks like a 1x2 plate with two 1x1 round plates on the ends, which are offset towards one side. Place this in front, vertically with the end studs offset to the left.

47.2. Place two transparent 1x1 round tiles on the offset studs of the previous piece. These are the submersible's lights!

47.3. Place two light gray 1x1 tiles with clips on top, so the clips look like a U if you look at them from the front, on the other two studs on the 1x4 offset plate. We'll use these clips to attach the window to the submersible.

47.4. Rotate the light assembly so the 1x4 offset plate is vertical, with the lights and clips on the left, and so the lights are offset below the clips. Place this, centered vertically, on the two studs on the left side of the submersible which are at the bottom.

47.5. Repeat steps 47.1-47.3 to make another light assembly. Place this symmetrically on the right side of the submersible.

Open group 11.

48. Place a white 4x4 plate with a 2x2 round center, sideways with the studs on the left, on the four side studs on the left side of the submersible. The bottom of this piece should touch the top of the tiles with clips on the light assembly. Repeat this piece symmetrically on the right side.

49.1. Now we'll build the roof of the submersible. Place a blue 2x2 plate in front of you.

49.2. Place two 1x4 double curved slopes, vertically and centered vertically, on the two columns of the previous piece.

49.3. Place the roof assembly on the left two columns on top of the submersible.

49.4. Repeat steps 49.1-49.2 to make another roof section. Place it on the right two columns on top of the submersible.

50.1. Find a transparent 4x4x2 half sphere canopy with a bar handle on one side. Attach the bar of this piece, with the bar at the right and the open side of the canopy facing up, to the two clips on the left light assembly. Now, rotate the canopy clockwise until it closes. The open side of the canopy should sit flush with the 4x4 round plate on the left side of the submersible.

50.2. Repeat the previous step symmetrically on the right side of the submersible.

51.1. Now we'll build the large thrusters. Find a dark blue 4x4x2 cylinder with a center bar and holes on two sides. Lay this flat in front of you, with the side holes on the left and right.

51.2. Push a black 2L pin from group A, from the right into the right hole of the previous piece.

51.3. Rotate the thruster so the pin is at the back, and the flat sides of the 4x4x2 cylinder are on the left and right. Push the pin, from the front, into the center hole on the front side of the submersible.

51.4. Repeat steps 51.1-51.2 to make another thruster. Place this symmetrically on the back side of the submersible.

52.1. Now we'll build the roller to allow the submersible to move back and forth on the rail. Find the front and back facing holes on top of the submersible. Find a light gray 3L thin crank liftarm. This looks like a 3L thin liftarm with a pin on one side, and a thick axle hole on the opposite side. Rotate it so the pin is at the bottom, facing forward. Push it from the back into the back hole on top of the submersible.

52.2. Push a black 4L axle, from the front into the top axle hole of the previous piece. Push it in just until the back side is even with the back of the axle hole. The axle should extend 3L to the front.

53. Find a blue 2L pin connector. This piece looks like a smooth cylinder which is 2L long and has a small notch in the middle. Slide this piece, from the front onto the previous piece. This piece does not attach to the axle, instead it spins on it and allows the submersible to slide back and forth easily on the rail.

54.1. Now we're ready to attach the submersible to the rail! Place the two bases connected by the rail in front of you, with the bases on the left and right. Place the submersible on the rail by placing the 2L pin connector from the previous step on top of the rail so that the submersible hangs below the rail.

54.2. Push a light gray 3L thin crank liftarm, with the pin at the bottom facing the rear, so it connects to the axle and the hole on top of the submarine. The rail should now be boxed in on all sides! If you lift one of the levers, it should raise the rail on that side and cause the submersible to roll to the other side.

Congratulations! Now this build is complete!

Thank you so much for building this set!

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