NOTES: If you grew up without a basement, you might be under the impression that a sump pump is some kind of fantastical Dr. Seuss contraption. In fact, the rhyme is a coincidence. A “sump”—the word comes from the same Dutch and German that gave us “swamp”—is a low point where water collects. In a home, a sump collects water that would otherwise flood the basement. There are two main varieties: pedestal and submersible. A pedestal sump pump has its motor mounted atop a long shaft to keep it above the water level. But the motor is exposed, so if water reaches it, the machine will fail. A submersible pump like this one is designed to sit entirely in the sump. The motor and impeller are usually encased in cast iron, and because they’re designed to be underwater, can run more or less forever. As Paul Ruzicka, chief mechanical engineer of Xylem, says, “If you threw this pump in a pond, eventually, that pond will be gone.”

TIME TO DISASSEMBLE: 31 MINUTES, 17 SECONDS
NUMBER OF PARTS: 97
PRODUCED: ZHEJIANG, CHINA
MODEL: XYLEM GOULDS GSP0311

THE FLOAT
When it rains heavily, a home’s drainage system directs water into the sump. The cast-iron body of the pump keeps internal components dry and gives it enough heft to ensure that neither water flow nor pump vibration will move it. If the pump moves, it could restrict the range of motion of the float (12). That would be a problem, because the float's movements turn the pump on and off, using the same process that signals when a toilet's tank is full. The float is a plastic capsule of cellular foam that rises with the water level, lifting the switch lever (13). The switch lever feeds into the mechanical switch housing (1). When the rod reaches a factory-set level, it triggers the switch that turns on the motor.

The motor (6) is a typical 1/3-hp AC motor. It draws power through a fully jacketed power cable (4) routed through a rubber gland (3) that keeps water out of the motor dome (2). Two perfectly flat silicon carbide faces (10) form another seal between the dome and the impeller cavity. These rotate against each other without letting water in, allowing the motor to turn the pump shaft (11), and the pump shaft to turn the impeller (8), while the motor stays dry. The dome is filled nearly to the brim with 21 fluid ounces of mineral oil (5)—some room is left for thermal expansion—which helps cool and lubricate the bands of the motor. (A removable rubber plug allows oil to be drained during maintenance.) Any water in the sump also performs a useful cooling function, but with the impeller turning, the water level can drop quickly.

THE IMPELLER
The impeller spins in the base (9) of the pump, which has a slotted design to screen out debris larger than ½ inch in diameter, the maximum size solid the pump is capable of moving. The impeller imparts rotational motion to the water in the sump, directing it into the volute (7). The volute funnels water to the outtake port, which connects to a 1 ½-inch outflow pipe that directs water up, out of the basement and, one hopes, far away.

Kevin Dupzyk

CHOOSE A PUMP
If your pump isn’t capable of moving water out of your house faster than rain brings it in, you’re up a creek. Here’s how to make sure your pump is adequate.

1. Measure the diameter of your sump: If the diameter is 18 inches, each one-inch rise in water will equal about one gallon. If it’s 24 inches, each inch is about two gallons. During a heavy rain, measure how much the water rises in one minute. Use this to calculate how many gallons per minute you need to pump.

2. Figure out how far your pump has to move water, which is called total dynamic head. Start with the static head, the vertical distance the water will travel. Then add the friction head—the length of pipe the water will traverse, adjusted to account for fittings and friction. (The appropriate adjustments can be found online.)

3. Check the pump’s performance curve, which will be provided by the manufacturer. The curve shows how many gallons per minute it can pump for a given amount of total dynamic head. If your pairing of measurements falls below the curve, you’re safe.