MBBRd
Installation Instructions

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DOCUMENT

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About These Instructions

This manual contains an Installation Overview and a set of Installation Steps. It is not intended to replace installer training or requirements and instructions detailed in your engineering plan set. It may include additional steps that require completion prior to, during, or after the installation of Orenco components. Check to be sure all instructions and items supplied comply with all applicable regulations. If you discover any inconsistencies between your plan set and the instructions in this manual, contact your engineer or your dealer.

Installation Overview provides a simple overview of the installation steps. It is intended as a summary only, to provide a suggested order of operations – it does not provide complete instructions.

Installation Steps provide general instructions for each installation step along with references to installation documents for specific components. Many Orenco products come with installation instructions. All of these instructions are available in hard copy from Orenco and online in the Orenco Document Library.

Before You Begin

Before beginning, read these instructions and any documents referenced in them, and confirm the instructions for all of these products are the most current available. Check the Orenco Document Library to be sure your documents are current.

Please note that you must perform the installation according to the current manual. If you do not, the system's warranty will be void. If you are not an authorized installer, contact your dealer for training and authorization before installing this system. The dealer can provide technical support, training, and replacement components. To find the nearest dealer, check the Orenco Distributor Locator. If there is no dealer in your area, contact Orenco.

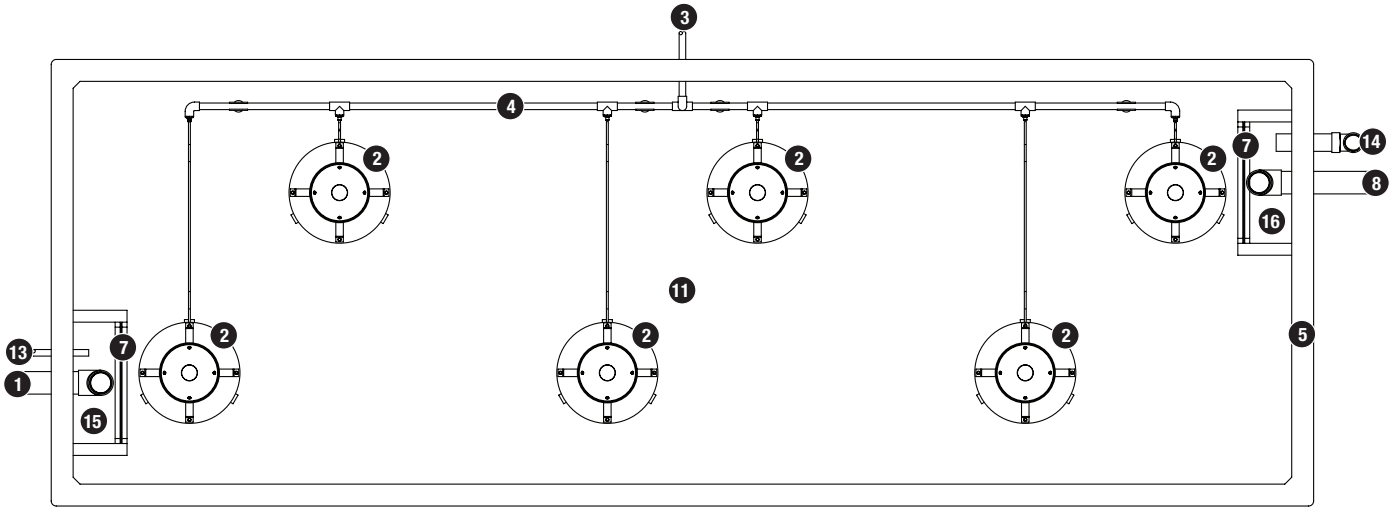
Be sure all of the necessary components are present before beginning the installation. Contact your dealer or Orenco at www.orenco.com if any components are missing or damaged.

Note — *All pipe diameters provided are US nominal PVC pipe sizes. If you're using metric pipe, you may need adapters to connect to the US fittings supplied with the unit(s).*

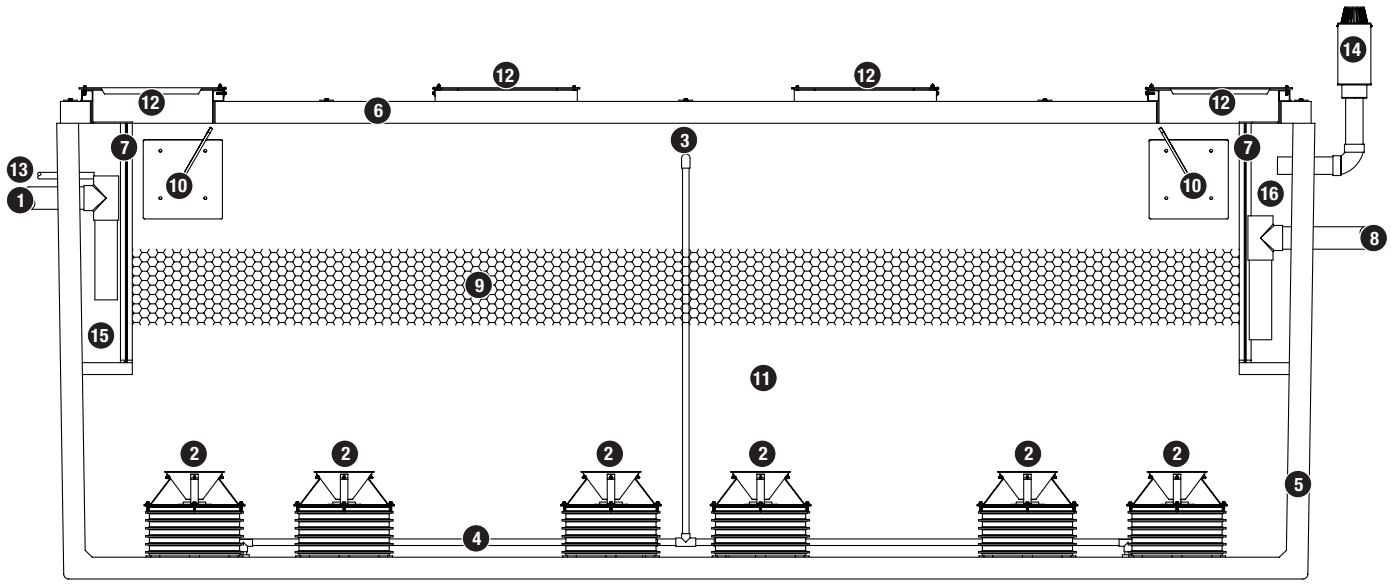
Standard Unit Components

Sample Moving Bed Biofilm Reactor - Denitrifying (MBBRd) Treatment Unit

Orenco's MBBRd units are highly customizable; multiple options and unit configurations are available. The configuration and components shown in this diagram are not intended to match the specific MBBRd unit(s) used in each installation.



Sample MBBRd Treatment Unit (top cutaway view)



Sample MBBRd Treatment Unit (side cutaway view)

1. Inlet
2. Pneumatic mixers
3. Air line from blower assembly (blower assembly not shown)
4. Pneumatic mixer line
5. Tank wall
6. Tank top
7. Media retention plate
8. Gravity outlet
9. Biofilm carrier
10. Lifting bracket
11. Denitrifying chamber
12. Access lid
13. Carbon feed line
14. Air vent
15. Inlet box
16. Outlet box

Installation Overview

Step 1. Review and compare the plan set to the actual site.

Step 2. For in-ground installations, perform the excavation(s) for the MBBRd unit(s) to the depths shown on the plan set.

Step 3. Prepare the pads for the MBBRd unit(s).

Step 4. Set the MBBRd unit(s) into position.

Step 5. For in-ground installations, construct antibuoyancy measures on the MBBRd unit(s) if they are required by the plan set.

Step 6. For above-ground installations, install any platforms and railings included with the MBBRd unit(s).

Step 7. Connect the plumbing. (If needed, backfill in stages until you reach the grade specified on the plan set.)

Step 8. Test for watertightness.

Step 9. Complete the backfilling around the units.

Step 10. Mount and connect the control panel for the MBBRd unit(s), or route and connect to the existing control panel.

Step 11. Install the blower.

Step 12. Refer to start-up instructions.

Installation Steps

Step 1. Review and Compare Plan Set

Review the plan set and compare it with the actual physical site:

- Make sure there are no obstructions on the site that could interfere with the installation.
- Check that all locations and elevations match the plan set.
- Discuss any differences between the plan set, the site, and these instructions with the engineer before continuing.

Key Points

- Follow the plan set for specific spacing distances between MBBRd units, as well as between MBBRd units and other components. Contact your dealer for more information.
- See Table 1 for depth and spacing recommendations.
- See the plan set for specific depths for burying or berming in-ground units.
- If the plan set calls for the unit(s) to be buried, contact your dealer or Orenco for additional instructions before proceeding.
- If the unit uses a gravity inlet or discharge, maintain a minimum slope of 1⁄8in per ft (10mm per m or 1%) in the gravity transport piping.

Table 1. Recommended Spacing for Units Equipped with Antibuoyancy Measures

Burial Depth*, ft (m)	Minimum Distance Between Units, ft (m)
5.5 (1.7)	8 (2.4)
6.5 (2.0)	10 (3.0)
7.5 (2.3)	12 (3.7)

** Burial depths are measured from the bottom of the MBBRd unit.*

Installation Steps

Compacted aggregate pad

Step 2. Perform Excavations

Note — *For units installed above grade, with or without berms, skip this step and go to Step 3.*

If the plan set calls for the unit(s) to be buried, perform the excavation(s).

- Mark the site(s) for the unit(s) and plumbing runs.
- Make the excavation(s) to the depth listed in the plans.
- If necessary, install shoring. Consult the engineer and applicable regulations for shoring requirements.
- If specified, excavate and prep French drains or other drainage systems.
- If high groundwater is discovered, contact the engineer.

Step 3. Prepare MBBRd Unit Pad(s)

Note — *An appropriately sized, level pad of concrete or asphalt can be used in place of a compacted pad.*

Step 3a. Make the bottom of the excavation or the pad site for each unit level and free of debris, rocks, and sharp objects.

- The bottom of the excavation or the pad site has to be stable and uniform to ensure equal bearing across the unit bottom.

Step 3b. Lay a level, compacted pad of ≤3/4in (19mm) aggregate, pea gravel, or approved granule overlying a firm, uniform base.

- Compact the pad to 95% compaction.
- Lay the pad at least 7.5ft (2.3m) wide and at least as long as the unit.

Key Points

- Completely level pads are critical for correct installation.
- If the base soil is unstable (peat, quicksand, muck, soft or highly expansive clay, etc.), overexcavate the site depth and set a firm, 6in (150mm) compacted pad of ≤1/2in to ≤3/4in (13 to 19mm) aggregate.
- In extremely unstable soil, a concrete pad may be required.
- If you have doubt about the soil's stability, consult a local civil or structural engineer.

Installation Steps

Step 4. Set MBBRd Unit(s)

IMPORTANT

- **Know the specific weight of the unit and use proper lifting equipment.**
- **MBBRd units can weigh over 10,000lbs (4536kg) depending on the model. If you are unsure of the unit's weight, contact Orenco before attempting to lift it.**
- **Keep nonessential personnel clear when moving and setting units!**

Key Point — When installing multiple MBBRd units, confirm each unit's location and direction before off-loading and placing it.

Step 4a. Position the transport vehicle and lifting equipment as close to the pad as possible.

- If the unit has been transported to the site in a shipping container, see *Removing Units from Shipping Containers*, NIN-ATX-MAX-1.

Step 4b. Attach the provided lifting cables to the four lifting brackets on the unit and raise the lifting equipment until all of the cables are tight.

IMPORTANT — Make sure the cables are properly attached!

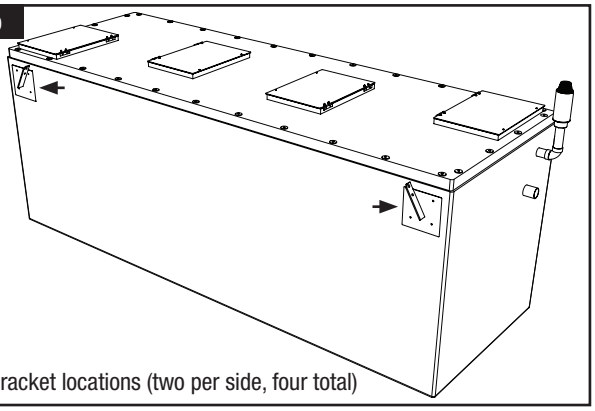
Step 4c. If antiflotation brackets are included with the unit, attach them to the unit's base with the supplied hardware.

Step 4d. Lift the MBBRd unit off of the transport and move it into position.

Step 4e. Lower the unit onto the pad.

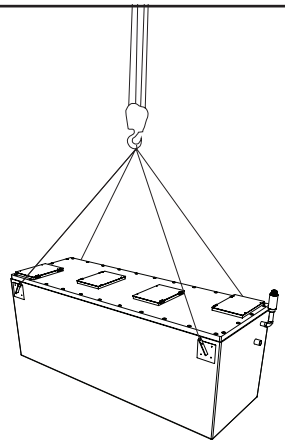
- Keep the unit centered on the pad as you lower it.

Step 4b



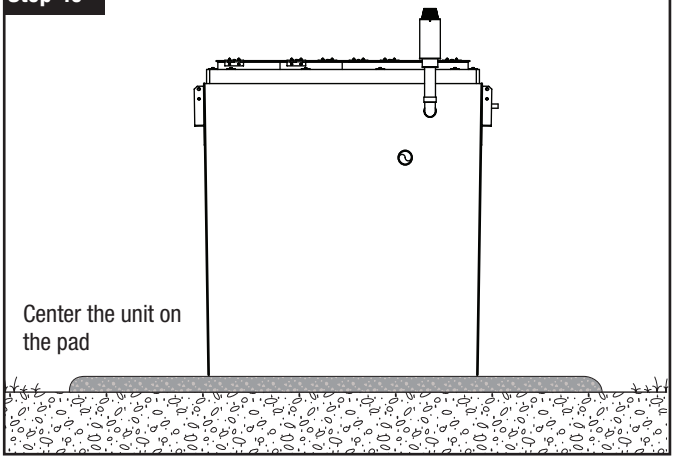
Lifting bracket locations (two per side, four total)

Step 4d



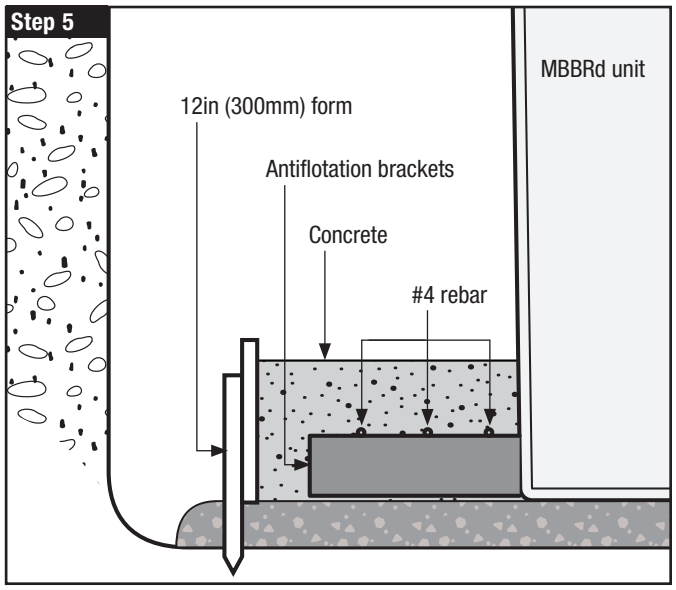
Lifting the unit

Step 4e



Installation Steps

Step 5



Step 6

Step 5. Construct Antibuoyancy Measures

Key Points

- The standard method for constructing antibuoyancy measures is described below. For other methods, contact your dealer or Orenco.
- Contact the project engineer if you are unsure about the need for antibuoyancy measures.

Step 5a. Build forms 12in high × 20in wide (300mm × 500mm) along the full length of both long sides of the unit.

Step 5b. Place three evenly spaced runs of #4 rebar on top of the antiflotation brackets, along the unit's entire length on both sides.

- Tack-weld or wire tie the rebar pieces in place on the brackets.

Step 5c. Pour concrete into the forms.

IMPORTANT — Use a 4000psi (27,580kPa) minimum concrete mix!

- The concrete has to cover the rebar by a minimum of 1.5in (40mm) after it is poured and level.

Step 5d. Wait for the concrete to set before backfilling.

Step 6. Install Platforms and Railings

If your unit's components include platforms and railings, install them now.

IMPORTANT — Wear proper safety equipment when installing platforms and railings!

Note — *Before installing the platforms and railings, make sure that all of the parts and hardware have been received.*

Step 6a. Unfold the platforms into a horizontal position, install the platform posts, and secure them to the unit(s) with the supplied hardware.

Step 6b. Place and secure the railings to the unit(s) with the supplied hardware.

Step 6c. Install the ladder(s) and secure them with the supplied hardware.

Installation Steps

Step 7. Connect Plumbing

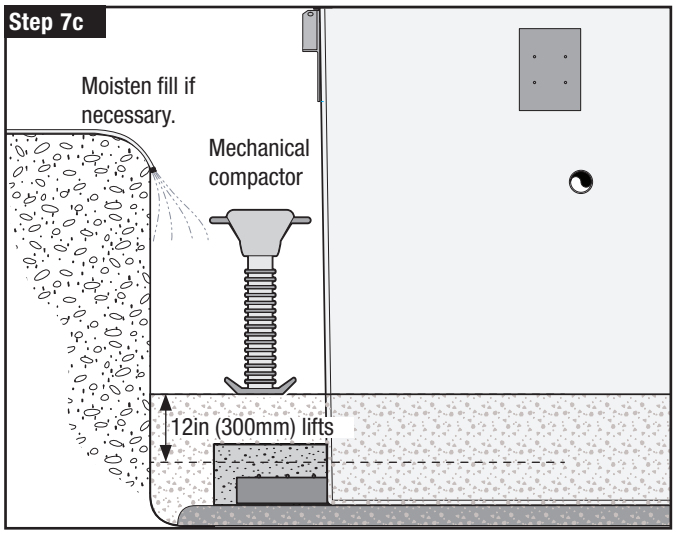
Step 7a. Using the plan set, identify the location of all transport lines and air lines between the MBBRd unit(s) and other system components.

Key Point — Contact Orenco before proceeding if the plan set shows the unit buried below grade.

Step 7b. Fill the MBBRd unit to the midpoint with water.

Step 7c. For in-ground or bermed installations, backfill around the unit to 24in (600mm) below the lowest unit penetration (liquid or air line).

- Do not backfill to a level higher than is called out on the plan set.
- Lay a level, 95% compacted bed of ≤3/4in (19mm) aggregate, pea gravel, or approved granule for transfer lines.
- Backfill in 12in (300mm) lifts – don't damage transport lines.
- Use a mechanical compactor to compact each lift.
- If necessary, moisten the backfill material with water to help compaction.



Step 7d. Connect liquid transport and air line piping to the MBBRd unit(s).

- Support the piping to prevent sagging.

Step 8. Test Watertightness

Step 8a. Fill the MBBRd unit(s) with water to 2in (50mm) above the outlet to test for watertightness.

IMPORTANT — NEVER submerge electrical conduit penetrations or junction boxes inside an MBBRd unit!

Step 8b. Wait 10 minutes and then check for leaks around the penetrations and lines, as well as for changes in the liquid level inside the unit(s).

- Repair any leaks in the lines and connections.
- Contact Orenco if there is any leakage around plumbing penetrations in the unit(s) or changes in the liquid level inside the unit(s).

Installation Steps

Step 9. Backfill Around the Units

Step 9a. For in-ground or bermed installations, backfill around the MBBRd unit(s) to the level listed on the plan set.

- Lay a level, 95% compacted bed of ≤3/4in (19mm) aggregate, pea gravel, or approved granule for inlet and outlet piping.
- Backfill in 12in (300mm) lifts.
- Use a mechanical compactor to compact each lift.
- If necessary, moisten the backfill material with water to help compaction.

Key Points

- Don't alter the slope of lines or damage the lines during backfilling.
- Do not use native material to backfill if it is very soft or highly expansive clay or if it contains debris, large >3/4in (19mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤3/4in (19mm) crushed stone as fill material. This material should be washed and free of debris.
  - In noncohesive soils with high seasonal water tables, use ≤3/4in (19mm) crushed rock as the backfill material.
  - Do not backfill with sand.
- Be sure that the final grade slopes away from the unit(s).

Step 10. Route and Connect Control Panel

Notes

- *Installation instructions, schematics, and panel-specific wiring diagrams are included with each Orenco control panel. If any of these are missing, contact your dealer for a replacement.*
- *Follow the panel manufacturer's instructions and schematics if you are not using an Orenco control panel.*

Step 10a. Turn off power to the control panel.

Step 10b. Route and install electrical conduit between the MBBRd unit(s), air supply, and the control panel.

Step 10c. Route all necessary electrical wires or cables between the MBBRd unit(s), the air supply, and the control panel.

Step 10d. Make all necessary electrical connections between the MBBRd unit(s), the air supply, and control panel, as shown in the system's wiring diagram.

Key Points

- This step should be performed by a licensed and qualified electrician.
- Follow all applicable regulations and electric codes.
- Use waterproof wire connectors to avoid electrical shorts and other issues.
- Be sure to seal the conduit at the control panel and at the splice box with UL-listed sealing foam, putty, silicone sealant, or an Orenco seal kit.

Step 10e. Restore power to the control panel.

Installation Steps

Step 11. Install the Blower

Step 11a. Prepare the area within the controls building for placement of the blower, according to the plan set.

- Be sure to allow for service space around the blower.

Step 11b. Remove the 1.25in (32mm) stainless steel flanges from the blower outlet piping and set them aside.

Step 11c. Position the blower in the appropriate orientation as you run the 1.25in (32mm) stainless steel blower outlet piping through the control building wall.

- You might need to maneuver the air piping while you position the blower.

Step 11d. Secure the blower to the floor (refer to the plans).

Step 11e. Seal the wall penetrations around the piping.

Step 11f. Install a 1.25in (32mm) PVC receiving adapter onto the threaded ends of the blower piping.

- Orenco recommends using an anti-seize compound on stainless steel threads.

Step 11g. Connect the piping from the blower outlet to the MBBRd.

Step 11h. Determine the incoming voltage in the control panel.

- The MBBRd blowers can operate on 120V and 240V for single-phase, and 240V or 480V for three-phase.

Step 11i. Connect the wiring to the blower motors. The back of the junction box cover on the blower has a schematic for how to wire depending on the voltage to the blower motor. Configure the wiring appropriately.

Step 11j. Refer to the control panel wiring diagram, the engineer's plans, and the documentation provided by the blower manufacturer for more information.

Step 11k. Verify that the blower works by powering it on, observing its function, and powering it back off.

Step 12. Refer to Start-Up Instructions

Refer to the *MBBRd Operation and Maintenance Instructions*, NIN-TRT-MBB-1 for start-up instructions.