MBBRa
Installation Instructions

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DOCUMENT

NIN-TRT-MBB-4
Rev. 2 © 09/25

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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.

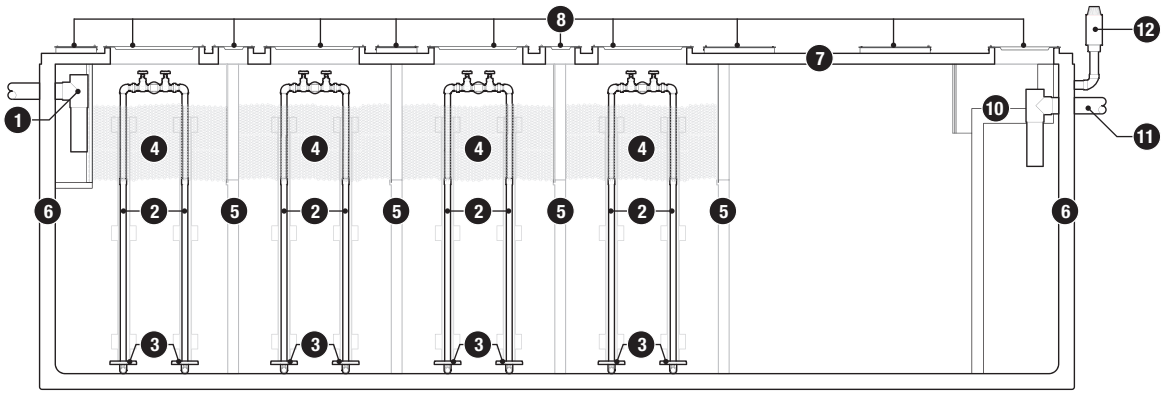
Be sure all of the necessary components are present before beginning the installation. Contact your dealer or Orenco at www.orenco.com if any components are missing or damaged.

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).*

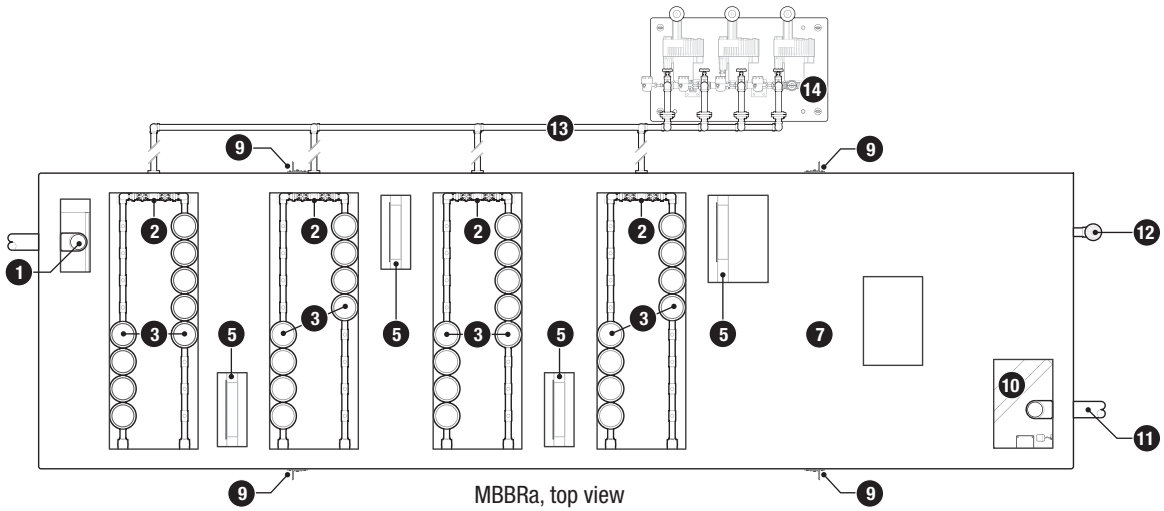
Standard Unit Components

Sample Moving Bed Biofilm Reactor - Aerating (MBBRa) Treatment Unit

Orenco's MBBRa 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 MBBRa unit(s) used in each installation.



MBBRa, side cutaway view



MBBRa, top view
(access lids removed)

MBBRa Components

1. Inlet with media retention plate
2. Air diffuser manifolds (duplex)
3. Air diffusers (quantity varies)
4. Biofilm carrier
5. Baffle
6. Tank wall
7. Tank top
8. Access lids
9. Lifting bracket
10. Corner weir
11. Outlet
12. Air vent
13. Air line
14. Air blower (3-blower configuration)

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 MBBRa unit(s) to the depths shown on the plan set.

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

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

Step 5. Secure the MBBRa vessel to the concrete slab.

Step 6. For above-ground installations, install any platforms and railings included with the MBBRa 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 MBBRa unit(s), or route and connect to the existing control panel.

Step 11. Install the blower skid.

Step 12. Install any additional equipment including any remaining ventilation piping and/or other auxiliary piping/equipment.

Step 13. Refer to the 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

- Based on the plans, note the dimensions and shipped weight of the vessel(s), elevation of inlet/outlet penetrations, and considerations for anti-buoyancy.
- Plan for a crane for off-loading and setting the vessel(s) in the excavation(s). Spreader bars are needed. Consult the lifting plan for details.
- Plan for work to be done for laying concrete and installing piping, electrical conduit, and any other utilities.
  - Stainless steel piping is needed for aeration lines.
  - Any needed concrete anchors are specified in the plan set.
- See the plan set for specific depths for burying or berming in-ground units.
  - The top of the unit(s) cannot be buried and should be at least 6in (approximately 150mm) above final grade.
  - If the top of a unit extends greater than 18in (460mm) above final grade, access must be considered.
  - If the top of a unit is more than 48in (1220mm) above final grade, appropriate fall prevention devices must be installed. (See local OSHA regulations regarding requirements).
- If the plan set calls for the unit(s) to be installed completely above grade, contact your dealer or Orenco for additional instructions before proceeding.
- For gravity lines, maintain a minimum slope of 1⁄8in per ft (10mm per m or 1%) in the direction of flow.

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 partially buried, perform the excavation(s).

- Mark the site(s) for the unit(s) and plumbing runs.
- Make the excavation(s) to the specifications 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 before continuing.

Step 3. Prepare MBBRa Unit Pad(s)

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 weight bearing across the unit bottom.

Key Points

- Completely level pads are critical for correct installation. A level pad should not vary more than 1/4in (6mm).
- 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 site of ≤1/2in to ≤3/4in (13 to 19mm) aggregate.

Step 3b. Create a pad that is free of debris, rocks, and sharp objects.

Without Antibuoyancy

1. Make a pad that extends 12in (approximately 300mm) outside the perimeter of the entire vessel.
2. Lay a level, compacted base at least 6in (approximately 150mm) deep using <1in (25mm) gravel.

With Antibuoyancy

3. Make a pad that extends 24in (approximately 600mm) outside the perimeter of the entire vessel.
4. Create a concrete slab that will extend 18in (457mm) outside the perimeter of the entire vessel and that is at least 6in (152mm) thick with #4 rebar in a 12in (or 300mm) grid pattern.
5. Install a 1/2in (12.7mm) thick ethylene propylene diene terpolymer (EPDM) or equivalent liner on top of the concrete.

Installation Steps

Step 4. Set MBBRa Unit(s)

IMPORTANT

- **Know the specific weight of the unit and use proper lifting equipment (a crane).**
- **MBBRa units can weigh up to more than 30,000lbs (13,608kg). If you are unsure of the unit's weight, contact Orenco before attempting to lift it.**
- **Do not use chains near the lifting brackets; damage to the fiberglass top can occur.**
- **Keep nonessential personnel clear when moving and setting units!**

Key Point — When installing multiple MBBRa 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 appropriate shackles to the four lifting brackets on the unit and raise the lifting equipment until all of the cables are tight.

- The attachment point holes are 1in (25mm) in diameter.

IMPORTANT

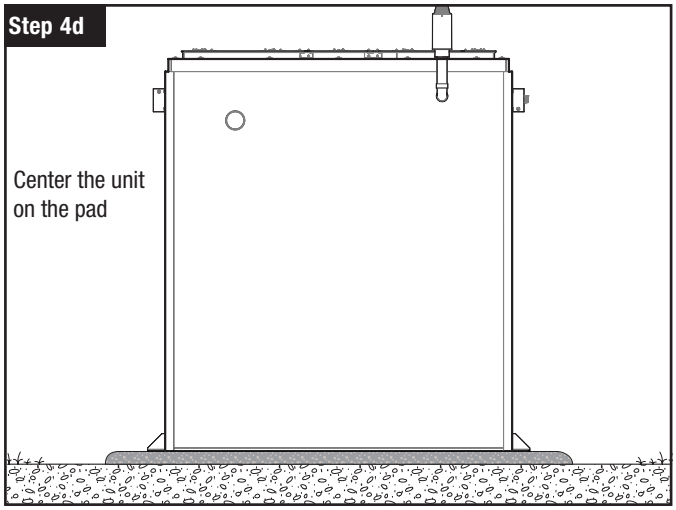
- **Be sure that all hatches are secured.**
- **Spreader bars will be required to lift the vessel.**
- **Make sure the cables are properly attached!**

Step 4c. Lift the MBBRa unit off of the transport and move it into position with the correct orientation.

Step 4d. Lower the unit onto the pad.

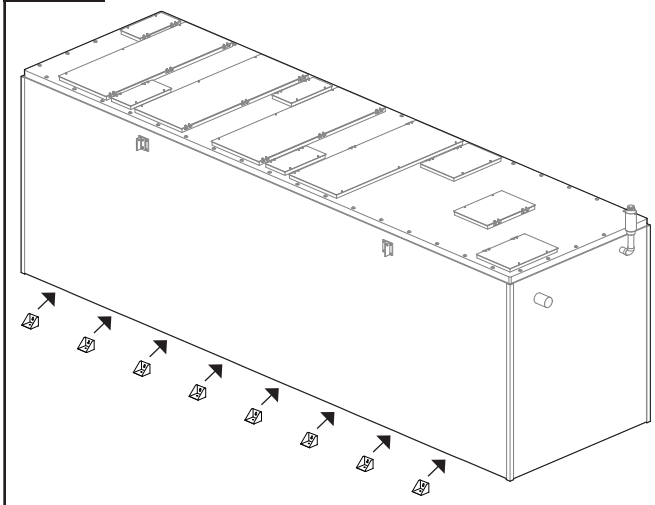
- Keep the unit centered on the pad as you lower it.

Step 4e. Verify that the unit is level.



Installation Steps

Step 5a



Anchoring bracket installation locations, one side

Step 6

Step 5. Secure Vessel to Concrete Slab

If the vessel has been placed on a concrete slab, secure it to the slab.

Key Points

- Tank anchoring brackets are shipped loose. The number of anchoring brackets depends on the size of the unit.
- The type of concrete anchors needed are specified by the engineer in the plan set.

Step 5a. Attach the anchoring brackets to both long sides of the vessel at the base.

Step 5b. Secure the brackets into the concrete with the concrete anchors.

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

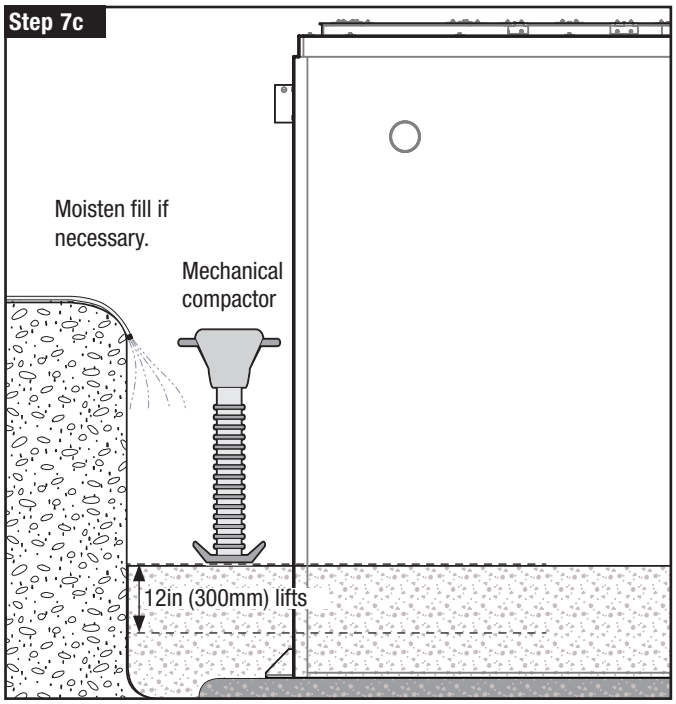
Step 7. Connect Plumbing

Step 7a. Using the plan set, identify the location of all transport piping, conduit runs, and other treatment components.

Step 7b. Begin filling the unit with water through the inlet of the vessel. Do not fill the unit above the invert of outlet at this time.

Step 7c. For in-ground or bermed installations, backfill around the unit in 12in (about 300mm) lifts to 24in (approximately 100mm) below the inlet, outlet, air, and conduit lines.

- Do not backfill to a level higher than is specified on the plan set.
- Lay a level, 95% compacted bed of ≤3/4in (19mm) aggregate, pea gravel, or approved granule for all piping.
- Backfill in 12in (about 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 the inlet and outlet piping to the MBBRa unit(s).

- Support the inlet and outlet piping to prevent sagging.

Step 7e. Connect the stainless steel air piping to the corresponding plumbing.

- Use either a 2in stainless steel flange or HPS boot to connect stainless steel plumbing to the unit.
  - When using pipe flanges, high temperature gaskets must be used.
  - Orenco recommends using an anti-seize compound on all stainless steel threaded connections.
  - For HPS boots, be sure both pipe ends are free of burrs and sharp edges before fitting the boot.

Step 7f. Label and track piping back to the control building for appropriate zones.

- For some systems, a single zone may have multiple penetration connections; see the site plans for appropriate plumbing in these circumstances.

Installation Steps

Step 8. Test Watertightness

Perform this step for each MBBRa vessel, following all applicable regulations for watertightness testing.

Step 8a. Plug the vessel's inlet and outlet with watertight plugs.

Step 8b. Fill the vessel with water to 2in (approximately 50mm) above the inlet to test for watertightness.

- Do not fill the unit more than 2in (50mm) above the inlet.

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

Step 8c. Wait 30 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).

Step 8d. Remove the plugs when the vessel passes the test.

Step 9. Backfill Around the Units

For in-ground or bermed installations, backfill around the MBBRa 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 (approximately 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.
- The underside of the unit's lid requires 24-30in (610-762mm) clearance above final grade.
- 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

Note — *Installation instructions, schematics, and wiring diagrams are included with each control panel. If any of these are missing, contact your dealer.*

Key Points

- This step should be performed by a licensed and qualified electrician.
- Follow all applicable regulations and electric codes.
- Mount the control panel in the controls building.
- Use waterproof wire connectors.
- 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 10a. Turn off power to the control panel.

Step 10b. Mount the control panel using the instructions included with it.

Step 10c. Route and install all necessary electrical conduit.

Step 10d. Route all system-related electrical and telecom wires into the control panel and make connections as shown in the system's wiring diagram.

- One or more incoming power circuits may be required for the control panel, depending upon the number of pumps and applicable codes.
- Phone, Ethernet, or cellular modem wiring is required for remote access (in TCOM™ remote telemetry panels).

Step 10e. Restore power to the control panel.

Installation Steps

Step 11. Install the Blower Skid

Step 11a. Inspect the blower skid assembly for any damage.

Step 11b. Review the site plans for placement of the blower skid and installation of all associated plumbing/electrical requirements.

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

- Be sure to allow for service space around the skid for servicing of the blowers and equipment.

Step 11d. Remove the 2in stainless steel flanges from the blower outlet piping and set them aside.

Step 11e. Lift the skid using the corner lifting rings or with forks from the bottom.

IMPORTANT — Be sure to use appropriate lifting equipment! The skid could weight over 600lbs (272kg). If the weight is unknown, contact Orenco.

Step 11f. Move the skid into the appropriate position and orientation.

- While positioning, you may need to simultaneously run the air piping through the control building wall as you maneuver the skid.

Step 11g. Secure the skid to the floor if required.

- Some skid assemblies are not attached; refer to the plans for confirmation.

Step 11h. Install any sealing devices for the wall penetrations for the 2in stainless steel blower outlet piping from the skid.

Step 11i. Reinstall the flanges onto the threaded ends of the blower piping.

IMPORTANT — For the flange gaskets, only use high temperature style gaskets rated for ≤200°F (93°C).

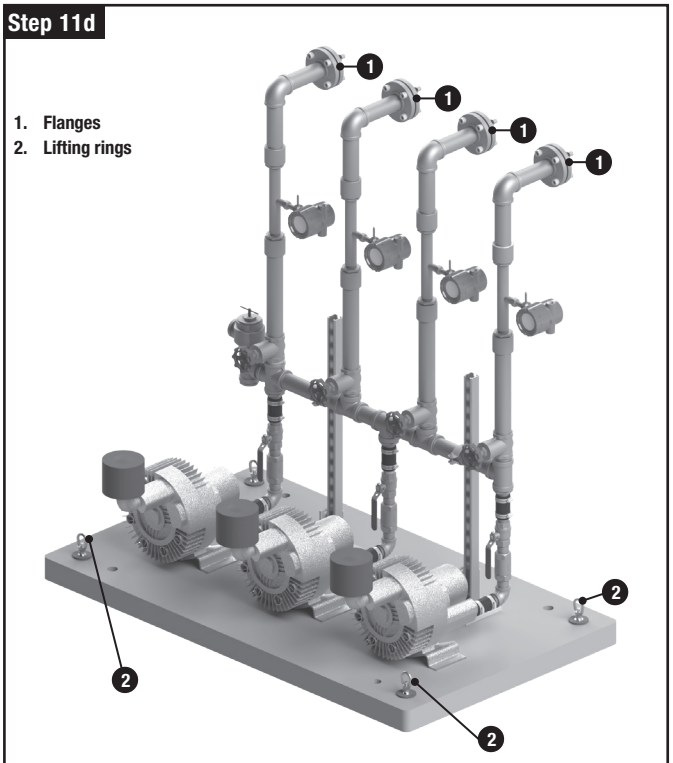
Key Point — Orenco recommends using an anti-seize compound on stainless steel threads.

Step 11j. Connect the piping from the blower outlet to the MBBRa.

Step 11k. Determine the incoming voltage from the variable-frequency drive (VFD) in the control panel.

- The MBBRa blowers can operate on either 240V or 480V 3-phase.

Step 11d



Typical three-blower skid assembly system

Installation Steps

Step 11. Install the Blower Skid, cont.

Step 11l. Connect the wiring to the blower motors. The back of the junction box cover on the blower has a wiring schematic based on the voltage to the blower motor. Configure the wiring appropriately.

Step 11m. Connect wiring to each of the electric flow meters on the blower skid to the appropriate terminals in the control panel.

- Some systems may require 4-20mA signal wiring from each flow meter as well.
- Refer to the control panel wiring diagram and site plans for more information.

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

- Verify that each blower is operational.

Step 12. Install Any Additional Equipment

Review the site plans and install any remaining ventilation piping and/or other auxiliary piping/equipment.

Step 13. Refer to Start-Up Instructions

Refer to the *MBBRa Operation and Maintenance Instructions*, NIN-TRT-MBB-3 for start-up instructions.

- Perform the initial start-up steps while the electrician is on-site to correct any wiring issues.